



## PUBLIC

SAP HANA Smart Data Integration and SAP HANA Smart Data Quality 2.0 SP03

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# Installation and Configuration Guide

# Content

<b>1</b>	<b>Installation and Configuration Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality</b>	<b>10</b>
1.1	Overview	10
1.2	Architecture	12
1.3	Components to Install, Deploy, and Configure	14
1.4	Deployment Options	15
	Deployment in High Availability Scenarios	16
	Deployment with SAP HANA Cloud	18
	Deployment with the SAP HANA Service	21
1.5	Administration Tools	23
<b>2</b>	<b>Configure Smart Data Integration</b>	<b>24</b>
2.1	Assign Roles and Privileges	25
2.2	Configure the Data Provisioning Server	31
	Enable the Server in a Multi-database Container Scenario	31
	Enable the Server in a Scale-out SAP HANA Database Scenario	32
	Enable the Server for the SAP HANA Service	32
2.3	Download and Deploy the Data Provisioning Delivery Unit	33
	Download the Data Provisioning Delivery Unit	34
	Deploy the Delivery Unit from SAP HANA Studio	35
	Deploy the Delivery Unit from SAP HANA Application Lifecycle Management	35
2.4	Install the Data Provisioning Agent	36
	Planning and Preparation	37
	Install the Data Provisioning Agent	42
	Manage Agents from the Data Provisioning Agent Monitor	47
2.5	Configure the Data Provisioning Agent	49
	Configuring the Agent in Command-Line Interactive Mode	50
	Configuring the Agent in Command Line Batch Mode	69
	Configuring the Agent in Graphical Mode [Deprecated]	83
	Managing Agent Groups	94
	Manage Agents from the Data Provisioning Agent Monitor	103
	Agent Adapter Framework Preferences	104
	Agent Runtime Options	108
	Replicating an Agent Configuration to Another Host	110
2.6	Register Data Provisioning Adapters	111
	Register Adapters with SAP HANA	112
	Register Adapters with SAP HANA [Command Line]	114

	Manage Adapters from the Data Provisioning Agent Monitor. . . . .	115
2.7	Create a Remote Source. . . . .	117
	Create a Remote Source in the Web-Based Development Workbench . . . . .	118
	Create a Remote Source in the SQL Console. . . . .	119
	Create Credentials for a Secondary User. . . . .	120
	Configure a Grantor for the HDI Container. . . . .	121
2.8	Set Up Data Provisioning Monitoring. . . . .	124
	Grant Roles to Users . . . . .	124
2.9	Enabling Enterprise Semantic Services. . . . .	125
	Setting Up the SAP HANA Instance for Enterprise Semantic Services. . . . .	126
	Download Enterprise Semantic Services Delivery Unit. . . . .	128
	Importing the Enterprise Semantic Services Delivery Unit. . . . .	128
	Install or Upgrade Enterprise Semantic Services (install.html) . . . . .	130
	Grant Enterprise Semantic Services Roles and Privileges to Users . . . . .	132
	Uninstall Enterprise Semantic Services. . . . .	133
2.10	Enable SAP HANA Smart Data Integration REST API. . . . .	133
<b>3</b>	<b>Configure Smart Data Quality. . . . .</b>	<b>135</b>
3.1	Directories. . . . .	135
	Install or Update Directories on the SAP HANA Host Using Lifecycle Manager. . . . .	136
	Install or Update Directories from a Web Browser Using Lifecycle Manager. . . . .	138
	Integrate Existing Directories into Lifecycle Manager. . . . .	141
	Uninstall Directories. . . . .	144
<b>4</b>	<b>Update Smart Data Integration. . . . .</b>	<b>145</b>
4.1	Update the Data Provisioning Agent. . . . .	145
4.2	Install or Upgrade Enterprise Semantic Services (install.html) . . . . .	148
<b>5</b>	<b>Uninstall Smart Data Integration. . . . .</b>	<b>150</b>
5.1	Uninstall the Data Provisioning Agent. . . . .	150
5.2	Uninstall Enterprise Semantic Services. . . . .	152
<b>6</b>	<b>Configure Data Provisioning Adapters. . . . .</b>	<b>153</b>
6.1	Configure Adapter Preferences. . . . .	156
	Configure Adapter Preferences in Discrete Command Mode. . . . .	157
6.2	Custom Adapters. . . . .	157
6.3	Apache Camel Facebook. . . . .	158
	Set up the Camel Facebook Adapter. . . . .	158
	Camel Facebook Adapter Remote Source Configuration. . . . .	159
6.4	Apache Camel Informix. . . . .	160
	Set Up the Camel Informix Adapter. . . . .	161
	Camel Informix Remote Source Configuration. . . . .	162
6.5	Apache Camel JDBC. . . . .	163

	Set up the Camel JDBC Adapter. . . . .	164
	Camel JDBC Remote Source Configuration. . . . .	166
	Connect to MySQL Using the Camel JDBC Adapter. . . . .	168
	Disable Adapter Write-back Functionality. . . . .	168
6.6	Apache Camel Microsoft Access. . . . .	169
	Set Up the Camel Microsoft Access Adapter. . . . .	170
	Microsoft Access Remote Source Configuration. . . . .	170
6.7	Apache Cassandra. . . . .	172
	Cassandra SSL Configuration. . . . .	172
	Enable Kerberos Authentication. . . . .	175
	Cassandra Remote Source Configuration. . . . .	177
	Disable Adapter Write-back Functionality. . . . .	180
6.8	Apache Impala. . . . .	181
	Apache Impala Remote Source Configuration. . . . .	182
	Kerberos Realm and KDC. . . . .	186
6.9	File. . . . .	187
	Configure the File Adapter. . . . .	189
	File Adapter Remote Source Configuration. . . . .	190
	Configuration Files. . . . .	198
	Remote Source Tables. . . . .	215
	Connect to a SharePoint Remote Source. . . . .	215
	Access SharePoint Using HTTPS/SSL. . . . .	217
	Accessing Files On a Shared Network. . . . .	218
	Disable Adapter Write-back Functionality. . . . .	219
	Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365. . . . .	220
	Configure Your Microsoft Azure Application. . . . .	221
6.10	File Datastore Adapters. . . . .	222
	Authorizations. . . . .	223
	Configuring Access to Your Data and Configuration Files . . . . .	223
	File Format Configuration Files. . . . .	224
	Format Parameters for File Datastore Adapters. . . . .	226
	Virtual Procedures. . . . .	230
	FileAdapterDatastore. . . . .	236
	SFTPAdapterDatastore. . . . .	240
6.11	Hive. . . . .	244
	Understanding Hive Versions, Features, and JAR Files. . . . .	245
	Hive Remote Source Configuration. . . . .	248
	Kerberos Debugging. . . . .	253
6.12	IBM DB2 Log Reader. . . . .	254
	IBM DB2 Real-time Replication. . . . .	256

	DB2LogReaderAdapter Preferences. . . . .	268
	DB2 Log Reader Remote Source Configuration. . . . .	270
	Using a Schema Alias . . . . .	277
	Log Reader Adapter Log Files. . . . .	278
	Configure SSL for the DB2 Log Reader Adapter. . . . .	278
	Creating a Whitelist to Limit Access to a Source Database. . . . .	281
	Disable Adapter Write-back Functionality. . . . .	282
6.13	IBM DB2 Mainframe. . . . .	283
	Setting DB2 Universal Database Environment Variables. . . . .	284
	IBM DB2 Mainframe Permissions. . . . .	284
	Bind the DB2 SYSHL Package. . . . .	285
	Preparing JDBC JAR Files. . . . .	285
	IBM DB2 Mainframe Remote Source Configuration. . . . .	286
6.14	Microsoft Excel. . . . .	288
	Microsoft Excel Authorizations. . . . .	289
	Microsoft Excel Adapter Preferences. . . . .	289
	Microsoft Excel Remote Source Configuration. . . . .	289
	Access SharePoint Using HTTPS/SSL. . . . .	295
	Accessing Microsoft Excel Data Files in a Shared Network Directory . . . . .	296
	Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365. . . . .	297
	Configure Your Microsoft Azure Application. . . . .	298
6.15	Microsoft Outlook. . . . .	299
	Microsoft Outlook Adapter Preferences. . . . .	299
	Microsoft Outlook Remote Source Configuration. . . . .	300
6.16	Microsoft SQL Server Log Reader. . . . .	301
	Microsoft SQL Server Real-time Replication. . . . .	303
	MssqlLogReaderAdapter Preferences. . . . .	322
	Microsoft SQL Server Log Reader Remote Source Configuration. . . . .	325
	Using a Schema Alias . . . . .	337
	Log Reader Adapter Log Files. . . . .	338
	Configure SSL for the Microsoft SQL Server Log Reader Adapter. . . . .	338
	Configuring Windows Authentication. . . . .	340
	Creating a Whitelist to Limit Access to a Source Database. . . . .	341
	Disable Adapter Write-back Functionality. . . . .	342
	Configure Microsoft Windows Authentication. . . . .	343
6.17	OData. . . . .	344
	Installation and Deployment. . . . .	345
	Consume HTTPS OData Services. . . . .	348
6.18	Oracle Log Reader. . . . .	349
	Oracle Database Permissions. . . . .	352

	Oracle Real-time Replication. . . . .	358
	OracleLogReaderAdapter Preferences. . . . .	367
	Oracle Log Reader Remote Source Configuration. . . . .	370
	Using a Schema Alias . . . . .	386
	Oracle RAC Configuration. . . . .	387
	Amazon Web Services Configuration . . . . .	389
	Log Reader Adapter Log Files. . . . .	390
	Synchronize the Oracle and Data Provisioning Agent Timestamp. . . . .	390
	Configure SSL for the Oracle Log Reader Adapter. . . . .	391
	Creating a Whitelist to Limit Access to a Source Database. . . . .	394
	Disable Adapter Write-back Functionality. . . . .	395
6.19	PostgreSQL Log Reader. . . . .	396
	Configure PostgreSQL Source for Real-time Replication. . . . .	397
	PostgreSQL Remote Source Configuration. . . . .	398
	Amazon Web Services Configuration. . . . .	401
	Using a Schema Alias . . . . .	402
	Disable Adapter Write-back Functionality. . . . .	403
	PostgreSQL DDL Replication. . . . .	404
6.20	SAP ABAP. . . . .	405
	Authorizations. . . . .	406
	Using RFC Streaming With Tables. . . . .	412
	SAP ABAP Adapter Preferences. . . . .	414
	SAP ABAP Adapter Remote Source Configuration. . . . .	414
6.21	SAP ASE. . . . .	419
	Configure Your SAP ASE Database. . . . .	420
	SAP ASE Adapter Preferences. . . . .	421
	SAP ASE Remote Source Configuration. . . . .	422
6.22	SAP ECC. . . . .	424
	Terminology. . . . .	426
	Installation and Setup. . . . .	426
	SAP ECC Adapter Preferences. . . . .	427
	Permissions for ECC Dictionary Tables. . . . .	436
	Create an ECC Remote Source. . . . .	436
	SAP ECC Remote Source Configuration. . . . .	437
	Creating a Whitelist to Limit Access to a Source Database. . . . .	439
	SQL Pushdown for Pooled and Cluster Tables. . . . .	440
	Loading Metadata for Cluster and Pooled Tables. . . . .	441
6.23	SAP HANA. . . . .	442
	User Permissions. . . . .	444
	SAP HANA Adapter Preferences. . . . .	444
	SAP HANA Remote Source Configuration. . . . .	444



	SAP HANA DDL Propagation. . . . .	456
	Use a Shadow Remote Source. . . . .	457
	Creating a Whitelist to Limit Access to a Source Database. . . . .	458
	Disable Adapter Write-back Functionality. . . . .	459
6.24	SDI DB2 Mainframe. . . . .	460
	SDI DB2 Mainframe Adapter Architecture. . . . .	462
	Mandatory Changes on Mainframe Systems. . . . .	463
	Install the SDI DB2 Mainframe Adapter. . . . .	464
	SDI DB2 Mainframe Adapter Preferences. . . . .	465
	Install Replication Agent for SDI DB2 Mainframe Adapter. . . . .	467
	Replication Agent for SDI DB2 Mainframe Adapter Configuration. . . . .	470
	Change the OCS Server Port Number Using Command-Line Utility. . . . .	472
	Preparing JDBC JAR Files. . . . .	473
	IBM DB2 Mainframe Remote Source Configuration. . . . .	473
6.25	SOAP. . . . .	478
	SOAP Adapter Remote Source Configuration. . . . .	478
	Setting up the SOAP Adapter: SQL Example. . . . .	480
6.26	Teradata. . . . .	481
	Authentication and User Privileges. . . . .	482
	Teradata Adapter Preferences. . . . .	483
	Teradata Remote Source Configuration. . . . .	483
	Disable Adapter Write-back Functionality. . . . .	490
6.27	Twitter. . . . .	491
	Installation and Deployment. . . . .	493
	Twitter Remote Source Configuration. . . . .	495
<b>7</b>	<b>Security. . . . .</b>	<b>497</b>
7.1	Authentication. . . . .	497
7.2	Configuring SSL. . . . .	498
	Configure SSL for SAP HANA (CA). . . . .	500
	Configure SSL for SAP HANA (Self-Signed). . . . .	505
	Configure SSL for SAP HANA On-Premise [Command Line Batch]. . . . .	509
	Connect to SAP HANA On-Premise with SSL. . . . .	512
	Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool . . . . .	513
	Change the Agent Configuration Tool SSL Settings. . . . .	515
	Reconfigure an Existing Agent for SSL. . . . .	516
	Troubleshoot the SSL Configuration. . . . .	517
7.3	Update JCE Policy Files for Stronger Encryption. . . . .	518
7.4	Authorizations. . . . .	519
	Activating and Executing Task Flowgraphs and Replication Tasks. . . . .	520
7.5	Communication Channel Security. . . . .	520

7.6	Auditing Activity on SAP HANA Smart Data Integration Objects. . . . .	521
7.7	Data Protection and Privacy in SAP HANA Smart Data Integration and SAP HANA Smart Data Quality. . . . .	522
<b>8</b>	<b>SQL and System Views Reference for Smart Data Integration and Smart Data Quality. . . . .</b>	<b>523</b>
8.1	SQL Statements. . . . .	523
	ALTER ADAPTER Statement [Smart Data Integration]. . . . .	525
	ALTER AGENT Statement [Smart Data Integration]. . . . .	527
	ALTER REMOTE SOURCE Statement [Smart Data Integration]. . . . .	528
	ALTER REMOTE SUBSCRIPTION Statement [Smart Data Integration]. . . . .	532
	CANCEL TASK Statement [Smart Data Integration]. . . . .	533
	CREATE ADAPTER Statement [Smart Data Integration]. . . . .	535
	CREATE AGENT Statement [Smart Data Integration]. . . . .	537
	CREATE AGENT GROUP Statement [Smart Data Integration]. . . . .	539
	CREATE AUDIT POLICY Statement [Smart Data Integration]. . . . .	540
	CREATE REMOTE SOURCE Statement [Smart Data Integration]. . . . .	542
	CREATE REMOTE SUBSCRIPTION Statement [Smart Data Integration]. . . . .	543
	CREATE VIRTUAL PROCEDURE Statement [Smart Data Integration]. . . . .	548
	DROP ADAPTER Statement [Smart Data Integration]. . . . .	550
	DROP AGENT Statement [Smart Data Integration]. . . . .	551
	DROP AGENT GROUP Statement [Smart Data Integration]. . . . .	552
	DROP REMOTE SUBSCRIPTION Statement [Smart Data Integration]. . . . .	553
	GRANT Statement [Smart Data Integration]. . . . .	554
	PROCESS REMOTE SUBSCRIPTION EXCEPTION Statement [Smart Data Integration]. . . . .	556
	SESSION_CONTEXT Function [Smart Data Integration]. . . . .	557
	START TASK Statement [Smart Data Integration]. . . . .	558
8.2	System Views. . . . .	561
	ADAPTER_CAPABILITIES System View [Smart Data Integration]. . . . .	564
	ADAPTER_LOCATIONS System View [Smart Data Integration]. . . . .	565
	ADAPTERS System View [Smart Data Integration]. . . . .	565
	AGENT_CONFIGURATION System View [Smart Data Integration]. . . . .	566
	AGENT_GROUPS System View [Smart Data Integration]. . . . .	566
	AGENTS System View [Smart Data Integration]. . . . .	566
	M_AGENTS System View [Smart Data Integration]. . . . .	567
	M_REMOTE_SOURCES System View [Smart Data Integration]. . . . .	568
	M_REMOTE_SUBSCRIPTION_COMPONENTS System View [Smart Data Integration]. . . . .	568
	M_REMOTE_SUBSCRIPTION_STATISTICS System View [Smart Data Integration]. . . . .	569
	M_REMOTE_SUBSCRIPTIONS System View [Smart Data Integration]. . . . .	570
	M_SESSION_CONTEXT System View [Smart Data Integration]. . . . .	571
	REMOTE_SOURCE_OBJECT_COLUMNS System View [Smart Data Integration]. . . . .	572
	REMOTE_SOURCE_OBJECT_DESCRIPTIONS System View [Smart Data Integration]. . . . .	572
	REMOTE_SOURCE_OBJECTS System View [Smart Data Integration]. . . . .	573



REMOTE_SOURCES System View [Smart Data Integration]. . . . .	573
REMOTE_SUBSCRIPTION_EXCEPTIONS System View [Smart Data Integration]. . . . .	574
REMOTE_SUBSCRIPTIONS System View [Smart Data Integration]. . . . .	575
TASK_CLIENT_MAPPING System View [Smart Data Integration]. . . . .	575
TASK_COLUMN_DEFINITIONS System View [Smart Data Integration]. . . . .	576
TASK_EXECUTIONS System View [Smart Data Integration]. . . . .	576
TASK_LOCALIZATION System View [Smart Data Integration]. . . . .	577
TASK_OPERATIONS System View [Smart Data Integration]. . . . .	578
TASK_OPERATIONS_EXECUTIONS System View [Smart Data Integration]. . . . .	578
TASK_PARAMETERS System View [Smart Data Integration]. . . . .	579
TASK_TABLE_DEFINITIONS System View [Smart Data Integration]. . . . .	580
TASK_TABLE_RELATIONSHIPS System View [Smart Data Integration]. . . . .	581
TASKS System View [Smart Data Integration]. . . . .	581
VIRTUAL_COLUMN_PROPERTIES System View [Smart Data Integration]. . . . .	582
VIRTUAL_TABLE_PROPERTIES System View [Smart Data Integration]. . . . .	583
BEST_RECORD_GROUP_MASTER_STATISTICS System View [Smart Data Quality]. . . . .	583
BEST_RECORD_RESULTS System View [Smart Data Quality]. . . . .	584
BEST_RECORD_STRATEGIES System View [Smart Data Quality]. . . . .	585
CLEANSE_ADDRESS_RECORD_INFO System View [Smart Data Quality]. . . . .	586
CLEANSE_CHANGE_INFO System View [Smart Data Quality]. . . . .	587
CLEANSE_COMPONENT_INFO System View [Smart Data Quality]. . . . .	588
CLEANSE_INFO_CODES System View [Smart Data Quality]. . . . .	589
CLEANSE_STATISTICS System View [Smart Data Quality]. . . . .	590
GEOCODE_INFO_CODES System View [Smart Data Quality]. . . . .	591
GEOCODE_STATISTICS System View [Smart Data Quality]. . . . .	592
MATCH_GROUP_INFO System View [Smart Data Quality]. . . . .	592
MATCH_RECORD_INFO System View [Smart Data Quality]. . . . .	593
MATCH_SOURCE_STATISTICS System View [Smart Data Quality]. . . . .	594
MATCH_STATISTICS System View [Smart Data Quality]. . . . .	594
MATCH_TRACING System View [Smart Data Quality]. . . . .	595

# 1 Installation and Configuration Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality

This guide describes the main tasks and concepts necessary for the initial installation and configuration of SAP HANA smart data integration and SAP HANA smart data quality.

For information about the capabilities available for your license and installation scenario, refer to the Feature Scope Description (FSD) for your specific SAP HANA version on the [SAP HANA Platform](#) page.

This guide includes the following content:

- Architecture, components, deployment, and tools
- Configuration tasks to enable functionality
- Configuring data provisioning adapters
- Security
- SQL syntax and system views

For information about the ongoing administration and operation of SAP HANA smart data integration and SAP HANA smart data quality, refer to the *Administration Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality*.

For information about administration of the overall SAP HANA system, refer to the *SAP HANA Administration Guide*.

## Related Information

[Overview \[page 10\]](#)

[Architecture \[page 12\]](#)

[Components to Install, Deploy, and Configure \[page 14\]](#)

[Deployment Options \[page 15\]](#)

[Administration Tools \[page 23\]](#)

[SAP HANA Administration Guide for SAP HANA Platform](#)

[Administration Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality](#)

## 1.1 Overview

SAP HANA smart data integration and SAP HANA smart data quality provide tools to access source data and provision, replicate, and transform that data in SAP HANA on-premise or in the cloud.

SAP HANA smart data integration and SAP HANA smart data quality let you enhance, cleanse, and transform data to make it more accurate and useful. You can efficiently connect to any source to provision and cleanse

data for loading into SAP HANA on-premise or in the cloud, and for supported systems, writing back to the original source.

Capabilities include:

- A simplified landscape; that is, one environment in which to provision and consume data
- Access to more data formats including an open framework for new data sources
- In-memory performance, which means increased speed and decreased latency

Feature area	Description
SAP HANA smart data integration	<p>Real-time, high-speed data provisioning, bulk data movement, and federation. Provides built-in adapters plus an SDK so you can build your own adapters.</p> <p>Includes the following features and tools:</p> <ul style="list-style-type: none"><li>• Replication Editor in SAP Web IDE and SAP HANA Web-based Development Workbench or Web IDE, which lets you set up batch or real-time data replication scenarios in an easy-to-use web application</li><li>• Transformations presented as nodes in SAP Web IDE and SAP HANA Web-based Development Workbench, which let you set up batch or real-time data transformation scenarios</li><li>• Data Provisioning Agent, a lightweight component that hosts data provisioning adapters, enabling data federation, replication, and transformation scenarios for on-premise or in-cloud deployments</li><li>• Data Provisioning adapters for connectivity to remote sources</li><li>• An Adapter SDK to create custom adapters</li><li>• Monitors for Data Provisioning Agents, remote subscriptions, and data loads</li></ul>
SAP HANA smart data quality	<p>Real-time, high-performance data cleansing, address cleansing, and geospatial data enrichment. Provides an intuitive interface to define data transformation flowgraphs in SAP Web IDE and SAP HANA Web-based Development Workbench.</p>

## New Features Delivered in Patches

This guide introduces you to features delivered in SAP HANA smart data integration and SAP HANA smart data quality 2.0 Service Packs only. For information about features delivered in subsequent patches, as well as other information, such as fixed and known issues, refer to the SAP Note for each of the relevant patches. The Central SAP Note for SAP HANA smart data integration and SAP HANA smart data quality is the best place to access this information, with links to the SAP Notes for every Service Pack and Patch.

## Related Information

[Central SAP Note for SAP HANA smart data integration and SAP HANA smart data quality](#) 

## 1.2 Architecture

These diagrams represent common deployment architectures for using smart data integration and smart data quality with SAP HANA.

In all deployments, the basic components are the same. However, the connections between the components may differ depending on whether SAP HANA is deployed on-premise, in the cloud, or behind a firewall.

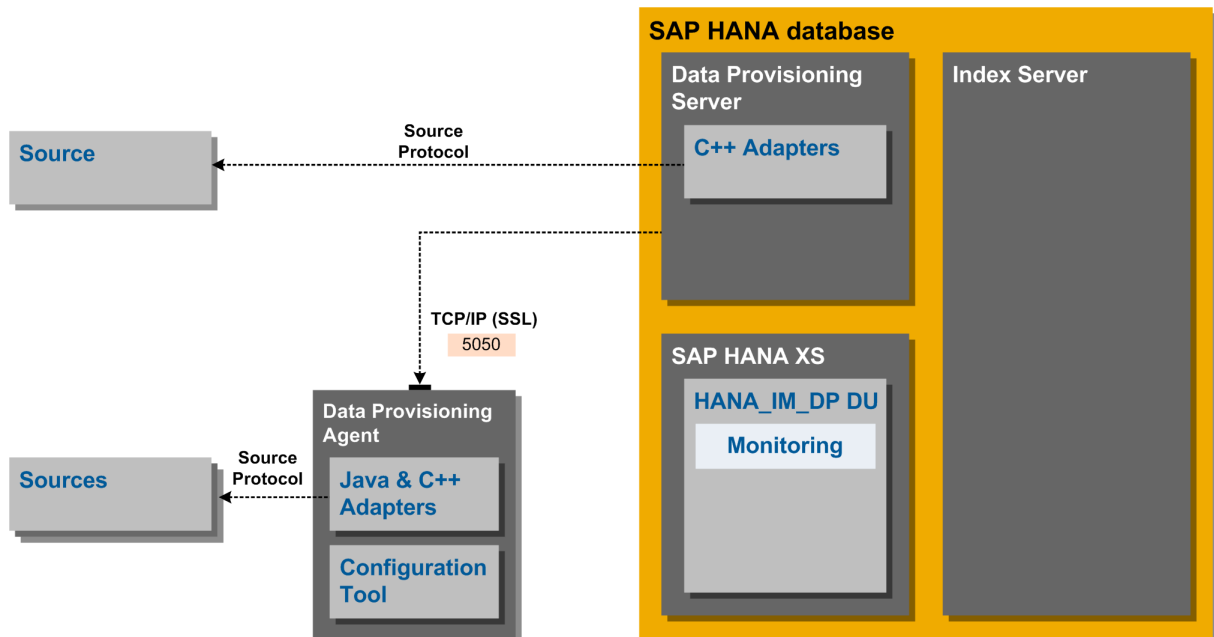


Figure 1: SAP HANA deployed on-premise

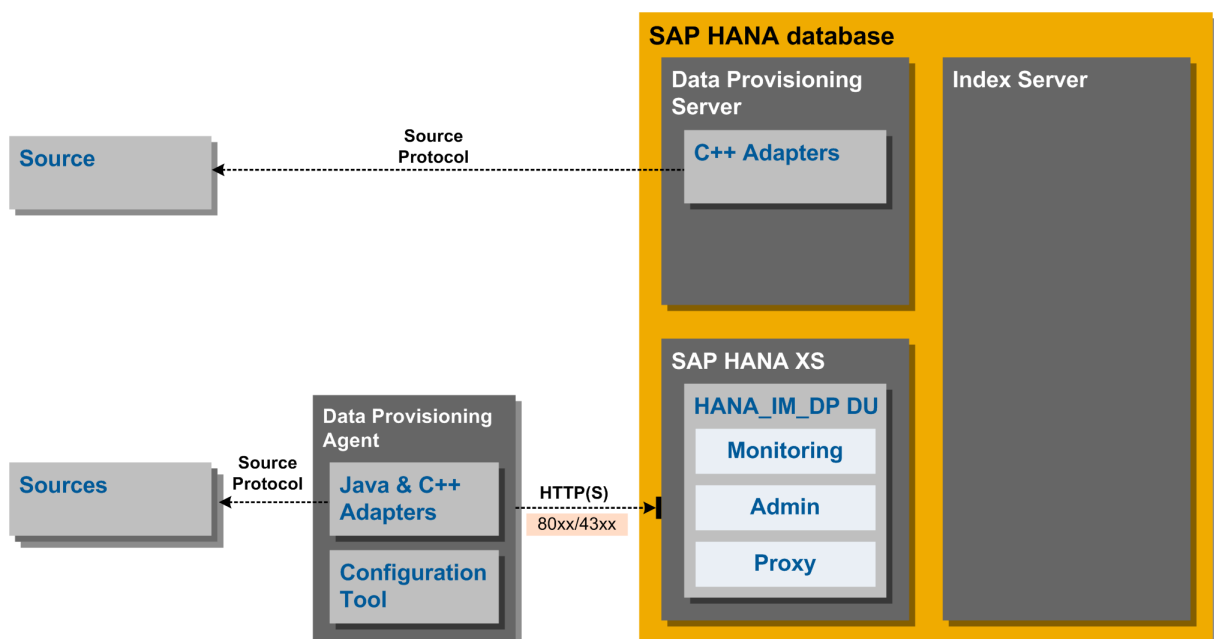


Figure 2: SAP HANA deployed in the cloud or behind a firewall

The following tables explain the diagram and the network connections in more detail.

## Outbound Connections

Client	Protocol and Additional Information	Default Port
Data Provisioning Agent	<p>When SAP HANA is deployed on-premise, the Data Provisioning Server within SAP HANA connects to the agent using the TCP/IP protocol.</p> <p>To manage the listening port used by the agent, edit the adapter framework preferences with the Data Provisioning Agent Configuration tool.</p>	5050
Sources Examples: Data Provisioning Adapters	<p>The connections to external data sources depend on the type of adapter used to access the source.</p> <p>C++ adapters running in the Data Provisioning Server and Java adapters deployed on the Data Provisioning Agent connect to the source using a source-defined protocol.</p>	Varies by source

## Inbound Connections

Client	Protocol and Additional Information	Default Port
Data Provisioning Agent	<p>When SAP HANA is deployed in the cloud or behind a firewall, the Data Provisioning Agent connects to the SAP HANA XS engine using the HTTP/S protocol.</p> <div><b>i Note</b> When the agent connects to SAP HANA in the cloud over HTTP/S, data is automatically gzip compressed to minimize the required network bandwidth.</div> <p>For information about configuring the port used by the SAP HANA XS engine, see the <i>SAP HANA Administration Guide</i>.</p>	80xx 43xx

## Related Information

[Configuring the Agent in Graphical Mode \[Deprecated\] \[page 83\]](#)

## 1.3 Components to Install, Deploy, and Configure

SAP HANA smart data integration and SAP HANA smart data quality include a number of components that you must install, deploy, and configure.

Within this guide, the steps to install and deploy the components appear in the section Configure [SDI/SDQ].

Component	Description
Data Provisioning Server	<p>The Data Provisioning Server is a native SAP HANA process. It is built as an index server variant, runs in the SAP HANA cluster, and is managed and monitored just like other SAP HANA services. It provides out-of-the-box native connectivity for many sources and connectivity to the Data Provisioning Agent.</p> <p>The Data Provisioning Server is installed with, but must be enabled in, the SAP HANA Server.</p>
Data Provisioning Agent	<p>The Data Provisioning Agent is a container running outside the SAP HANA environment, and it is managed by the Data Provisioning Server. It provides connectivity for all those sources where the driver cannot run inside the Data Provisioning Server. Through the Data Provisioning Agent, the preinstalled Data Provisioning Adapters communicate with the Data Provisioning Server for connectivity, metadata browsing, and data access. The Data Provisioning Agent also hosts custom adapters created using the Adapter SDK.</p> <p>The Data Provisioning Agent is installed separately from SAP HANA server or client.</p>
HANA_IM_DP delivery unit	<p>The HANA_IM_DP delivery unit bundles monitoring and administration capabilities and the Data Provisioning Proxy for connecting to SAP HANA in the cloud.</p> <p>The delivery unit includes the Data Provisioning administration application, the Data Provisioning Proxy, and the Data Provisioning monitor.</p>
Data Provisioning administration application	<p>The Data Provisioning administration application is an XS application that manages the administrative functions of the Data Provisioning Agent with SAP HANA in the cloud.</p> <p>This component is delivered via the HANA_IM_DP delivery unit.</p>
Data Provisioning Proxy	<p>The Data Provisioning Proxy is an XS application that acts as a proxy to provide communication between the Data Provisioning Agent and the Data Provisioning Server when SAP HANA runs in the cloud. When SAP HANA is in the cloud, the agent uses HTTP(S) to connect to the Data Provisioning Proxy in the XS Engine, which eliminates the need to open more ports in corporate IT firewalls.</p> <p>This component is delivered via the HANA_IM_DP delivery unit.</p>
Data Provisioning monitor	<p>The Data Provisioning monitor is a browser-based interface that lets you monitor agents, tasks, and remote subscriptions created in the SAP HANA system. You can view the monitors by entering the URL of each monitor into a web browser or by accessing the smart data integration links in the SAP HANA cockpit, a web-based launchpad that is installed with SAP HANA Server.</p> <p>You enable Data Provisioning monitoring functionality for agents, data loads, and remote subscriptions by creating the statistics tables and deploying the HANA_IM_DP delivery unit.</p>
SAP HANA Web-based Development Workbench Replication Editor	<p>The SAP HANA Web-based Development Workbench, which includes the Replication Editor to set up replication tasks, is installed with SAP HANA Server.</p>



Component	Description
SAP HANA Web-based Development Workbench Flowgraph Editor	The SAP HANA Web-based Development Workbench Flowgraph Editor provides an interface to create data provisioning and data quality transformation flowgraphs.
Application function modeler	The application function modeler provides an interface to create data provisioning and data quality transformation flowgraphs.  The application function modeler is installed with SAP HANA studio.

## 1.4 Deployment Options

Common deployment options for SAP HANA systems, Data Provisioning Agents, and source systems are described.

There are two common deployment landscapes that we recommend:

Landscape	Description
Distributed landscape	<ul style="list-style-type: none"> <li>System 1: SAP HANA Server</li> <li>System 2: Data Provisioning Agent</li> <li>System 3: Source system</li> </ul>
Combined landscape	<ul style="list-style-type: none"> <li>System 1: SAP HANA Server</li> <li>System 2: Data Provisioning Agent and the source system</li> </ul>

## SAP HANA on premise vs. SAP HANA in the SAP Cloud Platform Neo Environment

Using SAP HANA on premise or in the cloud is a choice of deployment. Here are some things to keep in mind when deciding which deployment to use. If your deployment includes SAP HANA in the cloud and a firewall between SAP HANA and the Data Provisioning Agent:

- The Data Provisioning Proxy must be deployed. To deploy the proxy, download and deploy the HANA\_IM\_DP delivery unit.
- The Data Provisioning Agent must be configured to communicate with SAP HANA using HTTP. Configure the Agent by using the Data Provisioning Agent Configuration tool.

## SAP Cloud Platform, SAP HANA Service

If your deployment includes the SAP Cloud Platform, SAP HANA service in the Cloud Foundry environment, configure the Data Provisioning Agent to connect via JDBC WebSockets.

For more information about connecting to the SAP Cloud Platform, SAP HANA service, see [Connect to the SAP HANA Service via JDBC WebSockets \[Command Line\] \[page 56\]](#).

## SAP HANA Cloud

If your deployment includes SAP HANA Cloud, configure the Data Provisioning Agent to connect via JDBC.

For more information about connecting to SAP HANA Cloud, see [Deployment with SAP HANA Cloud \[page 18\]](#).

## Other deployment considerations

When planning your deployment, keep the following in mind:

- You may not have one Data Provisioning Agent registered in multiple SAP HANA instances.
- You may have multiple instances of the Data Provisioning Agent installed on multiple machines. For example, a developer may want to have a Data Provisioning Agent installed on their computer to work on a custom adapter.

## Related Information

[Deployment in High Availability Scenarios \[page 16\]](#)

[Deployment with SAP HANA Cloud \[page 18\]](#)

[Deployment with the SAP HANA Service \[page 21\]](#)

### 1.4.1 Deployment in High Availability Scenarios

In addition to installing SAP HANA in a multiple-host configuration, you can use agent grouping to provide automatic failover and load balancing for SAP HANA smart data integration and SAP HANA smart data quality functionality in your landscape.

## Auto-failover for the Data Provisioning Server

In a multiple-host SAP HANA system, the Data Provisioning Server runs only in the active worker host. If the active worker host fails, the Data Provisioning Server is automatically started in the standby host when it takes over, and any active replication tasks are resumed.

### **i Note**

The Data Provisioning Server does not support load balancing.

For more information about installing SAP HANA in a multiple-host configuration, see the *SAP HANA Server Installation and Update Guide*.

## **Auto-failover for the Data Provisioning Agent**

Agent grouping provides automatic failover for connectivity to data sources accessed through Data Provisioning Adapters.

When an agent that is part of a group is unreachable for a time longer than the configured heart beat time limit, the Data Provisioning Server chooses a new active agent within the group, and it resumes replication for any remote subscriptions active on the original agent.

Initial and batch load requests to a remote source configured on the agent group are routed to the first available agent in the group.

### **! Restriction**

Fail-over is not supported for initial and batch load requests. Restart the initial load following a failure due to agent unavailability.

## **Load balancing for the Data Provisioning Agent**

Agent grouping provides load balancing for initial loads only.

For example, with multiple agents in the group, you can choose to have the agent for the initial load selected randomly, or selected from the list of agents in a round-robin fashion.

### **! Restriction**

Load balancing is not supported for change data capture (CDC) operations.

For complete information about configuring agent groups, see the *Administration Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality*.

## **Related Information**

[SAP HANA Server Installation and Update Guide](#)

[Load Balancing in an Agent Group \[page 96\]](#)

[Failover Behavior in an Agent Group \[page 95\]](#)

## 1.4.2 Deployment with SAP HANA Cloud

Understand the landscape and deployment and configuration process when using SAP HANA smart data integration with SAP HANA Cloud

When you are using SAP HANA Cloud, you can use SAP HANA smart data integration with tools such as SAP Web IDE on SAP Cloud Platform to transform and replicate data into the SAP HANA database.

Table 1: Deployment Tasks

Task	Description	More Information
Create an SAP HANA Cloud instance	<p>To create an SAP HANA Cloud instance in the SAP Cloud Platform cockpit, you must be working in a global account and have added a quota to the SAP HANA Cloud.</p> <p><b>→ Tip</b></p> <p>Add the IP addresses for your Data Provisioning Agent host systems to the list of whitelisted connections when creating your SAP HANA Cloud instance.</p>	<a href="#">SAP HANA Cloud Getting Started Guide: Creating SAP HANA Cloud Instances</a>
Enable flowgraph and replication task editors	<p>To use the flowgraph and replication task editors in SAP Web IDE on SAP Cloud Platform, you must first enable the SAP EIM Smart Data Integration Editors extension.</p> <p><b>i Note</b></p> <p>SAP HANA smart data quality functionality, including the Cleanse, Geocode, and Match nodes, is not available in the SAP EIM Smart Data Integration Editors extension in SAP Web IDE on SAP Cloud Platform.</p>	<a href="#">Enable Additional Features (Extensions)</a>
Connect the Data Provisioning Agent	<p>Connect to SAP HANA using JDBC when you are using an SAP HANA Cloud instance.</p> <p><b>i Note</b></p> <p>You must use Data Provisioning Agent version 2.4.2.4 or newer, and must create users for agent administration and agent messaging.</p>	<a href="#">Connect to SAP HANA Cloud [Command Line] [page 52]</a>
Configure adapters for your data sources	<p>The Data Provisioning Agent includes adapters that allow SAP HANA smart data integration to connect to your data sources. You may need to perform configuration steps on your source system to prepare your source for use with a data provisioning adapter.</p>	<a href="#">Register Data Provisioning Adapters [page 111]</a> <a href="#">Configure Data Provisioning Adapters [page 153]</a>

Task	Description	More Information
Create remote sources for your data sources	<p>Use the SAP HANA database explorer to create remote sources in SAP HANA Cloud.</p> <ol style="list-style-type: none"> <li>1. In the SAP HANA database explorer, right-click the <a href="#">Remote Sources</a> object in your database catalog and click <a href="#">New Remote Source</a>.</li> <li>2. Specify the remote source name, adapter name, and <b>dpserver</b> for <a href="#">Source Location</a>.</li> <li>3. Specify the adapter version and choose <a href="#">Adapter Properties</a> as the connection mode.</li> <li>4. Fill in the other required connection property fields as required for your adapter and data source, and click <a href="#">OK</a>.</li> </ol>	<a href="#">Configure Data Provisioning Adapters [page 153]</a>
Configure an HDI grantor service	Before SAP Web IDE users can create and execute flowgraphs and replication tasks, you must configure grantor privileges for the HDI container.	<a href="#">Configure a Grantor for the HDI Container [page 121]</a>
Design flowgraphs and replication tasks	<p>The <i>Modeling Guide, SAP Web IDE</i> addresses SAP HANA smart data integration features and tools to accomplish these tasks:</p> <ul style="list-style-type: none"> <li>• The Replication Editor is for creating real time or batch replication scenarios for moving data into SAP HANA.</li> <li>• Transformation nodes can be used for pivoting tables, capturing changed data, comparing tables, and so on.</li> </ul>	<a href="#">Modeling Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality</a>

Task	Description	More Information										
Execute and monitor flow-graphs and replication tasks	<p>Access the Data Provisioning Monitors from the <i>Catalog</i> folder in the SAP HANA database explorer.</p> <p>Table 2: Data Provisioning Monitors</p> <table><tr><th>Monitor</th><th>Access</th></tr><tr><td>Agents</td><td>Right-click ► <i>Data Provisioning Agents</i> ► <i>Show Data Provisioning Agents</i> ▾.</td></tr><tr><td>Remote Sources</td><td><p>Right-click ► <i>Remote Sources</i> ► <i>Show Remote Sources</i> ▾.</p><p>Click a remote source to access the detailed view for that source.</p></td></tr><tr><td>Remote Subscriptions</td><td><p>Open a system node such as SYSTEM, or a container. Right-click ► <i>Remote Subscriptions</i> ► <i>Show Remote Subscriptions</i> ▾.</p><p>Click a remote subscription to access the detailed view for that subscription.</p></td></tr><tr><td>Tasks</td><td><p>Open a system node such as SYSTEM, or a container. Right-click ► <i>Tasks</i> ► <i>Show Tasks</i> ▾.</p><div><p><b>i Note</b></p><p>You can also access the tasks monitor from the flowgraph editor by opening the flowgraph and choosing ► <i>Tools</i> ► <i>Launch Tasks Overview</i> ▾.</p></div><p>Click a task to access the detailed view for that task.</p></td></tr></table>	Monitor	Access	Agents	Right-click ► <i>Data Provisioning Agents</i> ► <i>Show Data Provisioning Agents</i> ▾.	Remote Sources	<p>Right-click ► <i>Remote Sources</i> ► <i>Show Remote Sources</i> ▾.</p> <p>Click a remote source to access the detailed view for that source.</p>	Remote Subscriptions	<p>Open a system node such as SYSTEM, or a container. Right-click ► <i>Remote Subscriptions</i> ► <i>Show Remote Subscriptions</i> ▾.</p> <p>Click a remote subscription to access the detailed view for that subscription.</p>	Tasks	<p>Open a system node such as SYSTEM, or a container. Right-click ► <i>Tasks</i> ► <i>Show Tasks</i> ▾.</p> <div><p><b>i Note</b></p><p>You can also access the tasks monitor from the flowgraph editor by opening the flowgraph and choosing ► <i>Tools</i> ► <i>Launch Tasks Overview</i> ▾.</p></div> <p>Click a task to access the detailed view for that task.</p>	<a href="#">Monitoring Data Provisioning in the SAP HANA Web-based Development Workbench</a>
Monitor	Access											
Agents	Right-click ► <i>Data Provisioning Agents</i> ► <i>Show Data Provisioning Agents</i> ▾.											
Remote Sources	<p>Right-click ► <i>Remote Sources</i> ► <i>Show Remote Sources</i> ▾.</p> <p>Click a remote source to access the detailed view for that source.</p>											
Remote Subscriptions	<p>Open a system node such as SYSTEM, or a container. Right-click ► <i>Remote Subscriptions</i> ► <i>Show Remote Subscriptions</i> ▾.</p> <p>Click a remote subscription to access the detailed view for that subscription.</p>											
Tasks	<p>Open a system node such as SYSTEM, or a container. Right-click ► <i>Tasks</i> ► <i>Show Tasks</i> ▾.</p> <div><p><b>i Note</b></p><p>You can also access the tasks monitor from the flowgraph editor by opening the flowgraph and choosing ► <i>Tools</i> ► <i>Launch Tasks Overview</i> ▾.</p></div> <p>Click a task to access the detailed view for that task.</p>											



## 1.4.3 Deployment with the SAP HANA Service

Understand the landscape and deployment and configuration process when using SAP HANA smart data integration with SAP Cloud Platform, SAP HANA service.

### Context

When you are using the SAP Cloud Platform, SAP HANA service, you can use SAP HANA smart data integration with tools such as SAP Web IDE on SAP Cloud Platform to transform and replicate data into the SAP HANA database.

#### ! Restriction

SAP HANA service does not support SAP HANA smart data quality functionality.

### Procedure

1. Ensure that you are using an SAP HANA service instance that has the SAP HANA Data Provisioning Server capability enabled.
  - To create an instance with the SAP HANA Data Provisioning Server capability, use the SAP Cloud Platform cockpit.  
For more information, see [Create an SAP HANA Service Instance Using the Cloud Cockpit](#).
  - To enable the SAP HANA Data Provisioning Server capability on an existing instance, use the SAP HANA Service Dashboard.  
For more information, see [Enable and Disable Capabilities](#).
2. Ensure that the flowgraph and replication task editors are available in SAP Web IDE on SAP Cloud Platform.  
To use the flowgraph and replication task editors in SAP Web IDE on SAP Cloud Platform, you must first enable the SAP EIM Smart Data Integration Editors extension. For more information, see [Enable Additional Features \(Extensions\)](#).

#### i Note

SAP HANA smart data quality functionality, including the Cleanse, Geocode, and Match nodes, is not available in the SAP EIM Smart Data Integration Editors extension in SAP Web IDE on SAP Cloud Platform.

3. Connect the Data Provisioning Agent to the SAP HANA service instance via JDBC WebSockets.  
For information, see [Connect to the SAP HANA Service via JDBC WebSockets \[Command Line\] \[page 56\]](#).
4. Configure adapters for your data sources.

The Data Provisioning Agent includes adapters that allow SAP HANA smart data integration to connect to your data sources. You may need to perform configuration steps on your source system to prepare your source for use with a data provisioning adapter.

For more information, see [Register Data Provisioning Adapters \[page 111\]](#) and [Configure Data Provisioning Adapters \[page 153\]](#).

5. Create remote sources in SAP HANA that connect to your data sources.

Use the SAP HANA database explorer to create remote sources in the SAP HANA service.

- a. In the SAP HANA database explorer, right-click the [Remote Sources](#) object in your database catalog and click [New Remote Source](#).
- b. Specify the remote source name, adapter name, and **dpserver** for [Source Location](#).
- c. Specify the adapter version and choose [Adapter Properties](#) as the connection mode.
- d. Fill in the other required connection property fields as required for your adapter and data source.
- e. Click **OK**.

For more information about the connection properties for each adapter, see [Configure Data Provisioning Adapters \[page 153\]](#).

6. Configure a grantor service for the HDI container.

Before SAP Web IDE users can create and execute flowgraphs and replication tasks, you must configure grantor privileges for the HDI container.

For more information, see [Configure a Grantor for the HDI Container \[page 121\]](#).

7. Design flowgraphs and replication tasks to retrieve data from your remote data sources, transform it, and persist it in SAP HANA database tables.

The *Modeling Guide, SAP Web IDE* addresses SAP HANA smart data integration features and tools to accomplish these tasks:

- The Replication Editor is for creating real time or batch replication scenarios for moving data into SAP HANA.
- Transformation nodes can be used for pivoting tables, capturing changed data, comparing tables, and so on.

For more information, see the [Modeling Guide, SAP Web IDE for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality](#).

8. Execute and monitor your SAP HANA smart data integration flowgraphs and replication tasks.

Access the Data Provisioning Monitors from the [Catalog](#) folder in the SAP HANA database explorer:

Option	Description
<b>Agents Overview</b>	Right-click ► <a href="#">Data Provisioning Agents</a> ► <a href="#">Show Data Provisioning Agents</a> ►.
<b>Remote Sources Detailed View</b>	Right-click ► <a href="#">Remote Sources</a> ► <a href="#">Show Remote Sources</a> ►. Click a remote source.
<b>Remote Sources Overview</b>	Right-click ► <a href="#">Remote Sources</a> ► <a href="#">Show Remote Sources</a> ►.
<b>Remote Subscriptions Detailed View</b>	Open a system node such as SYSTEM, or a container. Right-click ► <a href="#">Remote Subscriptions</a> ► <a href="#">Show Remote Subscriptions</a> ►. Click a remote subscription.
<b>Remote Subscriptions Overview</b>	Open a subfolder of the system, or a container. Right-click ► <a href="#">Remote Subscriptions</a> ► <a href="#">Show Remote Subscriptions</a> ►.
<b>Task Detailed View</b>	Open a system node such as SYSTEM, or a container. Right-click ► <a href="#">Tasks</a> ► <a href="#">Show Tasks</a> ►. Click a task.

Option	Description
	<p><b>i Note</b></p> <p>Also, you may access the tasks monitor from the flowgraph editor by opening the flowgraph and choosing ► <a href="#">Tools</a> ► <a href="#">Launch Tasks Overview</a> ►.</p>
<b>Task Overview</b>	<p>Open a system node such as SYSTEM, or a container. Right-click ► <a href="#">Tasks</a> ► <a href="#">Show Tasks</a> ►.</p> <p><b>i Note</b></p> <p>Also, you may access the tasks monitor from the flowgraph editor by opening the flowgraph and choosing ► <a href="#">Tools</a> ► <a href="#">Launch Tasks Overview</a> ►.</p>

For more details about the information provided in each monitor, see [Monitoring Data Provisioning in the SAP HANA Web-based Development Workbench](#).

## 1.5 Administration Tools

Several tools are available for the administration of SAP HANA smart data integration and SAP HANA smart data quality.

Tool	Description
SAP HANA studio	The SAP HANA Administration Console perspective of the SAP HANA studio is the main tool for general system administration and monitoring tasks.
Data Provisioning Agent Configuration tool	This tool manages Data Provisioning Agents and adapters, and connections to SAP HANA.
SAP HANA cockpit	<p>The SAP HANA cockpit is an SAP Fiori Launchpad site that provides you with a single point-of-access to a range of Web-based applications for the administration of SAP HANA. You access the SAP HANA cockpit through a web browser.</p> <p>Through the SAP HANA cockpit, you can monitor Data Provisioning Agents, tasks, and remote subscriptions.</p>
SAP HANA Enterprise Semantic Services Administration tool	<p>The SAP HANA Enterprise Semantic Services Administration user interface is a browser-based application that lets you manage artifacts for semantic services. To launch the SAP HANA Enterprise Semantic Services Administration tool, enter the following URL in a web browser: <code>http://&lt;your_HANA_instance:port&gt;/sap/hana/im/ess/ui</code></p>

## 2 Configure Smart Data Integration

A list of high-level tasks needed to set up SAP HANA smart data integration.

1. [Assign Roles and Privileges \[page 25\]](#)  
Add roles and privileges for users to perform various tasks.
2. [Configure the Data Provisioning Server \[page 31\]](#)  
Enable the Data Provisioning Server to use SAP HANA smart data integration.
3. [Download and Deploy the Data Provisioning Delivery Unit \[page 33\]](#)  
Download the Data Provisioning delivery unit. Then, using SAP HANA studio or SAP HANA Application Lifecycle Management tools, deploy the delivery unit to obtain the following functionality:
4. [Install the Data Provisioning Agent \[page 36\]](#)  
The Data Provisioning Agent provides secure connectivity between the SAP HANA database and your on-premise, adapter-based sources.
5. [Configure the Data Provisioning Agent \[page 49\]](#)  
Configure the Data Provisioning Agent before you can use adapters to connect to data sources, create remote sources, and so on.
6. [Register Data Provisioning Adapters \[page 111\]](#)  
After configuring the Data Provisioning Agent, register adapters.
7. [Create a Remote Source \[page 117\]](#)  
Using SAP HANA smart data integration, you set up an adapter that can connect to your source database, then create a remote source to establish the connection.
8. [Set Up Data Provisioning Monitoring \[page 124\]](#)  
After you install SAP HANA smart data integration, you must take several actions to enable and access the monitoring user interfaces for Data Provisioning Agents, remote subscriptions, and tasks.
9. [Enabling Enterprise Semantic Services \[page 125\]](#)  
Enterprise Semantic Services provides an API to enable searching for publication artifacts or run-time objects based on their metadata and contents. It is optional for SAP HANA smart data integration.
10. [Enable SAP HANA Smart Data Integration REST API \[page 133\]](#)  
Use the SAP HANA smart data integration REST API to programmatically execute and monitor flowgraphs and to process data for interactive data transformation within your application.

### Related Information

## 2.1 Assign Roles and Privileges

Add roles and privileges for users to perform various tasks.

The following tables list common tasks and roles or privileges that an administrator requires to assign to complete those tasks.

### Data Provisioning Agent and Data Provisioning Adapter Tasks

Users may need specific roles and privileges to accomplish tasks when installing and configuring the Data Provisioning Agent and Data Provisioning Adapters.

#### **i** Note

Users may also require permissions for accessing a particular database through a data provisioning adapter. See the “Data Provisioning Adapters” section for more information.

Task	Roles and Privileges	Description
Register a DP Agent	System privilege: <ul style="list-style-type: none"><li>AGENT ADMIN</li></ul>	
Register an adapter	System privilege: <ul style="list-style-type: none"><li>ADAPTER ADMIN</li></ul>	
Configure DP Agent to use HTTP (cloud) protocol	Role: <ul style="list-style-type: none"><li>sap.hana.im.dp.proxy::Agent-Messaging</li></ul>	Whoever sets the Data Provisioning Agent to use HTTP (cloud) in the Data Provisioning Agent Configuration tool requires this role.
Create an Agent or adapter when SAP HANA is in the cloud	Application privilege: <ul style="list-style-type: none"><li>sap.hana.im.dp.admin::Administrator</li></ul>	Needed when an administrator wants to create adapters and agents from the Data Provisioning Agent Configuration tool when SAP HANA is on the cloud (or the agent uses HTTP protocol).
Import a delivery unit using SAP HANA Application Lifecycle Management	Role: <ul style="list-style-type: none"><li>sap.hana.xs.lm.roles::Administrator</li></ul>	This role is necessary if you are using SAP HANA Application Lifecycle Management to import the data provisioning delivery unit.
Import a delivery unit using SAP HANA studio	Role: <ul style="list-style-type: none"><li>sap.hana.xs.lm.roles::Transport</li></ul>	

### Monitoring Tasks

Users may need specific roles and privileges to access and perform various tasks through the Data Provisioning monitors, which can be accessed from the SAP HANA cockpit.

Task	Roles and Privileges	Description
Monitoring	Role: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor.roles::Monitoring</li> </ul> Application privilege: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor::Monitoring</li> </ul>	The Monitoring role includes the following application privileges: <ul style="list-style-type: none"> <li>sap.hana.ide::LandingPage</li> <li>sap.hana.im.dp.monitor::Monitoring</li> </ul>
	Role: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor.roles::Operations</li> </ul>	The Operations role includes the following application privileges (sap.hana.im.dp.monitor::*): <ul style="list-style-type: none"> <li>AddLocationToAdapter</li> <li>AlterAgent</li> <li>AlterRemoteSource</li> <li>AlterRemoteSubscription</li> <li>CreateAgent</li> <li>DeleteSchedule</li> <li>DropAgent</li> <li>DropRemoteSubscription</li> <li>ExecuteDesignTimeObject</li> <li>NotificationAdministration</li> <li>ProcessRemoteException (This privilege includes both remote source and remote subscription exceptions.)</li> <li>RemoveLocationFromAdapter</li> <li>ScheduleDesignTimeObject</li> <li>ScheduleTask</li> <li>StartTask</li> <li>StopTask</li> <li>UpdateAdapter</li> </ul>
Enable users to schedule a task	Role: <ul style="list-style-type: none"> <li>sap.hana.xs.admin.roles::JobSchedulerAdministrator</li> </ul>	
Schedule a task	Role: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor.roles::Operations</li> </ul> Application privilege: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor::ScheduleTask</li> </ul>	
Start a task	Application privilege: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor::StartTask</li> </ul>	
Stop a task	Application privilege: <ul style="list-style-type: none"> <li>sap.hana.im.dp.monitor::StopTask</li> </ul>	



Task	Roles and Privileges	Description
Process remote subscription exceptions	Object privilege: <ul style="list-style-type: none"> <li>PROCESS REMOTE SUBSCRIPTION EXCEPTION</li> </ul>	Must be explicitly granted for a remote source created by another user.

## Remote Source and Remote Subscription Tasks

Users may need specific roles and privileges to create and manage remote sources and remote subscriptions.

Task	Roles and Privileges	Description
Create a remote source	System privilege: <ul style="list-style-type: none"> <li>CREATE REMOTE SOURCE</li> </ul>	When a user can create a remote source (has CREATE REMOTE SOURCE system privilege), that user automatically has CREATE VIRTUAL TABLE, DROP, CREATE REMOTE SUBSCRIPTIONS and PROCESS REMOTE SUBSCRIPTION EXCEPTION privileges; these privileges do not need to be assigned to the user. However, this only applies to remote sources that the user creates himself. If someone else creates a remote source, those privileges must be assigned for each remote source in order to perform those tasks.
Alter a remote source	Object privilege: <ul style="list-style-type: none"> <li>ALTER</li> </ul>	To alter a remote source, a user must have the ALTER object privilege on the remote source. Examples of altering a remote source include: <ul style="list-style-type: none"> <li>ALTER REMOTE SOURCE <code>&lt;remote_source_name&gt;</code> SUSPEND CAPTURE</li> <li>ALTER REMOTE SOURCE <code>&lt;remote_source_name&gt;</code> RESUME CAPTURE</li> </ul>
Drop a remote source	Object privilege: <ul style="list-style-type: none"> <li>DROP</li> </ul>	This privilege must be explicitly granted for a remote source created by another user.
Search for an object in a remote source	Object privilege: <ul style="list-style-type: none"> <li>ALTER on the remote source to be searched</li> </ul>	To search for remote objects such as tables in a remote source, a user must have the ALTER object privilege on the remote source so the system can create a dictionary.
Add a virtual table	Object privilege <ul style="list-style-type: none"> <li>CREATE VIRTUAL TABLE</li> </ul>	This privilege must be explicitly granted for a remote source created by another user. <div> <b>Note</b>  When you use SAP Web IDE for SAP HANA, the internal ObjectOwner of the HDI project must have privileges to create virtual tables on the remote source. </div>
Create a remote subscription	Object privilege: <ul style="list-style-type: none"> <li>CREATE REMOTE SUBSCRIPTION</li> </ul>	This privilege must be explicitly granted for a remote source created by another user.

## Replication Task and Flowgraph Tasks

Users may need specific roles and privileges to create and run flowgraphs and replication tasks from SAP Web IDE for SAP HANA, SAP HANA Web-based Development Workbench, or the SAP HANA studio.

Task	Roles and Privileges	Description
Create a flowgraph	<p>For SAP HANA Web-based Development Workbench and SAP HANA studio:</p> <p>Role:</p> <ul style="list-style-type: none"> <li>sap.hana.xs.ide.roles::Editor-Developer</li> </ul> <p>Object privilege:</p> <ul style="list-style-type: none"> <li>EXECUTE on "_SYS_REPO"."TEXT_ACCESSOR" and "_SYS_REPO"."MULTI_TEXT_ACCESSOR"</li> </ul>	<p>Allows creation of <code>.hdbflowgraph</code>.</p> <div> <p>→ Tip</p> <p>When you use SAP Web IDE for SAP HANA, specific roles or privileges are not required to create flowgraphs.</p> </div>
Create a flowgraph of type Task	<p>Object privilege:</p> <ul style="list-style-type: none"> <li>SELECT (for input/output schema)</li> </ul>	
Create a replication task	<p>Role:</p> <ul style="list-style-type: none"> <li>sap.hana.xs.ide.roles::Editor-Developer</li> </ul>	Allows creation of <code>.hdbreptask</code> .
Activate replication task ( <code>.hdbreptask</code> )	<p>Object privileges:</p> <ul style="list-style-type: none"> <li>SELECT on the source schema</li> <li>CREATE VIRTUAL TABLE on REMOTE SOURCE (Initial Load Only)</li> <li>CREATE REMOTE SUBSCRIPTION on REMOTE SOURCE (for real-time scenarios)</li> </ul>	Must be granted to <code>_SYS_REPO</code> .

Task	Roles and Privileges	Description
Activate flowgraph (.hdbflowgraph)	Object privileges: <ul style="list-style-type: none"> <li>• SELECT on the source table</li> <li>• INSERT, UPDATE, and DELETE on the target table</li> <li>• SELECT on the target schema (only when using a Template Table as a target)</li> <li>• If sequence is used, then GRANT SELECT on sequence</li> <li>• History Table:               <ul style="list-style-type: none"> <li>◦ GRANT INSERT on History Table</li> <li>◦ GRANT SELECT on Target Table</li> </ul> </li> </ul>	Must be granted to _SYS_REPO.  <b>→ Tip</b> When you use SAP Web IDE for SAP HANA, the ObjectOwner automatically has all necessary privileges for flowgraph activation. When using synonyms, the granter service must manage the privileges.
Execute a stored procedure	Object privilege: <ul style="list-style-type: none"> <li>• EXECUTE</li> </ul>	Needed on the schema where the stored procedure is located.  <b>→ Tip</b> When you use SAP Web IDE for SAP HANA, the ObjectOwner automatically has all necessary privileges for executing stored procedures. When using synonyms, the granter service must manage the privileges.
Execute a task	Object privilege: <ul style="list-style-type: none"> <li>• EXECUTE</li> <li>• INSERT</li> <li>• UPDATE</li> <li>• SELECT</li> <li>• DELETE</li> </ul>	Needed on the schema where the task is located.  <b>→ Tip</b> When you use SAP Web IDE for SAP HANA, the ObjectOwner automatically has all necessary privileges for executing tasks.
Use the JIT (just-in-time) Data Preview option	Object privilege: <ul style="list-style-type: none"> <li>• SELECT and EXECUTE with GRANT OPTION</li> </ul>	Must be granted to _SYS_REPO. Needed on the schema where the task or stored procedure is located.  <b>! Restriction</b> The JIT (just-in-time) Data Preview option is not supported in SAP Web IDE for SAP HANA. If you want to use the JIT Data Preview option, consider using SAP HANA Web-based Development Workbench.

Task	Roles and Privileges	Description
Use the AFL node or the Predictive Analysis node	<p>For AFL node in SAP HANA Web-based Development Workbench and Predictive Analysis node in SAP Web IDE:</p> <p>Role: XSA_DEV_USER_ROLE and _&lt;SYS&gt;_DI_OO_DEFAULTS</p> <ul style="list-style-type: none"> <li>AFL_AREAS</li> <li>AFL_FUNCTION_PARAMETERS</li> <li>AFL_FUNCTION_PROPERTIES</li> <li>AFL_FUNCTIONS</li> <li>AFL_PACKAGES</li> <li>AFL_TEXTS</li> </ul> <p>For execution, _&lt;SYS&gt;_DI_OO_DEFAULTS</p> <ul style="list-style-type: none"> <li>AFL__SYS_AFL_AFLPAL_EXECUTE</li> </ul>	

## Access to SAP Web IDE for SAP HANA

Although specific authorizations are not required to use the flowgraph editor, you may need to configure users if they do not already have access to SAP Web IDE in general. For example, they may need the following roles or permissions:

- A role collection containing the [WebIDE\\_Developer](#) role template
- A role collection containing the [WebIDE\\_Administrator](#) role template
- The [SpaceDeveloper](#) role for the space in which they need to work

For complete information about granting users access to SAP Web IDE, see the necessary configuration tasks described in [Post-Installation Administration Tasks](#).

**Parent topic:** [Configure Smart Data Integration \[page 24\]](#)

**Next:** [Configure the Data Provisioning Server \[page 31\]](#)

## Related Information

[Grant Roles to Users \[page 124\]](#)

[Developer Authorization in the Repository \(SAP HANA Security Guide\)](#)

[SAP HANA Web-based Development Workbench: Editor \(SAP HANA Developer Guide\)](#)

## 2.2 Configure the Data Provisioning Server

Enable the Data Provisioning Server to use SAP HANA smart data integration.

By default, the Data Provisioning Server is disabled when you install SAP HANA.

[Enable the Server in a Multi-database Container Scenario \[page 31\]](#)

To enable the Data Provisioning Server on tenants in a multi-database container environment, use the `ALTER DATABASE SQL` command.

[Enable the Server in a Scale-out SAP HANA Database Scenario \[page 32\]](#)

In a scale-out SAP HANA database scenario, you **must** enable the Data Provisioning Server only on the host that runs the master index server.

[Enable the Server for the SAP HANA Service \[page 32\]](#)

To use SAP HANA smart data integration with the SAP Cloud Platform, SAP HANA service, you must use an instance with the SAP HANA Data Provisioning Server capability enabled.

**Parent topic:** [Configure Smart Data Integration \[page 24\]](#)

**Previous:** [Assign Roles and Privileges \[page 25\]](#)

**Next:** [Download and Deploy the Data Provisioning Delivery Unit \[page 33\]](#)

### Related Information

### 2.2.1 Enable the Server in a Multi-database Container Scenario

To enable the Data Provisioning Server on tenants in a multi-database container environment, use the `ALTER DATABASE SQL` command.

For example, `ALTER DATABASE <database_name> ADD 'dpserver' [AT LOCATION '<hostname>[:<port_number>'] ]`.

**Parent topic:** [Configure the Data Provisioning Server \[page 31\]](#)

## Related Information

[Enable the Server in a Scale-out SAP HANA Database Scenario \[page 32\]](#)

[Enable the Server for the SAP HANA Service \[page 32\]](#)

[ALTER DATABASE Statement \(Tenant Database Management\) \(SAP HANA SQL and System Views Reference\)](#)

## 2.2.2 Enable the Server in a Scale-out SAP HANA Database Scenario

In a scale-out SAP HANA database scenario, you **must** enable the Data Provisioning Server only on the host that runs the master index server. Slave nodes should not have enabled Data Provisioning Server instances.

```
ALTER SYSTEM ALTER CONFIGURATION ('daemon.ini', 'HOST',  
'<master_indexserver_hostname>') SET ('dpserver','instances') = '1' WITH  
RECONFIGURE;
```

**Parent topic:** [Configure the Data Provisioning Server \[page 31\]](#)

## Related Information

[Enable the Server in a Multi-database Container Scenario \[page 31\]](#)

[Enable the Server for the SAP HANA Service \[page 32\]](#)

## 2.2.3 Enable the Server for the SAP HANA Service

To use SAP HANA smart data integration with the SAP Cloud Platform, SAP HANA service, you must use an instance with the SAP HANA Data Provisioning Server capability enabled.

## Context

Create an instance with the capability, or enable it on an existing instance.

## Procedure

- To create an instance with the SAP HANA Data Provisioning Server capability, use the SAP Cloud Platform cockpit.

- To enable the SAP HANA Data Provisioning Server capability on an existing instance, use the SAP HANA Service Dashboard.

## Next Steps

For more information about managing an SAP HANA Service instance, see the [SAP Cloud Platform, SAP HANA Service Getting Started Guide](#)

**Task overview:** [Configure the Data Provisioning Server \[page 31\]](#)

## Related Information

[Enable the Server in a Multi-database Container Scenario \[page 31\]](#)

[Enable the Server in a Scale-out SAP HANA Database Scenario \[page 32\]](#)

[Create an SAP HANA Service Instance Using the Cloud Cockpit](#)

[Enable and Disable Capabilities](#)

## 2.3 Download and Deploy the Data Provisioning Delivery Unit

Download the Data Provisioning delivery unit. Then, using SAP HANA studio or SAP HANA Application Lifecycle Management tools, deploy the delivery unit to obtain the following functionality:

Functionality	Description
Monitoring	The Monitoring application provides a browser-based interface to monitor agents, tasks, and remote subscriptions created in the SAP HANA system. The monitor application can be accessed from the SAP HANA cockpit.
Proxy	The Proxy application provides a way for the Data Provisioning Agent to communicate with the Data Provisioning Server. It is required when SAP HANA is running in the cloud or when the remote sources are behind a firewall. In this case, the Data Provisioning Agent stays behind the firewall (that is, close to the remote source) and communicates with SAP HANA (specifically, the dpserver) via the Proxy application running in the XS engine.
Admin	The Admin application provides a way for the Data Provisioning Agent Configuration tool to issue SQL commands necessary to register the agent and the adapters in the SAP HANA system. This application is used when SAP HANA is in the cloud and the Data Provisioning Agent is behind a firewall.

**Parent topic:** [Configure Smart Data Integration \[page 24\]](#)

**Previous:** [Configure the Data Provisioning Server \[page 31\]](#)

**Next:** [Install the Data Provisioning Agent \[page 36\]](#)

## Related Information

[Download the Data Provisioning Delivery Unit \[page 34\]](#)

[Deploy the Delivery Unit from SAP HANA Studio \[page 35\]](#)

[Deploy the Delivery Unit from SAP HANA Application Lifecycle Management \[page 35\]](#)

## 2.3.1 Download the Data Provisioning Delivery Unit

Download the Data Provisioning delivery unit from the SAP Software Download Center.

### Context

The data provisioning delivery unit is available in the same download area as the data provisioning agent.

### Procedure

1. Go to the SAP Software Download Center, and navigate to the following location: [SAP Software Download Center](#) [Software Downloads](#) [Installations & Upgrades](#) [By Alphabetical Index \(A-Z\)](#) [H](#) [SAP HANA SDI](#) [SAP HANA SDI 2.0](#).
2. Click [COMPRISED SOFTWARE COMPONENT VERSIONS](#).
3. Click [HANA DP 2.0](#).
4. Click the ZIP file that you need, and save it to your preferred location.
5. In the `HANAIMDP<version number>.ZIP` file, find and extract the `HANA_IM_DP.tgz` file.  
This is the delivery unit file that needs to be imported into SAP HANA.

## Related Information

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)





## 2.3.2 Deploy the Delivery Unit from SAP HANA Studio

You can deploy the Data Provisioning delivery unit from SAP HANA studio.

### i Note

When SAP HANA is deployed in a multi-tenant database container configuration, you must import the delivery unit into the tenant database.

## Prerequisites

Ensure that you have been granted the SYSTEM privilege REPO.IMPORT to be able to import the delivery unit.

## Procedure

1. Log in to SAP HANA studio as user SYSTEM.
2. In the upper left corner, click **File** > **Import**.
3. On the **Import** dialog, type **delivery** into the search box for *Select an import source*.
4. Click **Delivery Unit** on the resulting navigation tree and click **Next**.
5. Select your SAP HANA server name, and click **Next**.
6. On the **Import Through Delivery Unit** dialog, select either **Client** or **Server**, depending on whether the delivery unit is on the client or server machine.
  - a. If you select **Client**, click **Browse** and navigate to the location where you downloaded the delivery unit, then select `HANAIMDP.tgz` and click **Open**.
  - b. If you select **Server**, select the delivery unit you want to import from the dropdown list.
7. Click **Finish**.

## 2.3.3 Deploy the Delivery Unit from SAP HANA Application Lifecycle Management

You can deploy the Data Provisioning delivery unit through SAP HANA Application Lifecycle Management (ALM).

### i Note

When SAP HANA is deployed in a multi-tenant database container configuration, you must import the delivery unit into the tenant database.

## Procedure

1. If not already granted, grant the role `sap.hana.xs.lm.roles::Administrator` to the user name you use to log in to ALM.
  - a. In the SAP HANA studio *Systems* view, expand the name of your SAP HANA server and choose **Security > Users > System**.
  - b. On the *Granted Roles* tab, click the green “+” icon in the upper left corner.
  - c. On the *Select Roles* dialog, type `lm` in the search string box.
  - d. Select the role `sap.hana.xs.lm.roles::Administrator` and click *OK*.
2. Access ALM by typing the following URL in a web browser:  
`<host name>:80<2-digit instance number>/sap/hana/xs/lm`
3. Log in to ALM as the user name you authorized in step 1.  
The first time you log in, a pop-up window asks you to enter a name for this server.
4. On the ALM *Home* tab, click the *Delivery Units* tile.
5. Click the *Import* tab.
6. Click *Browse* and navigate to the location where you downloaded the delivery unit, then select `HANAIMDP.tgz` and click *Open*.
7. Click *Import*.  
After successful import, the name `HANA_IM_DP (sap.com)` appears in the list of delivery units on the left.

## 2.4 Install the Data Provisioning Agent

The Data Provisioning Agent provides secure connectivity between the SAP HANA database and your on-premise, adapter-based sources.

1. [Planning and Preparation \[page 37\]](#)  
Before you install the Data Provisioning Agent, plan your installation to ensure that it meets your system landscape's needs.
2. [Install the Data Provisioning Agent \[page 42\]](#)  
You can install the Data Provisioning Agent on a Windows or Linux host.
3. [Manage Agents from the Data Provisioning Agent Monitor \[page 47\]](#)  
Use the *Data Provisioning Agent Monitor* to perform basic administration tasks such as registering, altering, or dropping Data Provisioning Agents.

**Parent topic:** [Configure Smart Data Integration \[page 24\]](#)

**Previous:** [Download and Deploy the Data Provisioning Delivery Unit \[page 33\]](#)

**Next:** [Configure the Data Provisioning Agent \[page 49\]](#)

## Related Information

### 2.4.1 Planning and Preparation

Before you install the Data Provisioning Agent, plan your installation to ensure that it meets your system landscape's needs.

When planning your installation, consider the following questions:

- Where should the Data Provisioning Agent be installed?  
You can install the agent on any host system that has access to the sources you need, meets the minimum system requirements, and has any middleware required for source access installed. Install the agent on a host where you have full control to view logs and restart, if necessary.  
In many cases, installing the Data Provisioning Agent on the same host machine as the source database is not practical, because the Data Provisioning Agent host may need restarting when you troubleshoot issues and can consume a significant amount of memory.  
For best performance, install the Data Provisioning Agent on a separate machine or in a virtual machine as close to the source database as possible.

#### ! Restriction

We do not recommend installing the Data Provisioning Agent directly on the SAP HANA system.

#### i Note

For information about Data Provisioning Agent, operating system, and DBMS compatibility, refer to the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

- How many Data Provisioning Agents should be installed?  
You can install one or many agents depending on your landscape requirements.
- Which network protocols are required in your system landscape?  
Depending on whether SAP HANA is installed on premise, in the cloud, or behind a firewall, the connection between the agent and SAP HANA can use TCP/IP or HTTP.  
For security purposes, be sure to enable SSL correctly for the [Framework listener port](#) using the Data Provisioning Configuration Tool for On-Premise application. For SAP HANA on Cloud, use HTTPS to communicate with SAP HANA and configure the agent to communicate using the HTTPS protocol using the Data Provisioning Configuration Tool.
- Can the host system support the load from the Data Provisioning Agent?  
Generally speaking, the agent generates minimal additional load on the host system. The agent translates the source's format and commands to and from the SAP HANA format and commands. Additionally, the system utilization varies depending on the type and number of adapters deployed.

**Parent topic:** [Install the Data Provisioning Agent \[page 36\]](#)

**Next task:** [Install the Data Provisioning Agent \[page 42\]](#)

## Related Information

[Supported Platforms and System Requirements \[page 38\]](#)

[Software Download \[page 39\]](#)

[Prepare the Amazon Web Services Environment \[page 40\]](#)

[Download the SAP HANA Server Certificate \[page 41\]](#)

[Supported Platforms and System Requirements \[page 38\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



[Agent Adapter Framework Preferences \[page 104\]](#)

[Configuring SSL \[page 498\]](#)

### 2.4.1.1 Supported Platforms and System Requirements

Install the Data Provisioning Agent on a supported platform that meets the minimum system requirements or higher.

You can find a complete list of all SAP HANA components and the respective SAP HANA hardware and software requirements in the *Product Availability Matrix (PAM)* on the *Support Portal* and in the *SAP Community Network*.

## Operating System for the Data Provisioning Agent

For the Data Provisioning Agent host system, the following 64-bit platforms are supported:

- Microsoft Windows Server
- SUSE Linux Enterprise Server (SLES)
- Red Hat Enterprise Linux (RHEL)

## Software Requirements

For more information about supported Java versions, see the *SAP HANA Smart Data Integration Product Availability Matrix (PAM)*.

On Linux platforms, the following extra requirements apply:

- The system must have GCC 5.x to run the Data Provisioning Agent service, ASEAdapter, and ASECCAdapter.

For more information, see SAP Note [2338763](#) .

## Related Information

[SAP Note 2338763 - Linux: Running SAP Applications compiled with GCC 5.x](#)

[SAP HANA Smart Data Integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



### 2.4.1.2 Software Download

The Data Provisioning Agent installation package is available in the component SAP HANA SDI (SAP HANA smart data integration) on the SAP Software Download Center.

#### Note

Installation of the Data Provisioning Agent requires the correct version of SAP HANA. Subsequent support packages or revisions of SAP HANA may require an equivalent update to the Data Provisioning Agent. For details, see the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

On the [SAP Software Download Center](#), you can find the installation packages in the following locations:

- Installation media for an SAP HANA smart data integration release:  
[SAP Software Download Center](#) > [Software Downloads](#) > [Installations & Upgrades](#) > [By Alphabetical Index \(A-Z\)](#) > [H](#) > [SAP HANA SDI](#) > [SAP HANA SDI <version\\_number>](#) > [Comprised Software Component Versions](#)
  - Support Packages and Patches:  
[SAP Software Download Center](#) > [Software Downloads](#) > [Support Packages & Patches](#) > [By Alphabetical Index \(A-Z\)](#) > [H](#) > [SAP HANA SDI](#) > [SAP HANA SDI <version\\_number>](#) > [Comprised Software Component Versions](#) > [HANA DP AGENT <version\\_number>](#)
- In either case, on the [Downloads](#) tab, select the package to download. From the list of items, select the desired version. Click the [Add Selected Items to Download Basket](#) icon. Select [Download Basket](#) and select [Download Manager](#) to start the download process. In the downloaded ZIP file, locate the `HANAIMADP.tgz` file and extract it.
- To verify the agent version, see the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

## SAP JVM

The SAP JVM is the default Java runtime supported by the Data Provisioning Agent, and is bundled with the Data Provisioning Agent installation package. However, to obtain any subsequent security patches, you can independently download the latest releases of the SAP JVM from the same location and update your agent installation.

[SAP Software Download Center](#) > [Software Downloads](#) > [Installations & Upgrades](#) > [By Alphabetical Index \(A-Z\)](#) > [H](#) > [SAP HANA SDI](#) > [SAP HANA SDI 1.0](#) > [Comprised Software Versions](#)

For more information about changing the Java runtime, see “Reconfigure the Java Runtime Environment”.

## Related Information

[SAP Software Download Center](#) 

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



[Download and Deploy the Data Provisioning Delivery Unit \[page 33\]](#)

[Reconfigure the Java Runtime Environment \[page 92\]](#)

### 2.4.1.3 Prepare the Amazon Web Services Environment

Before you can install the Data Provisioning Agent on Amazon Web Services (AWS), you must prepare the environment.

#### Procedure

1. Launch the Amazon Web Services (AWS) instance.
2. Copy the Java Development Kit and the Data Provisioning Agent packages to `/download` on the AWS host:

For example:

- `jdk-8u60-linux-x64.rpm.rpm`
- `IMDB_DPAGENT100_00_2-70000174.SAR`

#### **i** Note

Create the `/download` directory, if it does not exist.

3. Log in to the AWS host as `ec2-user` and start a `sudo bash` command line.

```
sudo bash
```

4. Install the Java Development Kit.

```
zypper install jdk-8u60-linux-x64.rpm.rpm
```

5. Change to the `ec2-user` user and extract the Data Provisioning Agent installation program.

```
su ec2-user
./SAPCAR -xvf IMDB_DPAGENT100_00_2-70000174.SAR
```

## Results

The Java Development Kit is installed and the Data Provisioning Agent installation program is available on the AWS host. You can continue to install the Data Provisioning Agent from the command line.

## Related Information

[Install from the Command Line \[page 45\]](#)

### 2.4.1.4 Download the SAP HANA Server Certificate

When SAP HANA is configured for HTTPS, you need a copy of the server certificate to configure the SAP HANA Data Provisioning Agent.

#### → Tip

To verify whether the SAP HANA server is configured for HTTPS, examine the port number being used. If the port number is 80<xx>, the server is using standard HTTP. If the port number is 43<xx>, the server is using HTTPS.

When SAP HANA is located in the cloud, it is always configured for HTTPS communication.

## Context

You can download the SAP HANA server certificate using a web browser.

#### → Tip

If the agent keystore does not have the server certificate required for HTTPS communication, the Data Provisioning Agent Configuration tool allows you to import the server certificate into the agent keystore directly. This procedure is required only if you do not want the configuration tool to import the certificate directly, and you want to import it manually separately.

## Procedure

1. Navigate to the SAP HANA server in a web browser.

For example, `https://<hostname>.us1.hana.ondemand.com`.

2. Open the certificate information for the page.

The exact steps to open the certificate information depend on your browser.

- For Internet Explorer, click the lock icon in the address bar, and click [View Certificates](#).
- For Chrome, click the lock icon in the address bar, and click ► [Connection](#) ► [Certificate Information](#) ►.

3. In the [Details](#) tab, click [Copy to file](#).

The Certificate Export Wizard displays. Click [Next](#).

4. Select [DER encoded binary X.509 \(.CER\)](#) and click [Next](#).

5. Specify a name for the certificate file and save it locally.

For example, `HANA_Certificate_06Oct2015.cer`.

6. Transfer the certificate file to a location available to the Data Provisioning Agent.

## 2.4.2 Install the Data Provisioning Agent

You can install the Data Provisioning Agent on a Windows or Linux host.

The default installation manager is a graphical installation tool. If you cannot or do not want to use a graphical tool, see [Install from the Command Line \[page 45\]](#).

### Prerequisites

To install the Data Provisioning Agent on Windows, you must use the Administrator user or a user in the Administrators group.

To install the Data Provisioning Agent on Linux, there are extra prerequisites:

- GTK 2 is installed so you can run the installation tool.
- A local X11 graphical environment and an X server must be available on the machine where you install.
- Create or use an existing non-`root` agent user that is authorized to open a display and has full read and write access to the intended installation location.

#### **i** Note

The default installation location (`/usr/sap/dataprovagent`) requires the agent user to have write access to the `/usr/` directory.

Before installation, grant the agent user the appropriate permissions (use `sudo` to create the `/usr/sap/dataprovagent` directory and grant permissions to the user) or choose a different installation location.

### Context

#### **⚠** Caution

When you install the Data Provisioning Agent, the agent uses, by default, a non-secure channel when communicating with the SAP HANA server.

To enable secure communication, you must configure SSL with the Data Provisioning Agent Configuration tool after installation. For more information, see “Connect to SAP HANA on-premise with SSL” and “Connect to SAP HANA in the cloud”.



## Procedure

1. Download and extract the software to an empty directory.
2. Navigate to the directory where you extracted the software.
3. Call the installation manager.
  - On Windows, right-click **hdbsetup.exe** and choose *Run as administrator*.
  - On Linux, run **./hdbsetup**.
4. Choose *Install new SAP HANA Data Provisioning Agent* and specify the installation path.
5. On Windows, specify the unique agent name.

The unique agent name is a string of up to 30 alphanumeric characters that identifies the agent instance and must be different from any names already used by other agent instances on the same host system.

It is used as a suffix when creating the Windows service, uninstallation entry, and configuration tool shortcut.

6. On Windows, specify the username (**<domain>\<username>**) and password to use for the agent service.

The user that runs the agent service must have read and write access to the installation directory so configuration files can be updated.

### i Note

On Linux, the agent user who installs is the installation owner. Ideally, you should be logged in as this user when starting the agent service.

7. To use a custom Java runtime environment instead of the bundled SAP JVM, specify the path to the JRE installation.

### i Note

We recommend using the bundled SAP JVM located in **<DPAgent\_root>/sapjvm**

For example:

- On Windows, **C:\Program Files\Java\jre7**
- On Linux, **/usr/java/jdk<version>/jre**

### i Note

The Data Provisioning Agent supports only 64-bit Java runtime environments.

## Results

The Data Provisioning Agent is installed or updated.

## Next Steps

- After installing the Data Provisioning Agent, we recommend that you review the installation log file for any errors and take any necessary corrective actions.
- If you have installed the Data Provisioning Agent on Amazon Web Services (AWS), set the `cloud.deployment` parameter.  
Open `<DPAgent_root>/dpagentconfig.ini` in a text editor and set the value:

```
cloud.deployment=AWS_
```

- Proceed by configuring the agent as required for your landscape.

### ⚠ Caution

On Linux, we recommend that you do not start the Data Provisioning Agent while logged in as the `root` user. Instead, log in with the agent user, and then start the Data Provisioning Agent.

If you accidentally start the agent as the `root` user, see “Clean an Agent Started by the Root User” in the *Administration Guide*.

**Task overview:** [Install the Data Provisioning Agent \[page 36\]](#)

**Previous:** [Planning and Preparation \[page 37\]](#)

**Next task:** [Manage Agents from the Data Provisioning Agent Monitor \[page 47\]](#)

## Related Information

[Install from the Command Line \[page 45\]](#)

[Installation Logs \[page 47\]](#)

[Default Installation Paths \[page 47\]](#)

[Connect to SAP HANA On-Premise with SSL \[page 512\]](#)

[Connect to SAP HANA on Cloud \[page 86\]](#)

[Clean an Agent Started by the Root User](#)

## 2.4.2.1 Install from the Command Line

If you cannot use or do not want to use the graphical installation manager, you can install the Data Provisioning Agent using the command-line tool.

### Prerequisites

To install the Data Provisioning Agent on Windows, you must use the Administrator user or a user in the Administrators group.

To install the Data Provisioning Agent on Linux, you must create or use an existing non-root agent user that has full read and write access to the intended installation location.

#### **i** Note

The default installation location (`/usr/sap/dataprovagent`) requires the agent user to have write access to the `/usr/` directory.

Before installation, grant the agent user the appropriate permissions (use `sudo` to create the `/usr/sap/dataprovagent` directory and grant permissions to the user) or choose a different installation location.

### Context

#### **⚠** Caution

When you install the Data Provisioning Agent, the agent uses, by default, a non-secure channel when communicating with the SAP HANA server.

To enable secure communication, you must configure SSL with the Data Provisioning Agent Configuration tool after installation. For more information, see “Connect to SAP HANA on-premise with SSL” and “Connect to SAP HANA in the cloud”.

### Procedure

1. Download and extract the software to an empty directory.
2. Navigate to the directory where you extracted the software.
3. On Windows, create the password XML file one directory level above `hdbinst.exe`:

```
<?xml version="1.0" encoding="UTF-8"?>
<Passwords>
  <service_password><password></service_password>
</Passwords>
```

4. Call the installation program.

- On Windows, run `more ..\passwords.xml | hdbinst.exe --silent --batch --path="<DPAgent_root>" --agent_listener_port=<port> --agent_admin_port=<port> --agent_instance=<unique_name> --service_user=<domain>\<username> --read_password_from_stdin=xml.`
- On Linux, run `./hdbinst --silent --batch --path="<DPAgent_root>" --agent_listener_port=<port> --agent_admin_port=<port>.`

## Results

The Data Provisioning Agent is installed without displaying the graphical installation manager.

## Next Steps

### ⚠ Caution

If you created a password XML file for the installation, be sure to delete it after the installation process has completed. Leaving the password XML file on the server is a security risk.

If you have installed the Data Provisioning Agent on Amazon Web Services (AWS), set the `cloud.deployment` parameter.

Open `<DPAgent_root>/dpagentconfig.ini` in a text editor and set the value:

```
cloud.deployment=AWS_
```

Proceed by configuring the agent as required for your landscape.

### ⚠ Caution

On Linux, we recommend that you do not start the Data Provisioning Agent while logged in as the `root` user. Instead, log in with the agent user, and then start the Data Provisioning Agent.

If you accidentally start the agent as the `root` user, see “Clean an Agent Started by the Root User” in the *Administration Guide*.

## Related Information

[Connect to SAP HANA On-Premise with SSL \[page 512\]](#)

[Connect to SAP HANA on Cloud \[page 86\]](#)

[Clean an Agent Started by the Root User](#)

## 2.4.2.2 Installation Logs

Your system logs the Data Provisioning Agent installation. There are two files written during installation.

- \*.log: can be read using a text editor
- \*.msg: XML format for display in the installation tool with the graphical user interface

The log files are stored in the following locations:

- On Windows, %TEMP%\hdb\_dataprovagent\_<timestamp>
- On Linux, /var/tmp/hdb\_dataprovagent\_<timestamp>

## 2.4.2.3 Default Installation Paths

The default installation paths are specific to the operating system on which the Data Provisioning Agent is installed.

Platform	Package Version	Default Installation Path
Microsoft Windows x86, 64-bit	64-bit	C:\usr\sap\dataprovagent
Linux x86, 64-bit	64-bit	/usr/sap/dataprovagent

In this documentation, the variable <DPAgent\_root> represents these root installation paths.

## 2.4.3 Manage Agents from the Data Provisioning Agent Monitor

Use the [Data Provisioning Agent Monitor](#) to perform basic administration tasks such as registering, altering, or dropping Data Provisioning Agents.

### Prerequisites

The user must have the following roles or privileges to manage agents:

Table 3: Roles and Privileges

Action	Role or Privilege
Add Data Provisioning Agent	<ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.monitor.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::CreateAgent</li><li>• System privilege: AGENT ADMIN</li></ul>

Action	Role or Privilege
Alter Data Provisioning Agent	<ul style="list-style-type: none"> <li>• Role: sap.hana.im.dp.monitor.roles::Operations</li> <li>• Application privilege: sap.hana.im.dp.monitor::AlterAgent</li> <li>• System privilege: AGENT ADMIN</li> </ul>
Remove Data Provisioning Agent	<ul style="list-style-type: none"> <li>• Role: sap.hana.im.dp.monitor.roles::Operations</li> <li>• Application privilege: sap.hana.im.dp.monitor::DropAgent</li> <li>• System privilege: AGENT ADMIN</li> </ul>

## Context

Use the following controls in the [Agent Monitor](#) table to perform an action.

## Procedure

- Select [Create Agent](#) to register a new agent with the SAP HANA system.
  - a. Specify the name of the agent and relevant connection information.
  - b. If the agent uses a secure SSL connection, select [Enable SSL](#).
  - c. If you want to assign the agent to an existing agent group, select the group under [Agent Group](#).
  - d. Click [Create Agent](#).

The new agent appears in the [Agent Monitor](#) table.

- Select [Alter Agent](#) to make connection configuration changes on an agent already registered in the SAP HANA system.
  - a. Specify the new connection information for the agent. You can't change the name or connection protocol for an existing agent.
  - b. If the agent uses a secure SSL connection, check [Enable SSL](#).
  - c. If you want to assign the agent to an existing agent group, select the group under [Agent Group](#).
  - d. Click [Alter Agent](#).

The updated agent information appears in the [Agent Monitor](#) table.

- Select [Drop Agent](#) to remove an agent from the SAP HANA system.
  - a. To drop any dependent objects automatically, such as registered adapters, choose [CASCADE option](#). You can't remove an agent while it has dependent objects such as registered adapters. Remove the adapters from the agent manually, or check [CASCADE option](#).
  - b. Click [Drop Agent](#).

The agent is removed from the [Agent Monitor](#) table. If the agent was assigned to an agent group, it's also removed from the agent group.

**Task overview:** [Install the Data Provisioning Agent \[page 36\]](#)

**Previous task:** [Install the Data Provisioning Agent \[page 42\]](#)

## Related Information

[Assign Roles and Privileges \[page 25\]](#)

## 2.5 Configure the Data Provisioning Agent

Configure the Data Provisioning Agent before you can use adapters to connect to data sources, create remote sources, and so on.

[Configuring the Agent in Command-Line Interactive Mode \[page 50\]](#)

Use the command-line configuration tool to connect to the SAP HANA server and configure the Data Provisioning Agent and adapters.

[Configuring the Agent in Command Line Batch Mode \[page 69\]](#)

Use the command-line configuration tool to connect to the SAP HANA server and configure the Data Provisioning Agent and adapters.

[Configuring the Agent in Graphical Mode \[Deprecated\] \[page 83\]](#)

Connect to the SAP HANA server and configure the agent and adapters with the Data Provisioning Agent Configuration tool.

[Managing Agent Groups \[page 94\]](#)

Agent grouping provides failover and load-balancing capabilities by combining individual Data Provisioning Agents installed on separate host systems.

[Manage Agents from the Data Provisioning Agent Monitor \[page 103\]](#)

Use the *Data Provisioning Agent Monitor* to perform basic administration tasks such as registering, altering, or dropping Data Provisioning Agents.

[Agent Adapter Framework Preferences \[page 104\]](#)

The agent preferences provide advanced configuration options for the Data Provisioning Agent.

[Agent Runtime Options \[page 108\]](#)

Use the command-line configuration tool to manage advanced runtime options stored in the `dpagent.ini` configuration file safely.

[Replicating an Agent Configuration to Another Host \[page 110\]](#)

There are items that you need to consider when moving to a different host from one where your agent is configured.

**Parent topic:** [Configure Smart Data Integration \[page 24\]](#)

**Previous:** [Install the Data Provisioning Agent \[page 36\]](#)

**Next task:** [Register Data Provisioning Adapters \[page 111\]](#)

## Related Information

### 2.5.1 Configuring the Agent in Command-Line Interactive Mode

Use the command-line configuration tool to connect to the SAP HANA server and configure the Data Provisioning Agent and adapters. For example, you can use the configuration tool to view the agent and adapter statuses and versions, manage custom and SAP-delivered adapters, and modify keystore paths.

At each menu in interactive mode, specify the number of the desired action or option and press `Enter`. At any screen, you can press `b` to return to the previous menu or `q` to quit the configuration tool.

If the selected option requires input, the configuration tool displays any existing or default value in parentheses. You can accept the existing or default value by pressing `Enter` to move to the next prompt.

#### Note

Passwords are hidden from display in command-line interactive mode. If an option has an existing password, the password displays as "\*\*\*\*\*". You do not need to reenter the password unless the password has changed.

#### Caution

When you are asked for input entry for an option, you cannot cancel or return to the previous menu. To abort the operation without saving, you must press `Ctrl` + `C` to terminate the configuration tool.

#### [Start the Configuration Tool \[Command Line\] \[page 51\]](#)

Start the configuration tool in interactive mode to modify the agent configuration without a graphical environment.

#### [Connect to SAP HANA Cloud \[Command Line\] \[page 52\]](#)

Connect to SAP HANA using JDBC when you are using an SAP HANA Cloud instance.

#### [Connect to SAP HANA On-premise \[Command Line\] \[page 55\]](#)

Specify connection information and administrator credentials when the SAP HANA system is located on-premise.

#### [Connect to the SAP HANA Service via JDBC WebSockets \[Command Line\] \[page 56\]](#)

Connect to SAP HANA using JDBC WebSockets when you are using the SAP Cloud Platform, SAP HANA service in the Cloud Foundry environment.

#### [Connect to SAP HANA in the SAP Cloud Platform Neo Environment \[Command Line\] \[page 62\]](#)

Specify connection information, user credentials, and SSL configuration information when SAP HANA is deployed in the SAP Cloud Platform Neo environment.

#### [Manage the Agent Service \[Command Line\] \[page 64\]](#)

Use the command-line configuration tool to stop or start the Data Provisioning Agent service.

#### [Register the Agent with SAP HANA \[Command Line\] \[page 65\]](#)

Before you can use adapters deployed on the Data Provisioning Agent, you must register the agent with SAP HANA.



[Manage the HANA User for Agent Messaging Credentials \[Command Line\] \[page 67\]](#)

If the password for the HANA User for Agent Messaging has changed or expired, you must update the credentials in the agent secure storage.

[Store Source Database Credentials in Data Provisioning Agent \[Command Line\] \[page 68\]](#)

Store source database access credentials in the Data Provisioning Agent secure storage using batch mode.

**Parent topic:** [Configure the Data Provisioning Agent \[page 49\]](#)

## Related Information

[Configuring the Agent in Command Line Batch Mode \[page 69\]](#)

[Configuring the Agent in Graphical Mode \[Deprecated\] \[page 83\]](#)

[Managing Agent Groups \[page 94\]](#)

[Manage Agents from the Data Provisioning Agent Monitor \[page 103\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

[Agent Runtime Options \[page 108\]](#)

[Replicating an Agent Configuration to Another Host \[page 110\]](#)

## 2.5.1.1 Start the Configuration Tool [Command Line]

Start the configuration tool in interactive mode to modify the agent configuration without a graphical environment.

### Prerequisites

The command-line agent configuration tool requires the `DPA_INSTANCE` environment variable to be set to the installation root location (`<DPAgent_root>`).

For example, on Windows:

```
set DPA_INSTANCE=C:\usr\sap\dataprovagent
```

On Linux:

```
export DPA_INSTANCE=/usr/sap/dataprovagent
```

#### Caution

Multiple instances of the Data Provisioning Agent may be installed on a single Linux host. Be sure that you set `DPA_INSTANCE` to the instance that you want to modify before starting the configuration tool. If you do

not set the environment variable correctly, you may unintentionally modify the configuration of a different agent instance.

## Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--configAgent` parameter.
  - On Windows, `agentcli.bat --configAgent`
  - On Linux, `agentcli.sh --configAgent`
3. (Optional) Select **1** to display the agent status.

## Results

The command-line configuration tool opens.

### 2.5.1.2 Connect to SAP HANA Cloud [Command Line]

Connect to SAP HANA using JDBC when you are using an SAP HANA Cloud instance.

## Prerequisites

- You have created an SAP HANA Cloud instance in the SAP Cloud Platform Cockpit.
- You have installed the Data Provisioning Agent to an on-premise or cloud-based host system.

#### i Note

SAP HANA Cloud requires Data Provisioning Agent version 2.4.2.4 or newer.

- You have whitelisted the IP address of the agent host system in the SAP HANA Cloud instance.
- You have an Agent Admin HANA User for connecting the agent configuration tool to SAP HANA Cloud and performing administrative actions such as registering agents and adapters.  
This user must have the following roles or privileges to perform the actions noted in the table below:

Table 4: Roles and Privileges

Action	Role or Privilege
Register Agents and Adapters on SAP HANA Cloud	<ul style="list-style-type: none"><li>○ System privilege: AGENT ADMIN</li><li>○ System privilege: ADAPTER ADMIN</li></ul>

Action	Role or Privilege
Create the HANA User for Agent Messaging (Optional)	<ul style="list-style-type: none"> <li>Object privilege: <code>USERGROUP OPERATOR</code> on the <code>DEFAULT</code> usergroup.</li> </ul>

#### i Note

This privilege is required only when you want to create the HANA User for Agent Messaging automatically as part of the configuration process within the agent configuration tool.

#### i Note

On SAP HANA Cloud, the user **DBADMIN** already has the `USERGROUP OPERATOR` privilege and can be used if you also assign the `AGENT ADMIN` and `ADAPTER ADMIN` system privileges.

For security reasons, you may wish to assign all three privileges to a different user. For more information, see [SAP HANA Cloud Administrator DBADMIN](#) in the *SAP HANA Cloud Administration Guide*.

- You have a HANA User for Agent Messaging for messaging between the agent and SAP HANA Cloud. To create such a user manually, specify the **DEFAULT** usergroup and a non-expiring password when creating the user.

```
CREATE USER <username> PASSWORD <password> NO FORCE_FIRST_PASSWORD_CHANGE SET
USERGROUP DEFAULT;
```

#### → Tip

If the Agent Admin HANA User has been granted the privileges indicated in the “Roles and Privileges” table, it can create the HANA User for Agent Messaging during the configuration process. The configuration tool creates the HANA User for Agent Messaging as a technical user with the no expiration period for the password.

#### i Note

In general, the password for a new SAP HANA user expires according to the SAP HANA password policy settings, the default for which is 182 days. To avoid agent disruptions in a production scenario, treat a new HANA User for Agent Messaging as a technical user and ensure that its password does not expire.

For more information about configuring the password policy for a technical user in SAP HANA, see the *SAP HANA Security Guide*.

## Procedure

1. Start the command-line agent configuration tool.
2. Choose [SAP HANA Connection](#).
3. Choose [Connect to SAP HANA Cloud Services \(HCS\) via JDBC](#).

4. Specify **true** to use an encrypted connection over JDBC.

→ Tip

An encrypted connection is always required when connecting to SAP HANA in a cloud-based environment.

5. Specify the hostname and port for the SAP HANA Cloud instance.

For example:

- Hostname: **<instance\_name>.hanacloud.ondemand.com**
- Port Number: **443**

6. Specify the Agent Admin HANA User credentials for SAP HANA Cloud as prompted.
7. If HTTPS traffic from your agent host is routed through a proxy, specify any required proxy information as prompted.

The agent uses the HTTPS protocol to communicate with SAP HANA Cloud.

8. Specify the credentials for the HANA User for Agent Messaging.

The HANA User for Agent Messaging is used only for messaging between the agent and SAP HANA Cloud, and must be different from the Agent Admin HANA User used for agent administration tasks.

9. Specify whether to create a new HANA User for Agent Messaging.
  - Enter **true** to create a new user with the specified credentials.
  - Enter **false** if the specified credentials are for an existing user.

→ Tip

Generally, you create this user only during the initial configuration of an agent instance. If you are modifying the configuration of an existing agent instance, you usually do not need to create a user.

## Results

The configuration tool creates the HANA User for Agent Messaging, if applicable, and connects to the SAP HANA Cloud instance.

## Related Information

SAP HANA Cloud Administration Guide

[Managing SAP HANA Users](#)

[SAP HANA Cloud Administrator DBADMIN](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

## 2.5.1.3 Connect to SAP HANA On-premise [Command Line]

Specify connection information and administrator credentials when the SAP HANA system is located on-premise.

### Prerequisites

- The Agent Admin HANA User must have the following roles or privileges:

Table 5: Roles and Privileges

Action	Role or Privilege
Connect to SAP HANA	System privilege: AGENT ADMIN
	System privilege: ADAPTER ADMIN

- If the SAP HANA server is configured for SSL, the agent host must already be prepared for SSL before connecting the agent configuration tool to the SAP HANA server. If you want to use TCP with SSL, but the agent is not yet prepared, see [Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#).

### Procedure

- Start the command-line agent configuration tool.
- Select **5** to enter the *SAP HANA Connection* menu.
- Select **2** to connect to SAP HANA via TCP.
- Specify whether to use SSL over TCP.
  - If you want to use SSL and the agent has already been prepared, choose *true*.
  - If you do not want to use SSL or the agent has not already been prepared, choose *false*.

For more information about preparing the agent for SSL, see [Configuring SSL \[page 498\]](#).

- Specify the hostname, port, and Agent Admin HANA User credentials for the SAP HANA server as prompted.

#### → Tip

To determine the correct port number when SAP HANA is deployed in a multi-database configuration, execute the following SQL statement:

```
SELECT DATABASE_NAME, SERVICE_NAME, PORT, SQL_PORT, (PORT + 2) HTTP_PORT
FROM SYS_DATABASES.M_SERVICES WHERE DATABASE_NAME='<DBNAME>' and
((SERVICE_NAME='indexserver' and COORDINATOR_TYPE= 'MASTER') or
(SERVICE_NAME='xsengine'))
```

## Results

The configuration tool connects to the SAP HANA server.

## Related Information

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[Assign Roles and Privileges \[page 25\]](#)

### 2.5.1.4 Connect to the SAP HANA Service via JDBC WebSockets [Command Line]

Connect to SAP HANA using JDBC WebSockets when you are using the SAP Cloud Platform, SAP HANA service in the Cloud Foundry environment.

## Prerequisites

- You are using the SAP Cloud Platform, SAP HANA service with the SAP HANA Data Provisioning Server capability.
- You have installed the Data Provisioning Agent to an on-premise or cloud-based host system.
- The Agent Admin HANA User must have the following roles or privileges to perform the actions noted in the table below:

Table 6: Roles and Privileges

Action	Role or Privilege
Connect to SAP HANA	<ul style="list-style-type: none"><li>◦ System privilege: AGENT ADMIN</li><li>◦ System privilege: ADAPTER ADMIN</li></ul>
Create the HANA User for Agent Messaging (Optional)	<ul style="list-style-type: none"><li>◦ System privilege: USER ADMIN</li></ul>

**i Note**

These privileges are required only when you want to create the HANA User for Agent Messaging as part of the configuration process within the agent configuration tool.

You have an SAP HANA User for Agent Messaging for messaging between the agent and SAP HANA. To create such a user manually:

1. Create the agent user (for example, AGTUSR) with a non-expiring password.

2. GRANT AGENT MESSAGING ON AGENT "<your\_agent\_name>" TO AGTUSR;

#### → Tip

If the Agent Admin HANA User has been granted the privileges indicated in the "Roles and Privileges" table, it can create the HANA User for Agent Messaging during the configuration process. The configuration tool creates the HANA User for Agent Messaging as a technical user with the no expiration period for the password.

#### i Note

In general, the password for a new SAP HANA user expires according to the SAP HANA password policy settings, the default for which is 182 days. To avoid agent disruptions in a production scenario, treat a new HANA User for Agent Messaging as a technical user and ensure that its password does not expire.

For more information about configuring the password policy for a technical user in SAP HANA, see the *SAP HANA Security Guide*.

## Context

The Data Provisioning Agent connects to the SAP HANA service through JDBC WebSockets.

## Procedure

1. Start the command-line agent configuration tool.
2. Choose [SAP HANA Connection](#).
3. Choose [Connect to SAP HANA via JDBC](#).
4. Specify **true** to use an encrypted connection over JDBC.

#### → Tip

An encrypted connection is always required when connecting to SAP HANA in a cloud-based environment.

5. Specify **true** to use WebSockets instead of a Direct SQL connection.
6. Specify the WebSocket URL, host, and port for the SAP HANA service as prompted.

For example:

- WebSocket URL: **/service/<service\_instance\_id>**
- WebSocket Host: **<instance\_name>.dbaas.ondemand.com**
- WebSocket Port: **80**

7. Specify the Agent Admin HANA User credentials for SAP HANA as prompted.
8. If HTTPS traffic from your agent host is routed through a proxy, specify any required proxy information as prompted.

The agent uses the HTTPS protocol to communicate with the SAP HANA service.

9. Specify the credentials for the HANA User for Agent Messaging.

The HANA User for Agent Messaging is used only for messaging between the agent and SAP HANA, and must be different from the Agent Admin HANA User used to connect to SAP HANA.

10. Specify whether the HANA User for Agent Messaging is an existing user.

- Enter **true** if the user already exists.
- Enter **false** if you want the configuration tool to create a user with the specified credentials.

#### → Tip

Generally, you create this user only during the initial configuration of an agent instance. If you are modifying the configuration of an existing agent instance, you usually do not need to create a user.

## Results

The configuration tool creates the SAP HANA User for Agent Messaging, if applicable, and connects to the SAP HANA server.

## Related Information

[JDBC Connection Properties \[page 58\]](#)

[Password Policy Configuration Options \(SAP HANA Administration Guide\)](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[Configuring SSL \[page 498\]](#)

[JDBC Connection Properties \[page 58\]](#)

### 2.5.1.4.1 JDBC Connection Properties

When connecting to an SAP HANA database or to a remote source using JDBC, there are several connection properties that you can configure.

## Default Properties

The following table lists the default JDBC connection properties, which are case insensitive, available in the `agentcli` tool and are written to the `<DPAgent_root>\dpagentconfig.ini` file.



Property	Value	Default	Description
<code>jdbc.communicationTimeout</code>	<code>&lt;number&gt;</code>	330	Aborts communication after the specified timeout. Setting this parameter to 0 disables the timeout.
<code>jdbc.connections</code>	<code>&lt;number&gt;</code>	10	Specifies the maximum number of JDBC connections.
<code>jdbc.enabled</code>	Boolean	FALSE	Specifies whether to use JDBC for message communication.
<code>jdbc.encrypt</code>	Boolean	FALSE	Enables or disables TLS/SSL encryption.
<code>jdbc.host</code>	<code>&lt;name&gt;</code>	localhost	Specifies the JDBC host name.
<code>jdbc.hostNameInCertificate</code>	<code>&lt;name&gt;</code>	*	<p>Specifies the host name used to verify server's identity.</p> <p>The host name specified here is used to verify the identity of the server instead of the host name with which the connection was established.</p> <p>For example, in a single-host system, if a connection is established from a client on the same host as the server, a mismatch would arise between the host named in the certificate (actual host name) and the host used to establish the connection (localhost).</p>
<div> <div>i Note</div> <p>If you specify * as the host name, this property has no effect. Other wildcards aren't permitted.</p> </div>			
<code>jdbc.port</code>	<code>&lt;number&gt;</code>	30015	Specifies the JDBC port number.
<code>jdbc.proxyHost</code>	<code>&lt;name&gt;</code>	proxy	Specifies the JDBC proxy host name.

Property	Value	Default	Description
<code>jdbc.proxyHttp</code>	Boolean	FALSE	When using a proxy, this parameter specifies whether it's an HTTP proxy (true) or a SOCKS proxy (false).
<div> <div>i Note</div> <p>There's no support for WebSocket (HTTP/HTTPS) connections with a SOCKS proxy. WebSocket connections must either use no proxy or an HTTP proxy. Non-WebSocket (TCP/TLS, via Direct SQL, for example) connections can use no proxy, a SOCKS proxy, or an HTTP proxy.</p> </div>			
<code>jdbc.proxyPassword</code>	<code>&lt;String&gt;</code>	Empty	Specifies the JDBC proxy password.
<code>jdbc.proxyPort</code>	<code>&lt;number&gt;</code>	8080	Specifies the JDBC proxy port number.
<code>jdbc.proxyUsername</code>	<code>&lt;String&gt;</code>	Empty	Specifies the JDBC proxy user name.
<code>jdbc.reconnectRetries</code>	<code>&lt;number&gt;</code>	10	Specifies the maximum number of connect retries.
<code>jdbc.reconnectTime</code>	<code>&lt;number&gt;</code>	30	Specifies the amount of time to wait before JDBC attempts a new registration.
<code>jdbc.retryMax</code>	<code>&lt;number&gt;</code>	10	Specifies the maximum number of send retries.
<code>jdbc.retryTime</code>	<code>&lt;number&gt;</code>	5	Specifies the amount of time to wait before resending the message.
<code>jdbc.sniHostname</code>	<code>&lt;name&gt;</code>	Empty	Specifies the name of the host that is attempting to connect at the start of the TLS handshaking process.
<code>jdbc.timeout</code>	<code>&lt;number&gt;</code>	60	Specifies the amount of time to wait for an available JDBC connection.
<code>jdbc.timeUnit</code>	DAYS, HOURS, MICROSECONDS, MILLISECONDS, MINUTES, NANOSECONDS, SECONDS	SECONDS	Specifies the JDBC time unit.

Property	Value	Default	Description
<code>jdbc.useProxy</code>	Boolean	FALSE	Specifies whether to use proxy properties for the JDBC connection.
<code>jdbc.useProxyAuth</code>	Boolean	FALSE	Specifies whether to use proxy authentication. If true, you must provide a proxy username and password.
<code>jdbc.useWebsocketURL</code>	Boolean	FALSE	Specifies whether to use WebSocket properties for the JDBC connection.
<code>jdbc.validateCertificate</code>	Boolean	FALSE	If set to true, specifies that the server's certificate is validated.
<code>jdbc.websocketURL</code>	<code>&lt;websocket URL&gt;</code>	Empty	Specifies the JDBC WebSocket URL.
<code>jdbc.additionalParameters</code>	<code>&lt;String&gt;</code>	Empty	<p>Additional parameters to pass to the JDBC driver.</p> <p>Any property that isn't supported in the <code>dpagentconfig.ini</code> file (that is, not listed here), but is supported by the SAP HANA JDBC driver, can be specified using <code>jdbc.additionalParameters</code> property.</p> <p>Entries in the <code>jdbc.additionalParameters</code> must be specified with a comma delimiter when there are multiple parameters. For example, <code>jdbc.additionalParameters=reconnect=TRUE,ignoreTopology=FALSE</code></p>

#### i Note

These additional properties aren't prepended with "jdbc".

There are other SAP HANA-specific properties available in addition to the properties listed here. See the *SAP HANA Client Interface Programming Reference for SAP HANA Platform* for more information.

## Related Information

[\[SAP HANA\] JDBC Connection Properties](#)

### 2.5.1.5 Connect to SAP HANA in the SAP Cloud Platform Neo Environment [Command Line]

Specify connection information, user credentials, and SSL configuration information when SAP HANA is deployed in the SAP Cloud Platform Neo environment.

#### ⚠ Caution

This topic applies only to SAP HANA in the SAP Cloud Platform Neo environment. For information about connecting to the SAP Cloud Platform, SAP HANA service in the Cloud Foundry environment, see [Connect to the SAP HANA Service via JDBC WebSockets \[Command Line\]](#) [page 56].

When SAP HANA is in the cloud, the agent initiates all communication. The agent polls the server to see if there are any messages for the agent to act upon.

## Prerequisites

- The Data Provisioning delivery unit must be imported to the SAP HANA system.
- The Agent Admin HANA User must have the following roles or privileges:

Table 7: Roles and Privileges

Action	Role or Privilege
Connect to SAP HANA	<ul style="list-style-type: none"><li>◦ Application privilege: <code>sap.hana.im.dp.admin::Administrator</code></li><li>◦ System privilege: AGENT ADMIN</li><li>◦ System privilege: ADAPTER ADMIN</li></ul>
Create HANA User for Agent Messaging (Optional)	<ul style="list-style-type: none"><li>◦ System privilege: USER ADMIN</li><li>◦ Object privilege: EXECUTE on <code>GRANT_APPLICATION_PRIVILEGE</code></li></ul>

#### i Note

These privileges are required only when you want to create the HANA User for Agent Messaging as part of the configuration process within the agent configuration tool.

- The HANA User for Agent Messaging must have the following roles or privileges:

Table 8: Roles and Privileges

Action	Role or Privilege
Messaging between the agent and SAP HANA	Application privilege: <code>sap.hana.im.dp.proxy::AgentMessaging</code>

### → Tip

If the Agent Admin HANA User has been granted the privileges indicated in the “Roles and Privileges” table, it can create the HANA User for Agent Messaging during the configuration process. The configuration tool creates the HANA User for Agent Messaging as a technical user with the no expiration period for the password.

### i Note

In general, the password for a new SAP HANA user expires according to the SAP HANA password policy settings, the default for which is 182 days. To avoid agent disruptions in a production scenario, treat a new HANA User for Agent Messaging as a technical user and ensure that its password does not expire.

For more information about configuring the password policy for a technical user in SAP HANA, see the *SAP HANA Security Guide*.

## Procedure

1. Start the command-line agent configuration tool.
2. Choose [SAP HANA Connection](#).
3. Choose [Connect to SAP HANA on Cloud \(HTTP/HTTPS\)](#).
4. Specify whether to use HTTPS when connecting to SAP HANA.

### i Note

If the agent framework keystore does not already have the certificates for the SAP HANA server, the configuration tool automatically downloads and imports them during configuration.

5. Specify the hostname, port, and Agent Admin HANA User credentials for SAP HANA as prompted.  
The hostname should include the instance name. For example,  
`<your_instance_name>.hana.ondemand.com`.
6. If there is a firewall between SAP HANA and the agent host, specify any required proxy information as prompted.
7. Specify the credentials for the HANA User for Agent Messaging.  
The HANA User for Agent Messaging is used only for messaging between the agent and SAP HANA, and must be different from the Agent Admin HANA User used to connect to SAP HANA.
8. Specify whether the HANA User for Agent Messaging is an existing user.
  - Enter **true** if the user already exists.
  - Enter **false** if you want the configuration tool to create a user with the specified credentials.

#### → Tip

Generally, you create this user only during the initial configuration of an agent instance. If you are modifying the configuration of an existing agent instance, you usually do not need to create a user.

## Results

The configuration tool creates the HANA User for Agent Messaging, if applicable, and connects to the SAP HANA server.

## Related Information

[Password Policy Configuration Options \(SAP HANA Administration Guide\)](#)

[Download and Deploy the Data Provisioning Delivery Unit \[page 33\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

## 2.5.1.6 Manage the Agent Service [Command Line]

Use the command-line configuration tool to stop or start the Data Provisioning Agent service.

## Procedure

1. Start the command-line agent configuration tool.
2. Select **2** to enter the *Start or Stop Agent* menu.
3. Select **1** to start the agent or **2** to stop the agent.

## Results

The configuration tool indicates whether the agent service is running and the listening port in use by the agent.

## Next Steps

On Windows, you can also manage the agent service from the standard Windows Services tool. The name of the service is *SAP\_HANA\_SDI\_Agent\_Service\_Daemon\_<instance\_name>*.

On Linux, you can also manage the agent with a shell script. The shell script is located at `<DPAgent_root>/bin/dpagent_servicedaemon.sh` and supports the following commands:

- `./dpagent_servicedaemon.sh start`
- `./dpagent_servicedaemon.sh stop`

## Related Information

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

### 2.5.1.7 Register the Agent with SAP HANA [Command Line]

Before you can use adapters deployed on the Data Provisioning Agent, you must register the agent with SAP HANA.

## Prerequisites

- The Agent Admin HANA User must have the following roles or privileges:

Table 9: Roles and Privileges

Action	Role or Privilege
Register adapter	System privilege: AGENT ADMIN

- For SAP HANA on Cloud, the Agent XS HANA User must have the following roles or privileges:

Table 10: Roles and Privileges

Action	Role or Privilege
Register adapter	System privilege: AGENT ADMIN
Messaging between the agent and SAP HANA on Cloud	Application privilege: <code>sap.hana.im.dp.proxy::AgentMessaging</code>

## Procedure

1. Start the command-line agent configuration tool and connect to SAP HANA.
2. Select **6** to enter the *Agent Registration* menu.
3. Select **1** to register the agent.

4. Specify the agent connection information as prompted.

#### Caution

When you are asked for input entry for an option, you cannot cancel or return to the previous menu. To abort the operation without saving, you must press `Ctrl` + `C` to terminate the configuration tool.

- If SAP HANA is not in the cloud, specify the agent name and hostname.  
Ensure that the SAP HANA server can communicate with the agent host. Depending on the network configuration, you may need to qualify the agent hostname fully.  
Ensure that your firewall settings allow the connection from the SAP HANA server to the agent host on the listener port. By default, the listener is port 5050.
- If SAP HANA is in the cloud, specify the agent name.  
When SAP HANA is in the cloud, the agent service restarts to complete the registration process.

5. Press `Enter` to continue.

## Results

The agent is registered with SAP HANA. If SAP HANA is in the cloud, the agent service automatically restarts.

## Next Steps

To unregister the agent, select **2** in the [Agent Registration](#) menu.

#### Caution

Unregistering the agent from the SAP HANA server performs a cascade drop of the agent. As a result, any remote subscriptions that use the agent are also deleted, even if they are active.

## Related Information

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)



## 2.5.1.8 Manage the HANA User for Agent Messaging Credentials [Command Line]

If the password for the HANA User for Agent Messaging has changed or expired, you must update the credentials in the agent secure storage.

### Context

To set the new credentials in the agent secure storage, use the agent configuration tool in command-line interactive mode.

### Procedure

1. At the command line, navigate to `<DPAgent_root>/bin`.
2. Execute one of the following commands using the `--setSecureProperty` parameter:  
  
On Windows, `agentcli.bat --setSecureProperty`  
  
On Linux, `./agentcli.sh --setSecureProperty`
3. If you want to use a different HANA User for Agent Messaging, choose [Set HANA XS Username](#) and enter the new username as prompted.
4. Choose [Set HANA XS Password](#) and enter the new password as prompted.
5. Restart the Data Provisioning Agent.

#### Caution

When the agent restarts, any real-time subscriptions configured on the agent are terminated and must be reconfigured.

### Related Information

[Manage the Agent Service \[Command Line\] \[page 64\]](#)

## 2.5.1.9 Store Source Database Credentials in Data Provisioning Agent [Command Line]

Store source database access credentials in the Data Provisioning Agent secure storage using batch mode.

### Context

If you don't want to store credentials in SAP HANA, you can store them in the Data Provisioning Agent secure storage.

Entering credentials in the Data Provisioning Agent requires three components: remote source name, user name and password. This method of storing credentials also gives you more management flexibility by allowing you to edit and delete whenever you want.

### Procedure

1. Start the command-line agent configuration tool.
2. Select **4** to enter the *Remote Source Credentials* menu.
3. Select **2** to add credentials.
4. Enter the remote source name, user name, and password (and confirmation), and press Enter.

### Results

You can now access these credentials to connect to a remote source through the *Use Agent Stored Credential* remote source configuration parameter for your adapter. You can also use this editor to view, delete, and edit credentials.

### Related Information

[SAP HANA Remote Source Configuration \[page 444\]](#)

[IBM DB2 Mainframe Remote Source Configuration \[page 286\]](#)

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

## 2.5.2 Configuring the Agent in Command Line Batch Mode

Use the command-line configuration tool to connect to the SAP HANA server and configure the Data Provisioning Agent and adapters. For example, you can use the configuration tool to view the agent and adapter statuses and versions, manage custom and SAP-delivered adapters, and modify keystore paths.

### → Tip

Combine sequences of individual batch commands into scripts for tasks such as silent configuration with no user interaction or automated configuration.

#### [Execute Single Configuration Commands \[page 70\]](#)

Execute single commands to perform individual configuration tasks, or automate agent configuration by grouping multiple commands into a script.

#### [Supported Configuration Functions \[Batch\] \[page 71\]](#)

Perform configuration tasks by specifying a supported batch mode function.

#### [Connecting to SAP HANA \[Batch\] \[page 73\]](#)

Connect the Data Provisioning Agent to SAP HANA in batch mode by specifying parameters that depend on your scenario.

#### [Manage the Agent XS HANA User Credentials \[Batch\] \[page 81\]](#)

If the Agent XS HANA User password has changed or expired, you may need to update the credentials in the agent's secure storage.

#### [Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 82\]](#)

Store source database access credentials in the Data Provisioning Agent secure storage using batch mode.

**Parent topic:** [Configure the Data Provisioning Agent \[page 49\]](#)

## Related Information

[Configuring the Agent in Command-Line Interactive Mode \[page 50\]](#)

[Configuring the Agent in Graphical Mode \[Deprecated\] \[page 83\]](#)

[Managing Agent Groups \[page 94\]](#)

[Manage Agents from the Data Provisioning Agent Monitor \[page 103\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

[Agent Runtime Options \[page 108\]](#)

[Replicating an Agent Configuration to Another Host \[page 110\]](#)

## 2.5.2.1 Execute Single Configuration Commands

Execute single commands to perform individual configuration tasks, or automate agent configuration by grouping multiple commands into a script.

### Prerequisites

The command-line agent configuration tool requires the `DPA_INSTANCE` environment variable to be set to the installation root location (`<DPAgent_root>`).

For example, on Windows:

```
set DPA_INSTANCE=C:\usr\sap\dataprovagent
```

On Linux:

```
export DPA_INSTANCE=/usr/sap/dataprovagent
```

#### ⚠ Caution

Multiple instances of the Data Provisioning Agent may be installed on a single Linux host. Be sure that you set `DPA_INSTANCE` to the instance that you want to modify before starting the configuration tool. If you do not set the environment variable correctly, you may unintentionally modify the configuration of a different agent instance.

### Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Execute the command using the `--configAgent` parameter.  
Specify the function to perform with the `--function <function>` parameter.

On Windows, `agentcli.bat --configAgent --function <function> [ <additional_parameters> ]`

On Linux, `./agentcli.sh --configAgent --function <function> [ <additional_parameters> ]`

### Results

The command executes without extra input.

## 2.5.2.2 Supported Configuration Functions [Batch]

Perform configuration tasks by specifying a supported batch mode function.

Table 11: Supported Functions

Function	Description	Parameters and Notes
adapterStatus	Displays the status of adapters on the agent instance	<b>! Restriction</b> Connect the configuration tool to SAP HANA before using this function.
adapterVersions	Displays the version of adapters on the agent instance	(Optional) <code>--adapter.name &lt;adapter_name&gt;</code> <b>i Note</b> <code>&lt;adapter_name&gt;</code> must match the name displayed by <code>adapterStatus</code> . If you do not specify the <code>--adapter.name</code> parameter, all adapter versions display.
agentComponentVersions	Displays the version for all components of the agent instance	
agentPreferences	Sets adapter framework preferences	<code>--D&lt;name&gt;=&lt;value&gt;</code> For preference details, see <a href="#">Agent Adapter Framework Preferences [page 104]</a>
agentStatus	Displays the status of the agent instance	
agentVersion	Displays the version of the agent instance	
configureAdaptersKeystore	Configures the SSL keystore used by adapters on the agent instance	
configureAdaptersTruststore	Configures the SSL truststore used by adapters on the agent instance	
configureFrameworkKeystore	Configures the SSL keystore used by the agent framework	<b>i Note</b> If you do not specify the <code>-Dframework.keystore.key.password</code> parameter, the keystore password is used for both the keystore and individual keys. This value is checked only if a key password was specified during key generation in the <code>keytool</code> utility.
connectHanaViaHTTP	Connects to the SAP HANA server using HTTP or HTTPS	For parameter details, see <a href="#">Connecting to SAP HANA [Batch] [page 73]</a>
connectHanaViaTCP	Connects to an on-premise SAP HANA server using TCP	For parameter details, see <a href="#">Connecting to SAP HANA [Batch] [page 73]</a>

Function	Description	Parameters and Notes
deployAdapter	Deploys a custom adapter on the agent instance	--adapter.filepath <path_to_jar_file>
pingAgent	Pings the agent instance to verify connectivity	
registerAdapter	Registers an adapter with the SAP HANA server	--adapter.name <adapter_name> <div> <p><b>i Note</b></p> <p>&lt;adapter_name&gt; must match the name displayed by adapterStatus.</p> </div> <div> <p><b>! Restriction</b></p> <p>Connect the configuration tool to SAP HANA before using this function.</p> </div>
registerAgent	Registers the agent instance with the SAP HANA server	-Dagent.name=<agent_name> For TCP only: -Dagent.hostname=<hostname> <div> <p><b>! Restriction</b></p> <p>Connect the configuration tool to SAP HANA before using this function.</p> </div>
showAgentPreferences	Displays agent framework preferences	
showKeystores	Displays all keystores for the agent instance	
startAgent	Starts the agent service	
stopAgent	Stops the agent service	
undeployAdapter	Undeploys a custom adapter from the agent instance	--adapter.name <adapter_name> <div> <p><b>i Note</b></p> <p>&lt;adapter_name&gt; must match the name displayed by adapterStatus.</p> </div>
unregisterAdapter	Unregisters an adapter from the SAP HANA server	--adapter.name <adapter_name> <div> <p><b>i Note</b></p> <p>&lt;adapter_name&gt; must match the name displayed by adapterStatus.</p> </div> <div> <p><b>! Restriction</b></p> <p>Connect the configuration tool to SAP HANA before using this function.</p> </div>

Function	Description	Parameters and Notes
unregisterAgent	Unregisters the agent instance from the SAP HANA server	<div> <div>! Restriction</div> <div>Connect the configuration tool to SAP HANA before using this function.</div> </div>

## Accessing Help for Batch Functions

The configuration tool provides help for each supported command and function, including required and optional parameters and usage information. To view the help for a command or function, append `--help` to the command.

For example, to view the help for the `connectHanaViaHttp` configuration function:

```
agentcli.bat --configAgent --function connectHanaViaHttp --help
```

### 2.5.2.3 Connecting to SAP HANA [Batch]

Connect the Data Provisioning Agent to SAP HANA in batch mode by specifying parameters that depend on your scenario.

To connect to the SAP HANA server in batch mode, use the `connectHanaViaTcp` or `connectHanaViaHTTP` function and specify any additional parameters relevant to your system landscape.

## Common Connection Parameters

Parameters related to the SAP HANA server and administrator user are required in all connection scenarios.

Table 12: Required Parameters

Parameter	Description
<code>-Dhana.server=&lt;hostname&gt;</code>	Hostname of the SAP HANA server
<code>-Dhana.port=&lt;port&gt;</code>	Port used to connect to the SAP HANA server
<code>-Dhana.admin.username=&lt;username&gt;</code>	Name of the Agent Admin HANA User that connects to the SAP HANA server
<code>-Dhana.admin.password=&lt;password_path&gt;</code>	Path to the file that contains the Agent Admin HANA User password

### → Tip

To determine the correct port number when SAP HANA is deployed in a multi-database configuration, execute the following SQL statement:

```
SELECT DATABASE_NAME, SERVICE_NAME, PORT, SQL_PORT, (PORT + 2) HTTP_PORT
FROM SYS_DATABASES.M_SERVICES WHERE DATABASE_NAME='<DBNAME>' and
((SERVICE_NAME='indexserver' and COORDINATOR_TYPE= 'MASTER') or
(SERVICE_NAME='xsengine'))
```

## Related Information

[Connecting to SAP HANA On-premise \[Batch\] \[page 74\]](#)

[Connect to SAP HANA via JDBC WebSockets or Direct SQL \[Batch\] \[page 75\]](#)

[Connect to SAP HANA in the SAP Cloud Platform Neo Environment \[Batch\] \[page 79\]](#)

### 2.5.2.3.1 Connecting to SAP HANA On-premise [Batch]

Connect to SAP HANA on-premise with the `connectHanaViaTcp` function of the command-line configuration tool. In addition to the common parameters, additional connection parameters are required.

## Prerequisites

- The Agent Admin HANA User must have the following roles or privileges:

Table 13: Roles and Privileges

Action	Role or Privilege
Connect to SAP HANA	System privilege: AGENT ADMIN
	System privilege: ADAPTER ADMIN

- If the SAP HANA server is configured for SSL, the agent host must already be prepared for SSL.



## More Connection Parameters

Table 14: More Parameters

Parameter	Description
<code>-Dframework.enableSSL=&lt;value&gt;</code>	Specifies whether the connection uses SSL encryption Allowed values: <b>true</b> or <b>false</b>

### Example: Connect to SAP HANA On-premise with TCP

```
agentcli.bat --configAgent --function connectHanaViaTcp  
-Dframework.enableSSL=false -Dhana.server=<hostname> -Dhana.port=<port>  
-Dhana.admin.username=<username> -Dhana.admin.password=<password_path>
```

### Example: Connect to SAP HANA On-premise with TCP and SSL

```
agentcli.bat --configAgent --function connectHanaViaTcp  
-Dframework.enableSSL=true -Dhana.server=<hostname> -Dhana.port=<port>  
-Dhana.admin.username=<username> -Dhana.admin.password=<password_path>
```

#### **i** Note

The agent host must already be configured for SSL.

## Related Information

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

### 2.5.2.3.2 Connect to SAP HANA via JDBC WebSockets or Direct SQL [Batch]

Connect to SAP HANA via JDBC WebSockets or Direct SQL with the `connectHanaViaJdbc` function of the command-line configuration tool. In addition to the required parameters, additional optional connection parameters may be needed for your configuration.

## Prerequisites

- The Data Provisioning delivery unit must be imported to the SAP HANA system.
- The Agent Admin HANA User must have the following roles or privileges:

Table 15: Roles and Privileges

Action	Role or Privilege
Connect to SAP HANA	<ul style="list-style-type: none"><li>◦ System privilege: AGENT ADMIN</li><li>◦ System privilege: ADAPTER ADMIN</li></ul>
Create the HANA User for Agent Messaging (Optional)	<ul style="list-style-type: none"><li>◦ System privilege: USER ADMIN</li></ul>

**i Note**

These privileges are required only when you want to create the HANA User for Agent Messaging as part of the configuration process within the agent configuration tool.

- You have an SAP HANA User for Agent Messaging for messaging between the agent and SAP HANA. To create such a user manually:
  1. Create the agent user (for example, AGTUSR) with a non-expiring password.
  2. GRANT AGENT MESSAGING ON AGENT "<your\_agent\_name>" TO AGTUSR;

### → Tip

If the Agent Admin HANA User has been granted the privileges indicated in the "Roles and Privileges" table, it can create the HANA User for Agent Messaging during the configuration process. The configuration tool creates the HANA User for Agent Messaging as a technical user with the no expiration period for the password.

### i Note

In general, the password for a new SAP HANA user expires according to the SAP HANA password policy settings, the default for which is 182 days. To avoid agent disruptions in a production scenario, treat a new HANA User for Agent Messaging as a technical user and ensure that its password does not expire.

For more information about configuring the password policy for a technical user in SAP HANA, see the *SAP HANA Security Guide*.

## Required Connection Parameters

Table 16: Required Parameters

Parameter	Description
-Dhana.admin.username=<username>	Specifies the name of the Agent Admin HANA User that connects to the SAP HANA server

Parameter	Description
- Dhana.admin.password=<password_path> >	Specifies the path to the file that contains the password for the Agent Admin HANA User
-Dhana.xs.username=<username>	Specifies the name of the HANA User for Agent Messaging
- Dhana.xs.password=<path_to_password> >	Specifies the path to the file that contains the password for the HANA User for Agent Messaging

## Additional Connection Parameters

Table 17: Optional Parameters

Parameter	Description
-Djdbc.encrypt=<value>	Specifies whether to use an encrypted JDBC connection  Allowed values: <b>true</b> or <b>false</b>  Default: <b>true</b>
-Djdbc.useWebsocketURL=<value>	Specifies whether to use JDBC WebSockets or Direct SQL  Allowed values: <b>true</b> or <b>false</b>  Default: <b>true</b>  To use Direct SQL to connect to SAP HANA, specify <b>false</b> .
-Djdbc.websocketURL=<value>	Specifies the URL to use for the JDBC WebSockets connection  For example, /service/<service_instance_id>
-Djdbc.host=<value>	Specifies the JDBC WebSocket host  For Direct SQL, specifies the hostname of the SAP HANA server.
-Djdbc.port=<value>	Specifies the JDBC WebSocket port  For Direct SQL, specifies the port used to connect to the SAP HANA server.
-Djdbc.useProxy=<value>	Specifies whether to use a proxy for the JDBC WebSockets or Direct SQL connection  Allowed values: <b>true</b> or <b>false</b>  Default: <b>false</b>

Parameter	Description
<code>-Djdbc.proxyHttp=&lt;value&gt;</code>	<p>Specifies whether the proxy uses HTTP or SOCKS</p> <p>Allowed values: <b>true</b> or <b>false</b></p> <p>Default: <b>false</b></p> <p>To use an HTTP proxy, specify <b>true</b>.</p> <div> <b>! Restriction</b>  SOCKS proxies are not supported when using JDBC WebSockets to connect to SAP HANA. </div>
<code>-Djdbc.proxyHost=&lt;value&gt;</code>	Specifies the host name of the HTTP or SOCKS proxy
<code>-Djdbc.proxyPort=&lt;value&gt;</code>	Specifies the port used by the HTTP or SOCKS proxy
<code>-Djdbc.useProxyAuth=&lt;value&gt;</code>	<p>Specifies whether the proxy requires authentication</p> <p>Allowed values: <b>true</b> or <b>false</b></p> <p>Default: <b>false</b></p>
<code>-Djdbc.proxyUserName=&lt;value&gt;</code>	Specifies the user name to use for proxy authentication
<code>-Djdbc.proxyPassword=&lt;value&gt;</code>	Specifies the path to the file that contains the password used for proxy authentication
<code>--hana.xs.createUser &lt;value&gt;</code>	<p>Specifies whether or not the configuration program should create an Agent XS HANA User</p> <p>To use an existing Agent XS HANA User, specify <b>false</b>.</p>

## Example: Connect to SAP HANA via JDBC WebSockets and HTTP Proxy without Authentication

```
agentcli.bat --configAgent --function connectHanaViaJdbc -
Dhana.admin.username=<username>
-Dhana.admin.password=<password_path> -Dhana.xs.username=<username>
-Dhana.xs.password=<password_path> -Djdbc.encrypt=false -
Djdbc.useWebSocketURL=true
-Djdbc.host=<hana_hostname> -Djdbc.port=<hana_sql_port>
-Djdbc.useProxy=true -Djdbc.proxyHttp=true -Djdbc.proxyHost=<http_proxy_hostname>
-Djdbc.proxyPort=<http_proxy_port> -Djdbc.useProxyAuth=false
```

## Example: Connect to SAP HANA via Direct SQL and SOCKS Proxy with Authentication

```
agentcli.bat --configAgent --function connectHanaViaJdbc -
Dhana.admin.username=<username>
```

```
-Dhana.admin.password=<password_path> -Dhana.xs.username=<username>
-Dhana.xs.password=<password_path> -Djdbc.encrypt=false -
Djdbc.useWebsocketURL=false
-Djdbc.host=<hana_hostname> -Djdbc.port=<hana_sql_port>
-Djdbc.useProxy=true -Djdbc.proxyHttp=false -
Djdbc.proxyHost=<socks_proxy_hostname>
-Djdbc.proxyPort=<socks_proxy_port> -Djdbc.useProxyAuth=true
-Djdbc.proxyUserName=<username> -Djdbc.proxyPassword=<password_path>
```

### 2.5.2.3.3 Connect to SAP HANA in the SAP Cloud Platform Neo Environment [Batch]

Connect to SAP HANA on cloud with the `connectHanaViaHttp` function of the command-line configuration tool. In addition to the common parameters, extra connection parameters are required.

#### Prerequisites

- The Data Provisioning delivery unit must be imported to the SAP HANA system.
- The Agent Admin HANA User must have the following roles or privileges:

Table 18: Roles and Privileges

Action	Role or Privilege
Connect to SAP HANA	<ul style="list-style-type: none"> <li>◦ Application privilege: <code>sap.hana.im.dp.admin::Administrator</code></li> <li>◦ System privilege: <code>AGENT ADMIN</code></li> <li>◦ System privilege: <code>ADAPTER ADMIN</code></li> </ul>
Create Agent XS HANA User	<ul style="list-style-type: none"> <li>◦ System privilege: <code>USER ADMIN</code></li> <li>◦ Object privilege: <code>EXECUTE on GRANT_APPLICATION_PRIVILEGE</code></li> </ul>

- The Agent XS HANA User must have the following roles or privileges:

Table 19: Roles and Privileges

Action	Role or Privilege
Messaging between the agent and SAP HANA on Cloud	<ul style="list-style-type: none"> <li>◦ Application privilege: <code>sap.hana.im.dp.proxy::AgentMessaging</code></li> </ul>

#### → Tip

The configuration tool can create the Agent XS HANA User during the agent configuration process as long as the Agent Admin HANA User has been granted the correct privileges.

## Extra Connection Parameters

Table 20: Extra Parameters

Parameter	Description
<code>-Dhana.useSSL=&lt;value&gt;</code>	Specifies whether the connection uses SSL encryption Allowed values: <b>true</b> or <b>false</b>
<code>-Dcloud.useProxy=&lt;value&gt;</code>	Specifies whether a proxy is required for the connection Allowed values: <b>true</b> or <b>false</b>
<code>-Dcloud.useProxyAuth=&lt;value&gt;</code>	Specifies whether proxy authorization is required Allowed values: <b>true</b> or <b>false</b>
<code>-Dhana.xs.username=&lt;username&gt;</code>	Name of the Agent XS HANA User for messaging between the Data Provisioning Agent and the SAP HANA server
<code>-Dhana.xs.password=&lt;path_to_password&gt;</code>	Path to the file that contains the Agent XS HANA User password
<code>--hana.xs.createUser &lt;value&gt;</code>	Specifies whether or not the configuration program should create an Agent XS HANA User To use an existing Agent XS HANA User, specify <b>false</b> .

### Example: Connect to SAP HANA on Cloud with HTTP

```
agentcli.bat --configAgent --function connectHanaViaHttp
-Dhana.useSSL=false -Dhana.server=<hostname> -Dhana.port=<port>
-Dhana.admin.username=<admin_username> -
Dhana.admin.password=<admin_password_path>
-Dhana.xs.username=<xs_username> -Dhana.xs.password=<xs_password_path> --
hana.xs.createUser false
```

### Example: Connect to SAP HANA on Cloud with HTTP and Create Agent XS HANA User

```
agentcli.bat --configAgent --function connectHanaViaHttp
-Dhana.useSSL=false -Dhana.server=<hostname> -Dhana.port=<port>
-Dhana.admin.username=<admin_username> -
Dhana.admin.password=<admin_password_path>
-Dhana.xs.username=<xs_username> -Dhana.xs.password=<xs_password_path> --
hana.xs.createUser true
```

## Example: Connect to SAP HANA on Cloud with HTTPS

```
agentcli.bat --configAgent --function connectHanaViaHttp
-Dhana.useSSL=true -Dhana.server=<hostname> -Dhana.port=<port>
-Dhana.admin.username=<admin_username> -
Dhana.admin.password=<admin_password_path>
-Dhana.xs.username=<xs_username> -Dhana.xs.password=<xs_password_path> --
hana.xs.createUser false
```

## Example: Connect to SAP HANA on Cloud with HTTPS and Proxy

```
agentcli.bat --configAgent --function connectHanaViaHttp
-Dhana.useSSL=true -Dhana.server=<hostname> -Dhana.port=<port>
-Dhana.admin.username=<admin_username> -
Dhana.admin.password=<admin_password_path>
-Dhana.xs.username=<xs_username> -Dhana.xs.password=<xs_password_path> --
hana.xs.createUser false
-Dcloud.useProxyAuth=false -Dcloud.useProxy=true -DproxyHost=<proxy_hostname> -
DproxyPort=<proxy_port>
```

### 2.5.2.4 Manage the Agent XS HANA User Credentials [Batch]

If the Agent XS HANA User password has changed or expired, you may need to update the credentials in the agent's secure storage.

#### Context

Use the agent configuration tool in command-line interactive mode to set the new credentials in the agent's secure storage.

#### Procedure

1. At the command line, navigate to <DPAgent\_root>/bin.
2. Execute the commands using the --setSecureProperty parameter.
  - a. If you want to use a different Agent XS HANA User, specify the setHanaXsUsername function.

On Windows, **agentcli.bat --setSecureProperty --function setHanaXsUsername --file <username\_file\_path>**

On Linux, **./agentcli.sh --setSecureProperty --function setHanaXsUsername --file <username\_file\_path>**

- b. Specify the `setHanaXsPassword` to set the new password.

On Windows, `agentcli.bat --setSecureProperty --function setHanaXsPassword --file <password_file_path>`

On Linux, `./agentcli.sh --setSecureProperty --function setHanaXsPassword --file <password_file_path>`

3. Restart the Data Provisioning Agent.

#### ⚠ Caution

When the agent restarts, any real-time subscriptions configured on the agent are terminated and you may need to configure the real-time subscriptions again.

## 2.5.2.5 Store Source Database Credentials in Data Provisioning Agent [Batch]

Store source database access credentials in the Data Provisioning Agent secure storage using batch mode.

### Context

If you don't want to store credentials in SAP HANA, you can store them in the Data Provisioning Agent secure storage.

Entering credentials in the Data Provisioning Agent requires three components: remote source name, user name and password. This method of storing credentials also gives you more management flexibility by allowing you to edit and delete whenever you want.

### Procedure

1. List all remote credentials stored in Data Provisioning Agent.

```
bin/agentcli.sh --configAgent --function listCredentials
```

2. Add a new remote credential.

```
bin/agentcli.sh --configAgent --function addCredentials
-Dadd.remoteCredential.remoteSourceName=<Remote Source Name>
-Dadd.remoteCredential.username=<User Name>
-Dadd.remoteCredential.password=<Password File>
```

3. Edit a new remote credential.

```
bin/agentcli.sh --configAgent --function editCredentials
-Dedit.originalRemoteCredential.remoteSourceName=<Original Remote Source Name>
-Dedit.originalRemoteCredential.username=<Original User Name>
-Dedit.remoteCredential.remoteSourceName=<New Remote Source Name>
```



```
-Dedit.remoteCredential.username=<New User Name>
-Dedit.remoteCredential.password=<Password file including New Password>
```

4. Delete a credential.

```
bin/agentcli.sh --configAgent --function delCredentials
-Ddel.remoteCredential.remoteSourceName=<Remote Source Name>
-Ddel.remoteCredential.username=<User Name>
```

## Results

You can now access these credentials to connect to a remote source through the *Use Agent Stored Credential* remote source configuration parameter for your adapter.

## Related Information

[SAP HANA Remote Source Configuration \[page 444\]](#)

[IBM DB2 Mainframe Remote Source Configuration \[page 286\]](#)

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

## 2.5.3 Configuring the Agent in Graphical Mode [Deprecated]

Connect to the SAP HANA server and configure the agent and adapters with the Data Provisioning Agent Configuration tool.

### ⚠ Caution

The graphical interface for the Data Provisioning Agent Configuration tool is deprecated.

For the latest supported functionality, use the command-line interface in interactive or batch mode. For more information, see:

- [Configuring the Agent in Command-Line Interactive Mode \[page 50\]](#)
- [Configuring the Agent in Command Line Batch Mode \[page 69\]](#)

The configuration tool allows you to perform the following administrative tasks:

#### [Start and Connect the Configuration Tool \[page 84\]](#)

Before you can use the configuration tool to register the agent or deploy and register adapters, you must connect to the SAP HANA server.

#### [Manage the Agent Service \[page 90\]](#)

Use the configuration tool to stop or start the agent service.

#### [Register the Agent with SAP HANA \[page 91\]](#)

Before you can use adapters deployed on the Data Provisioning Agent, you must register the agent with SAP HANA.

[Reconfigure the Java Runtime Environment \[page 92\]](#)

The SAP JVM is bundled with the Data Provisioning Agent and used as the default Java Runtime Environment. You can choose to update the version of the SAP JVM used by an installed agent or replace it with a custom Java Runtime Environment.

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

Store source database access credentials in the Data Provisioning Agent secure storage using the DP Agent Configuration Tool.

**Parent topic:** [Configure the Data Provisioning Agent \[page 49\]](#)

## Related Information

[Configuring the Agent in Command-Line Interactive Mode \[page 50\]](#)

[Configuring the Agent in Command Line Batch Mode \[page 69\]](#)

[Managing Agent Groups \[page 94\]](#)

[Manage Agents from the Data Provisioning Agent Monitor \[page 103\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

[Agent Runtime Options \[page 108\]](#)

[Replicating an Agent Configuration to Another Host \[page 110\]](#)

### 2.5.3.1 Start and Connect the Configuration Tool

Before you can use the configuration tool to register the agent or deploy and register adapters, you must connect to the SAP HANA server.

The steps required to connect the Data Provisioning Agent to the SAP HANA server vary depending on whether the SAP HANA server is installed on-premise or in the cloud, and whether it is configured for secure SSL connections.

[Connect to SAP HANA On-premise \[page 85\]](#)

Specify connection information and user credentials when the SAP HANA system is located on-premise and does not require a secure SSL connection.

[Connect to SAP HANA on Cloud \[page 86\]](#)

Specify connection information, user credentials, and SSL configuration information when the SAP HANA system is located in the cloud.

## Related Information

## 2.5.3.1.1 Connect to SAP HANA On-premise

Specify connection information and user credentials when the SAP HANA system is located on-premise and does not require a secure SSL connection.

### Prerequisites

The Agent Admin HANA User must have the following roles or privileges:

Table 21: Roles and Privileges

Action	Role or Privilege
Connect to SAP HANA	System privilege: AGENT ADMIN
	System privilege: ADAPTER ADMIN

### Procedure

1. Navigate to the `<DPAgent_root>/configTool` directory.
2. Start the configuration tool.
  - On Windows, run `dpagentconfigtool.exe`.
  - On Linux, run `./dpagentconfigtool`.

#### i Note

Start the configuration tool using the Data Provisioning Agent installation owner. The installation owner is the same user that is used to start the agent service.

3. Connect to the SAP HANA server.
  - a. Click [Connect to HANA](#).
  - b. Specify the hostname, port, and Agent Admin HANA User credentials for the SAP HANA server.

#### → Tip

To determine the correct port number when SAP HANA is deployed in a multi-database configuration, execute the following SQL statement:

```
SELECT DATABASE_NAME, SERVICE_NAME, PORT, SQL_PORT, (PORT + 2) HTTP_PORT
FROM SYS_DATABASES.M_SERVICES WHERE DATABASE_NAME='<DBNAME>' and
((SERVICE_NAME='indexserver' and COORDINATOR_TYPE= 'MASTER') or
(SERVICE_NAME='xsengine'))
```

## Related Information

[Default Installation Paths \[page 47\]](#)

[Assign Roles and Privileges \[page 25\]](#)

### 2.5.3.1.2 Connect to SAP HANA on Cloud

Specify connection information, user credentials, and SSL configuration information when the SAP HANA system is located in the cloud.

When SAP HANA is in the cloud, the agent initiates all communication. The agent polls the server to see if there are any messages for the agent to act upon.

## Prerequisites

- The Data Provisioning delivery unit must be imported to the SAP HANA system.
- The Agent Admin HANA User must have the following roles or privileges.

Table 22: Roles and Privileges

Action	Role or Privilege
Connect to SAP HANA	<ul style="list-style-type: none"><li>◦ Application privilege: <code>sap.hana.im.dp.admin::Administrator</code></li><li>◦ System privilege: AGENT ADMIN</li><li>◦ System privilege: ADAPTER ADMIN</li></ul>
Create Agent XS HANA User	<ul style="list-style-type: none"><li>◦ System privilege: USER ADMIN</li><li>◦ Object privilege: EXECUTE on <code>GRANT_APPLICATION_PRIVILEGE</code></li></ul>

- The Agent XS HANA User must have the following roles or privileges.

Table 23: Roles and Privileges

Action	Role or Privilege
Messaging between the agent and SAP HANA on Cloud	<ul style="list-style-type: none"> <li>Application privilege: <code>sap.hana.im.dp.proxy::AgentMessaging</code></li> </ul>

#### Note

The password for a new SAP HANA user expires according to the SAP HANA system's password policy settings, the default for which is 182 days. To avoid agent disruptions in a production scenario, we recommend that the Agent XS HANA User is a technical user with a password that does not expire.

For more information about configuring the password policy for a technical user in SAP HANA, see the *SAP HANA Security Guide*.

#### → Tip

The configuration tool can create the Agent XS HANA User during the agent configuration process as long as the Agent Admin HANA User has been granted the correct privileges. The configuration tool creates the Agent XS HANA User as a technical user with the default maximum password lifetime for the SAP HANA system.

## Procedure

1. Import the Data Provisioning Delivery Unit.

For complete information, see *Download and Deploy the Data Provisioning Delivery Unit*.

2. Create or grant privileges to the Agent Admin HANA User and Agent XS HANA User.

- a. Configure the Agent Admin HANA User.

This user connects to the SAP HANA system via the configuration tool to perform administrative tasks, such as registering agents and registering adapters.

Create a user or grant an existing user the following privileges:

- Application privilege `sap.hana.im.dp.admin::Administrator`
- System privilege `AGENT ADMIN`
- System privilege `ADAPTER ADMIN`

- b. Configure the Agent XS HANA User.

The Agent XS HANA User is used only for messaging between the Data Provisioning Agent and SAP HANA on Cloud. The system saves the credentials for this user in the Data Provisioning Agent's secure store for use at runtime.

#### ⚠ Caution

It is strongly recommended that this user has only the minimally required application privilege, and no additional administrative privileges.

Create a user or grant an existing user the following privilege:

- Application privilege `sap.hana.im.dp.proxy::AgentMessaging`

#### → Tip

The Data Provisioning Agent Configuration tool can create the Agent XS HANA User during the agent configuration process. If you want the configuration tool to create the user, ensure that the Agent Admin HANA User has the correct roles and privileges.

For complete information about creating users and granting permissions, see the *SAP HANA Administration Guide*.

3. Connect to the SAP HANA server.
  - a. Click [Connect to HANA](#).
  - b. Select [HANA On Cloud](#).
  - c. Select [Use HTTPS](#).

When you attempt to connect to HANA on Cloud with HTTPS for the first time, the configuration tool allows you to automatically download and import the SAP HANA server certificates into the Data Provisioning Agent keystore.

#### i Note

If you prefer not to import the server certificates by this method, you must manually download and import the certificates. For more information, see *Manually Configure SSL for HANA on Cloud*.

- d. Specify the hostname, HTTP(s) port, and Agent Admin HANA User credentials for the SAP HANA server.

The hostname should include the instance name. For example,

`<your_instance_name>.hana.ondemand.com`.

- e. If there is a firewall between the SAP HANA server and the agent, specify any required proxy information.
- f. Specify the Agent XS HANA User credentials if the user already exists.

The Agent XS HANA User is used only for messaging between the Data Provisioning Agent and the SAP HANA server, and must be different from the Agent Admin HANA User that you used to connect to the SAP HANA server.

- Choose [Create User](#) if you want the configuration tool to create a user.

#### → Tip

To create a user from the configuration tool, the Agent Admin HANA User that you use to connect to the SAP HANA system must have the correct roles and privileges.

- Choose [Update User Credentials](#) if you already specified an Agent XS HANA User and want to change the user's credentials.

4. Register the Data Provisioning Agent with SAP HANA by specifying the agent name and clicking [Register](#).

The agent service is stopped and restarted.

## Related Information

[Default Installation Paths \[page 47\]](#)

[Assign Roles and Privileges \[page 25\]](#)

[Password Policy Configuration Options \(SAP HANA Administration Guide\)](#)

[Download and Deploy the Data Provisioning Delivery Unit \[page 33\]](#)

## (Optional) Manually Configure SSL for HANA on Cloud

If you do not want to automatically download the SAP HANA server certificates the first time you attempt to connect to HANA on Cloud, you must manually download and import the certificates.

### Procedure

1. Obtain and import the SAP HANA server root certificate.
  - a. Download the SAP HANA server certificate to a location on the Data Provisioning Agent host machine.  
For complete information, see *Download the SAP HANA Server Certificate*.
  - b. Import the SAP HANA server root certificate into the agent keystore.

```
keytool -importcert -keystore cacerts -storepass <store_password> -file  
<certificate_filename>.der -noprompt
```

#### Note

You need the password for the Java `keytool` program to generate a keystore and import the SAP HANA server certificate. For the password, commands, and additional information, see the `keytool.txt` file located at `<DPAgent_root>\ssl\keytool.txt`.

#### → Tip

Change the default password for the keystore to safeguard your certificates.

2. Configure the Data Provisioning Agent for SSL.
  - a. Navigate to the `<DPAgent_root>/configTool` directory.
  - b. Start the configuration tool.
    - On Windows, run `dpagentconfigtool.exe`.
    - On Linux, run `./dpagentconfigtool`.
  - c. Click *Configure SSL*.
  - d. Enter the relative path (`ssl/cacerts`) and password for the keystore that contains the SAP HANA server certificate.

For the password, if you explicitly changed the keystore password, specify the new password here. Otherwise, leave the default password as it is.

- e. Select [Use SSL to communicate with HANA on Cloud](#) and click [Save](#).

## Related Information

[Download the SAP HANA Server Certificate \[page 41\]](#)

### 2.5.3.2 Manage the Agent Service

Use the configuration tool to stop or start the agent service.

## Procedure

1. Start the agent configuration tool.
2. Click [Start Agent](#) or [Stop Agent](#).

## Results

The configuration tool indicates whether the agent service is running and the listening port in use by the agent.

## Next Steps

On Windows, you can also manage the agent service from the standard Windows Services tool. The name of the service is [SAP\\_HANA\\_SDI\\_Agent\\_Service\\_Daemon\\_<instance\\_name>](#).

On Linux, you can also manage the agent with a shell script. The shell script is located at [<DPAgent\\_root>/bin/dpagent\\_servicedaemon.sh](#) and supports the following commands:

- `./dpagent_servicedaemon.sh start`
- `./dpagent_servicedaemon.sh stop`

## Related Information

[Start and Connect the Configuration Tool \[page 84\]](#)



## 2.5.3.3 Register the Agent with SAP HANA

Before you can use adapters deployed on the Data Provisioning Agent, you must register the agent with SAP HANA.

### Prerequisites

- The Agent Admin HANA User must have the following roles or privileges.

Table 24: Roles and Privileges

Action	Role or Privilege
Register adapter	System privilege: AGENT ADMIN

- For SAP HANA on Cloud, the Agent XS HANA User must have the following roles or privileges.

Table 25: Roles and Privileges

Action	Role or Privilege
Register adapter	System privilege: AGENT ADMIN
Messaging between the agent and SAP HANA on Cloud	Application privilege: <code>sap.hana.im.dp.proxy::AgentMessaging</code>

### Procedure

- Start the agent configuration tool and connect to the SAP HANA server.
- Click [Register Agent](#).
- Specify the agent connection information.
  - If SAP HANA is not in the cloud, specify the agent name and hostname.  
Ensure that the SAP HANA server can communicate with the agent host. Depending on the network configuration, you may need to qualify the agent hostname fully.  
Ensure that your firewall settings allow the connection from the SAP HANA server to the agent host on the listener port. By default, port 5050.
  - If SAP HANA is in the cloud, specify the agent name.  
When SAP HANA is in the cloud, the agent service is restarted to complete the registration process.
- Click [Register](#).

### Results

The agent is registered with SAP HANA. If SAP HANA is in the cloud, the agent service is automatically restarted.

## Next Steps

To unregister the agent, click [Unregister Agent](#).

### ⚠ Caution

Unregistering the agent from the SAP HANA server performs a cascade drop of the agent. As a result, any remote subscriptions that use the agent are also deleted, even if they are active.

## Related Information

[Start and Connect the Configuration Tool \[page 84\]](#)

## 2.5.3.4 Reconfigure the Java Runtime Environment

The SAP JVM is bundled with the Data Provisioning Agent and used as the default Java Runtime Environment. You can choose to update the version of the SAP JVM used by an installed agent or replace it with a custom Java Runtime Environment.

## Prerequisites

If you want to update your version of the SAP JVM, download the version of the SAP JVM that matches the operating system and processor architecture used by the Data Provisioning Agent host.

## Procedure

- Update the SAP JVM with a newer version.
  - a. Extract the downloaded .SAR file containing the latest SAP JVM to a temporary location.
  - b. Stop the Data Provisioning Agent service.
  - c. Delete or back up the entire contents of the `<DPAgent_root>/sapjvm` directory.
  - d. Copy the extracted .SAR contents from `<temp_location>/sapjvm_<version>/jre` into `<DPAgent_root>/sapjvm`.
  - e. Restart the Data Provisioning Agent service.
- Replace the SAP JVM with a custom JRE. That is, any Java runtime other than the SAP JVM.
  - a. Stop the Data Provisioning Agent service.
  - b. In a text editor, open `dpagent.ini` and replace the value of the `-vm` setting with the path to the custom JRE.

### i Note

The `-vm` setting must be specified before the `-vmargs` setting in the `dpagent.ini` file, and `-vm` and its setting must be entered on different lines. Additionally, do not use quotes around the path even if the path contains spaces.

Table 26: Example Replacement

Platform	Original Value	New Value
Windows	<code>-vm C:\usr\sap\dataprovagent\sapjvm \bin</code>	<code>-vm C:\Program Files\Java\jre7\bin</code>
Linux	<code>-vm /usr/sap/dataprovaagent/ sapjvm/lib/amd64/server</code>	<code>-vm /usr/java/jdk1.7.0_71/jre/lib/ amd64/server</code>

- c. Restart the Data Provisioning Agent service.

## Related Information

[Manage the Agent Service \[page 90\]](#)

[Software Download \[page 39\]](#)

### 2.5.3.5 Store Source Database Credentials in Data Provisioning Agent [Graphical Mode]

Store source database access credentials in the Data Provisioning Agent secure storage using the DP Agent Configuration Tool.

## Context

If you don't want to store credentials in SAP HANA, you can store them in the Data Provisioning Agent secure storage.

Entering credentials in the Data Provisioning Agent requires three components: remote source name, user name, and password. This method of storing credentials also gives you more management flexibility by allowing you to edit and delete whenever you want.

## Procedure

1. Open the Data Provisioning Agent Configuration Tool.
2. Choose ► [Configure](#) ► [Remote Source Credentials](#) ►.
3. Click [Add Credentials](#)
4. In the [Add Credentials](#) window, add the remote source name, user name, and password, and then click [OK](#).

## Results

You can now access these credentials to connect to a remote source through the [Use Agent Stored Credential](#) remote source configuration parameter for your adapter. You can also use this editor to view, delete, and edit credentials.

## Related Information

[SAP HANA Remote Source Configuration \[page 444\]](#)

[IBM DB2 Mainframe Remote Source Configuration \[page 286\]](#)

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

## 2.5.4 Managing Agent Groups

Agent grouping provides failover and load-balancing capabilities by combining individual Data Provisioning Agents installed on separate host systems.

### ! Restriction

Failover is not supported for initial and batch load requests. Restart the initial load following a failure due to agent unavailability.

### ! Restriction

Load balancing is supported only for initial loads. It is not supported for changed-data capture (CDC) operations.

## Planning considerations

Before configuring agents in a group, review the following considerations and limitations:

- For real-time replication failover, each agent in a group must be installed on a different host system.
- All agents in a group must have identical adapter configurations.
- All agents in a group must use the same communication protocol. You cannot mix on-premise agents (TCP) and cloud-based agents (HTTP) in a single group.

#### [Failover Behavior in an Agent Group \[page 95\]](#)

When an agent node in an agent group is inaccessible for longer than the configured heartbeat interval, the Data Provisioning Server chooses a new active agent within the group. It then resumes replication for any remote subscriptions active on the original agent.

#### [Load Balancing in an Agent Group \[page 96\]](#)

With multiple agents in an agent group, you can choose to have the agent for the initial loads selected randomly, selected from the list of agents in a round-robin fashion, or not load balanced.

#### [Create or Remove an Agent Group \[page 97\]](#)

You can create an agent group or remove an existing group in the *Data Provisioning Agent Monitor*.

#### [Manage Agent Nodes in an Agent Group \[page 98\]](#)

You can manage the agent nodes that belong to an agent group in the *Data Provisioning Agent Monitor*.

#### [Add Adapters to an Agent Group \[page 99\]](#)

Before you can create remote sources in an agent group, you must add adapters to the group in the SAP HANA Web-based Development Workbench.

#### [Configure Remote Sources in an Agent Group \[page 100\]](#)

To receive the benefits of failover from an agent group, you must configure your remote sources in the agent group.

**Parent topic:** [Configure the Data Provisioning Agent \[page 49\]](#)

## Related Information

[Configuring the Agent in Command-Line Interactive Mode \[page 50\]](#)

[Configuring the Agent in Command Line Batch Mode \[page 69\]](#)

[Configuring the Agent in Graphical Mode \[Deprecated\] \[page 83\]](#)

[Manage Agents from the Data Provisioning Agent Monitor \[page 103\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

[Agent Runtime Options \[page 108\]](#)

[Replicating an Agent Configuration to Another Host \[page 110\]](#)

### 2.5.4.1 Failover Behavior in an Agent Group

When an agent node in an agent group is inaccessible for longer than the configured heartbeat interval, the Data Provisioning Server chooses a new active agent within the group. It then resumes replication for any remote subscriptions active on the original agent.

Initial and batch load requests to a remote source configured on the agent group are routed to the first available agent in the group.

### ! Restriction

Failover is not supported for initial and batch load requests. Restart the initial load following a failure due to agent unavailability.

Although no user action is required for automatic failover within an agent group, you may choose to monitor the current agent node information.

- To query the current master agent node name for a remote source:

```
SELECT AGENT_NAME FROM "SYS"."M_REMOTE_SOURCES_" WHERE "REMOTE_SOURCE_OID" =  
(SELECT REMOTE_SOURCE_OID FROM "SYS"."REMOTE_SOURCES_" WHERE  
REMOTE_SOURCE_NAME = '<remote_source_name>');
```

- To query a list of all agent and agent group names:

```
SELECT AGENT_NAME, AGENT_GROUP_NAME FROM SYS."AGENTS";
```

### ⚠ Caution

If all nodes in an agent group are down, replication cannot continue and must be recovered after one or more agent nodes are available.

## Restarting Agent Nodes in an Agent Group

Restarting nodes in an agent group does not impact active replication tasks.

For the master agent node, stopping or restarting the agent triggers the agent group failover behavior and a new active master node is selected.

### 2.5.4.2 Load Balancing in an Agent Group

With multiple agents in an agent group, you can choose to have the agent for the initial loads selected randomly, selected from the list of agents in a round-robin fashion, or not load balanced.

#### i Note

Agent grouping provides load balancing for initial loads only. Load balancing is not supported for changed-data capture (CDC) operations.

Load balancing is governed by the 'agent\_group'. 'load\_balance\_mode' index server parameter and supports the following modes:

- *none*: No load balancing is performed.
- *random*: The agent is chosen randomly.
- *round\_robin*: The chosen agent is the next in the list of available agents after the previously chosen agent.

For example, to select the agent for initial loads randomly:

```
ALTER SYSTEM ALTER CONFIGURATION ('indexserver.ini','SYSTEM') SET
('agent_group', 'load_balance_mode') = 'random' WITH RECONFIGURE;
```

## 2.5.4.3 Create or Remove an Agent Group

You can create an agent group or remove an existing group in the [Data Provisioning Agent Monitor](#).

### Prerequisites

The user who creates or removes the agent group must have the following roles or privileges:

Table 27: Roles and Privileges

Action	Role or Privilege
Create agent group	<ul style="list-style-type: none"><li>Role: sap.hana.im.dp.monitor.roles::Operations</li><li>Application privilege: sap.hana.im.dp.monitor::CreateAgentGroup</li><li>System privilege: AGENT ADMIN</li></ul>
Remove agent group	<ul style="list-style-type: none"><li>Role: sap.hana.im.dp.monitor.roles::Operations</li><li>Application privilege: sap.hana.im.dp.monitor::DropAgentGroup</li><li>System privilege: AGENT ADMIN</li></ul>

### Context

Use the buttons in the [Agent Group](#) table to create or remove an agent group.

### Procedure

- Click [Create](#) to create an agent group.  
Specify the name for the new agent group, and click [Create Agent Group](#).  
The new agent group appears in the [Agent Group](#) table.
- Select the agent group and click [Drop](#) to remove an existing agent group.

#### i Note

When you remove an agent group, any agent nodes for the group are removed from the group first. Agents cannot be removed from the group if there are active remote subscriptions.

Any agent nodes are removed from the group, and the group is removed from the [Agent Group](#) table.

## Related Information

[CREATE AGENT GROUP Statement \[Smart Data Integration\] \[page 539\]](#)

[DROP AGENT GROUP Statement \[Smart Data Integration\] \[page 552\]](#)

### 2.5.4.4 Manage Agent Nodes in an Agent Group

You can manage the agent nodes that belong to an agent group in the [Data Provisioning Agent Monitor](#).

## Prerequisites

The user must have the following roles or privileges to manage agent nodes:

Table 28: Roles and Privileges

Action	Role or Privilege
Create agent	<ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::CreateAgent</li><li>• System privilege: AGENT ADMIN</li></ul>
Add agent to agent group	<ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::AlterAgent</li><li>• System privilege: AGENT ADMIN</li></ul>
Remove agent from agent group	<ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::AlterAgent</li><li>• System privilege: AGENT ADMIN</li></ul>

## Context

Use the buttons in the [Agent Monitor](#) and [Agent Group](#) tables to perform the action.

### → Tip

Select an agent group in the [Agent Group](#) table to display its nodes in the [Agent Monitor](#) table.

## Procedure

- To register a new agent with the SAP HANA system and add it to an existing agent group, click [Create Agent](#).



When specifying the parameters for the agent, select the agent group from the [Agent Group](#) list.

The new agent appears in the [Agent Monitor](#) table.

- To modify the group assignment for an existing agent, click [Alter Agent](#).
  - Select the new agent group from the [Agent Group](#) list.  
If you are assigning the agent to a different group, select the empty entry for [Enable SSL](#) to avoid connection issues when the group is changed.
  - To remove the agent from an agent group, select the empty entry from the [Agent Group](#) list.

The group for the agent is displayed in the [Agent Monitor](#) table.

- To add multiple existing agents to an agent group, select the group in the [Agent Group](#) table and click [Add Agents](#).
  - a. Select the agents that you want to add to the group.
  - b. Click [Add Agents](#).

The selected agents are assigned to the agent group and all associated entries in the [Agent Monitor](#) and [Agent Group](#) tables are updated.

## Related Information

[Manage Agents from the Data Provisioning Agent Monitor \[page 103\]](#)

[CREATE AGENT Statement \[Smart Data Integration\] \[page 537\]](#)

[ALTER AGENT Statement \[Smart Data Integration\] \[page 527\]](#)

## 2.5.4.5 Add Adapters to an Agent Group

Before you can create remote sources in an agent group, you must add adapters to the group in the SAP HANA Web-based Development Workbench.

### Prerequisites

The user who adds an adapter must have the following roles or privileges:

Table 29: Roles and Privileges

Action	Role or Privilege
Add adapter to agent group	System privilege: ADAPTER ADMIN

### Procedure

1. Open the SQL console in the SAP HANA Web-based Development Workbench.

2. If you do not know the agent names, query the system for a list of agents and agent groups.

```
SELECT AGENT_NAME, AGENT_GROUP_NAME FROM SYS."AGENTS";
```

3. Create the adapter on the first agent node.

```
CREATE ADAPTER "<adapter_name>" AT location agent "<agent1_name>";
```

4. Add the agent to each additional agent node in the agent group.

```
ALTER ADAPTER "<adapter_name>" ADD location agent "<agent#_name>";
```

## 2.5.4.6 Configure Remote Sources in an Agent Group

To receive the benefits of failover from an agent group, you must configure your remote sources in the agent group.

## Configure Remote Sources in the Web-based Development Workbench

### Procedure

- To create a new remote source in an agent group:
  - a. In the Catalog editor, right-click the ► *Provisioning* ► *Remote Sources* ► folder, and choose *New Remote Source*.
  - b. Enter the required configuration information for the remote source, including the adapter name.
  - c. In the *Location* dropdown, choose *agent group*, and select the agent group name.
  - d. Click *Save*.
- To add an existing remote source to an agent group:
  - a. In the Catalog editor, select the remote source in the ► *Provisioning* ► *Remote Sources* ► folder.
  - b. In the *Location* dropdown, choose *agent group*, and select the agent group name.
  - c. Click *Save*.

### Related Information

[Create a Remote Source in the Web-Based Development Workbench](#)

# Configure Remote Sources in the SQL Console

## Procedure

1. Open the SQL console in the SAP HANA studio or Web-based Development Workbench.
2. Execute the CREATE or ALTER REMOTE SOURCE statement in the SQL console.
  - To create a new remote source in the group:

```
CREATE REMOTE SOURCE <source_name> ADAPTER <adapter_name> AT LOCATION  
AGENT GROUP <group_name> <configuration_clause> <credential_clause>
```

- To add an existing remote source to the group:

```
ALTER REMOTE SOURCE <source_name> ADAPTER <adapter_name> AT LOCATION AGENT  
GROUP <group_name> <configuration_clause> <credential_clause>
```

### Note

If you are changing only the location for the remote source, you can omit the ADAPTER and CONFIGURATION clauses:

```
ALTER REMOTE SOURCE <source_name> AT LOCATION AGENT GROUP <group_name>  
<credential_clause>
```

## Related Information

[CREATE REMOTE SOURCE Statement \[Smart Data Integration\] \[page 542\]](#)

[ALTER REMOTE SOURCE Statement \[Smart Data Integration\] \[page 528\]](#)

## Alter Remote Source Clauses

When you use ALTER REMOTE SOURCE to modify a remote source, you must specify the configuration and credential details as XML strings.

## Example Credential Clause

```
WITH CREDENTIAL TYPE 'PASSWORD' USING '<CredentialEntry name="credential">  
  <user><username></user>  
  <password><password></password>  
</CredentialEntry>'
```

## Example Configuration Clause

```
CONFIGURATION '<?xml version="1.0" encoding="UTF-8"?>
  <ConnectionProperties name="configurations">
    <PropertyGroup name="generic">
      <PropertyEntry name="map_char_types_to_unicode">false</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="database">
      <PropertyEntry name="cdb_enabled">false</PropertyEntry>
      <PropertyEntry name="pds_use_tnsnames">false</PropertyEntry>
      <PropertyEntry name="pds_host_name"><db_hostname></PropertyEntry>
      <PropertyEntry name="pds_port_number">1521</PropertyEntry>
      <PropertyEntry name="pds_database_name">ORCL</PropertyEntry>
      <PropertyEntry name="cdb_service_name"></PropertyEntry>
      <PropertyEntry name="pds_service_name"></PropertyEntry>
      <PropertyEntry name="pds_tns_filename"></PropertyEntry>
      <PropertyEntry name="pds_tns_connection"></PropertyEntry>
      <PropertyEntry name="cdb_tns_connection"></PropertyEntry>
      <PropertyEntry name="_pds_tns_connection_with_cdb_enabled"></
PropertyEntry>
      <PropertyEntry name="pds_byte_order"></PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="schema_alias_replacements">
      <PropertyEntry name="schema_alias"></PropertyEntry>
      <PropertyEntry name="schema_alias_replacement"></PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="security">
      <PropertyEntry name="pds_use_ssl">false</PropertyEntry>
      <PropertyEntry name="pds_ssl_sc_dn"></PropertyEntry>
      <PropertyEntry name="_enable_ssl_client_auth">false</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="jdbc_flags">
      <PropertyEntry name="remarksReporting">false</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="cdc">
      <PropertyGroup name="databaseconf">
        <PropertyEntry name="pdb_archive_path"></PropertyEntry>
        <PropertyEntry name="pdb_supplemental_logging_level">table</
PropertyEntry>
      </PropertyGroup>
      <PropertyGroup name="parallelscan">
        <PropertyEntry name="lr_parallel_scan">false</PropertyEntry>
        <PropertyEntry name="lr_parallel_scanner_count"></PropertyEntry>
        <PropertyEntry name="lr_parallel_scan_queue_size"></
PropertyEntry>
        <PropertyEntry name="lr_parallel_scan_range"></PropertyEntry>
      </PropertyGroup>
      <PropertyGroup name="logreader">
        <PropertyEntry name="skip_lr_errors">false</PropertyEntry>
        <PropertyEntry name="lr_max_op_queue_size">1000</PropertyEntry>
        <PropertyEntry name="lr_max_scan_queue_size">1000</PropertyEntry>
        <PropertyEntry name="lr_max_session_cache_size">1000</
PropertyEntry>
        <PropertyEntry name="scan_fetch_size">10</PropertyEntry>
        <PropertyEntry name="pdb_dflt_column_repl">true</PropertyEntry>
        <PropertyEntry name="pdb_ignore_unsupported_anydata">false</
PropertyEntry>
        <PropertyEntry name="pds_sql_connection_pool_size">15</
PropertyEntry>
        <PropertyEntry name="pds_retry_count">5</PropertyEntry>
        <PropertyEntry name="pds_retry_timeout">10</PropertyEntry>
      </PropertyGroup>
    </PropertyGroup>
  </ConnectionProperties>'
```

### i Note

You cannot change user names while the remote source is suspended.

## 2.5.5 Manage Agents from the Data Provisioning Agent Monitor

Use the [Data Provisioning Agent Monitor](#) to perform basic administration tasks such as registering, altering, or dropping Data Provisioning Agents.

### Prerequisites

The user must have the following roles or privileges to manage agents:

Table 30: Roles and Privileges

Action	Role or Privilege
Add Data Provisioning Agent	<ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.monitor.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::CreateAgent</li><li>• System privilege: AGENT ADMIN</li></ul>
Alter Data Provisioning Agent	<ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.monitor.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::AlterAgent</li><li>• System privilege: AGENT ADMIN</li></ul>
Remove Data Provisioning Agent	<ul style="list-style-type: none"><li>• Role: sap.hana.im.dp.monitor.roles::Operations</li><li>• Application privilege: sap.hana.im.dp.monitor::DropAgent</li><li>• System privilege: AGENT ADMIN</li></ul>

### Context

Use the following controls in the [Agent Monitor](#) table to perform an action.

### Procedure

- Select [Create Agent](#) to register a new agent with the SAP HANA system.
  - a. Specify the name of the agent and relevant connection information.
  - b. If the agent uses a secure SSL connection, select [Enable SSL](#).
  - c. If you want to assign the agent to an existing agent group, select the group under [Agent Group](#).

- d. Click [Create Agent](#).

The new agent appears in the [Agent Monitor](#) table.

- Select [Alter Agent](#) to make connection configuration changes on an agent already registered in the SAP HANA system.
  - a. Specify the new connection information for the agent. You can't change the name or connection protocol for an existing agent.
  - b. If the agent uses a secure SSL connection, check [Enable SSL](#).
  - c. If you want to assign the agent to an existing agent group, select the group under [Agent Group](#).
  - d. Click [Alter Agent](#).

The updated agent information appears in the [Agent Monitor](#) table.

- Select [Drop Agent](#) to remove an agent from the SAP HANA system.
  - a. To drop any dependent objects automatically, such as registered adapters, choose [CASCADE option](#). You can't remove an agent while it has dependent objects such as registered adapters. Remove the adapters from the agent manually, or check [CASCADE option](#).
  - b. Click [Drop Agent](#).

The agent is removed from the [Agent Monitor](#) table. If the agent was assigned to an agent group, it's also removed from the agent group.

**Task overview:** [Configure the Data Provisioning Agent \[page 49\]](#)

## Related Information

[Configuring the Agent in Command-Line Interactive Mode \[page 50\]](#)

[Configuring the Agent in Command Line Batch Mode \[page 69\]](#)

[Configuring the Agent in Graphical Mode \[Deprecated\] \[page 83\]](#)

[Managing Agent Groups \[page 94\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

[Agent Runtime Options \[page 108\]](#)

[Replicating an Agent Configuration to Another Host \[page 110\]](#)

[Assign Roles and Privileges \[page 25\]](#)

## 2.5.6 Agent Adapter Framework Preferences

The agent preferences provide advanced configuration options for the Data Provisioning Agent. The method for accessing and modifying agent preferences depends on the configuration mode that you use.

## Graphical Mode

Choose **Config** > **Preferences** in the Data Provisioning Agent Configuration tool, and then select **Adapter Framework**.

## Command-Line Interactive Mode

Use the **Set Agent Preferences** action in the **Agent Preferences** menu in interactive mode.

For example, to set the agent logging level to **ALL**:

1. Select **3** to enter the **Agent Preferences** menu.
2. Select **2** to set the value of a preference.
3. Select the menu index for logging level, and enter **ALL** when prompted for the new value.

## Command-Line Batch Mode

Use the `agentPreferences` function of the command-line configuration tool.

For example, to set the agent logging level to **ALL**:

```
--function agentPreferences -Dframework.log.level=ALL
```

## Available Agent Preferences

By default, the agent is configured to start in TCP mode and monitor port 5050 for requests from SAP HANA.

Table 31: Agent Preferences

Key	Description	Default Value
Framework listener port <code>framework.listenerPort</code>	Port the agent monitors for requests from the SAP HANA server  The Framework listener port should be SSL-enabled for security.	5050
Admin port <code>framework.adminport</code>	Local port used for internal communication between the agent and the agent configuration tool  Do not enable the admin port within a firewall; the port should be blocked from outside access to prevent unauthorized changes on the agent.	5051

Key	Description	Default Value
Worker thread pool <code>framework.threadPoolSize</code>	Number of worker threads	10
Polling timeout <code>framework.pollingTimeout</code>	Length of time to perform a blocking wait on queue	10
Polling timeout unit <code>framework.timeUnit</code>	Unit used by the polling timeout	SECONDS
Max data size in bytes <code>framework.maxDataSize</code>	Maximum amount of data to fetch	100000000
Row fetch size (max) <code>framework.fetchSize</code>	Maximum number of browse nodes or rows to fetch from an adapter	1000
Row fetch size (min) <code>framework.min.fetchSize</code>	Minimum number of rows to fetch from an adapter	10
Max number of retries <code>framework.retry.maxTries</code>	Maximum number of times the agent tries to connect after a registration or ping failure	10
Time to wait before retry <code>framework.retry.waitTime</code>	The amount of time to wait before retrying	30
Shared Directory for Agent Group <code>framework.clusterSharedDir</code>	Shared directory for the agent group to which this agent instance belongs, if any	None
Logging level <code>framework.log.level</code>	Type of logging to perform for the agent: <ul style="list-style-type: none"> <li>TRACE</li> <li>DEBUG</li> <li>ERROR</li> <li>ALL</li> </ul>	TRACE
Log max backup <code>framework.log.maxBackupIndex</code>	Number of log files to keep	10
Log file max file size <code>framework.log.maxFileSize</code>	Maximum file size in MB or KB that the log file should use	10 MB
Trace message max size <code>framework.trace.length</code>	When tracing is enabled, the specific number of characters in a trace message after which the message is truncated	1024
Trace ping message <code>framework.trace.pingMessage</code>	When tracing is enabled, specifies printing of the ping message	false
Trace all data <code>framework.trace.data</code>	Enables printing the content of the data rows sent to server	false



Key	Description	Default Value
Max HTTP Connection per route <code>cloud.defaultMaxPerRoute</code>	Maximum number of connections the internal HTTP client can create	20
Max available HTTP connection <code>cloud.maxTotal</code>	Maximum number of connections	20
Proxy type <code>proxyType</code>	Type of proxy being used	http
Proxy Host <code>proxyHost</code>	Hostname of the proxy being used	
Proxy Port <code>proxyPort</code>	Port used by the proxy	
Non-Proxy Hosts <code>nonProxyHosts</code>		
Read-only Adapters <code>framework.readOnlyAdapters</code>	List of adapters to operate in read-only mode.	
Maximum open socket connections <code>framework.so.maxOpenConnection</code>		

**Parent topic:** [Configure the Data Provisioning Agent \[page 49\]](#)

## Related Information

[Configuring the Agent in Command-Line Interactive Mode \[page 50\]](#)

[Configuring the Agent in Command Line Batch Mode \[page 69\]](#)

[Configuring the Agent in Graphical Mode \[Deprecated\] \[page 83\]](#)

[Managing Agent Groups \[page 94\]](#)

[Manage Agents from the Data Provisioning Agent Monitor \[page 103\]](#)

[Agent Runtime Options \[page 108\]](#)

[Replicating an Agent Configuration to Another Host \[page 110\]](#)

## 2.5.7 Agent Runtime Options

Use the command-line configuration tool to manage advanced runtime options stored in the `dpagent.ini` configuration file safely.

Agent runtime options are typically used when troubleshooting an agent issue or optimizing agent performance.

The method for accessing and modifying the agent runtime options depends on the configuration mode that you use.

### Command-Line Interactive Mode

Start the configuration tool with the `--configAgentIniFile` parameter and select the option that you want to modify.

The configuration tool prompts you for any information required for the runtime option that you are modifying.

### Command-Line Batch Mode


Use the `--configAgentIniFile` parameter and specify the function for the agent runtime option that you want to modify, as well as any additional parameters required by the function.



For example, to change the maximum amount of memory available to the agent to 16 GB on Windows:

```
agentcli.bat --configAgentIniFile --function setDPAgentMemory -  
Ddpagent.vm.xmx=16g
```

## Supported Runtime Options

Table 32: Agent Runtime Options

Option and Function	Description and Parameters
Clear DPAgent Cache on Next Start	When enabled, the next time the agent is restarted, any cached agent, OSGi, and Eclipse runtime data is removed and the caches are reinitialized.
<div> <b>Caution</b> Do not enable this option unless instructed to do so by SAP Support.</div>	

Option and Function	Description and Parameters
Switch Java Virtual Machine <code>changeDefaultJVM</code>	<p>Updates the version of the SAP JVM used by an installed agent, or replaces the SAP JVM with a custom Java Runtime Environment</p> <p>The SAP JVM is bundled with the Data Provisioning Agent and used as the default Java Runtime Environment</p> <pre>-Ddpagent.vm.directory=&lt;jvm_path&gt;</pre>
Switch DPAgent Log Directory <code>changeLogDirectory</code>	<p>Modifies the location of the root directory where all agent-related log files are generated</p> <p>The default root log path is <code>&lt;DPAgent_root&gt;/log</code>.</p> <pre>-Ddpagent.log.directory=&lt;log_root_path&gt;</pre>
Change DPAgent Max Available Memory <code>setDPAgentMemory</code>	<p>Modify the maximum amount of memory that the agent can use</p> <pre>-Ddpagent.vm.vmx=&lt;amount&gt;</pre> <p>For example, for 16 GB, specify <b>16g</b>.</p>
Enable Remote Debugging <code>enableRemoteDebugging</code>	<p>Assists SAP Support in troubleshooting agent-related issues</p> <pre>-Ddpagent.remoteDebugging.port=&lt;port_number&gt;</pre> <pre>-Ddpagent.remoteDebugging.suspend=&lt;value&gt;</pre> <p>Available values: <b>true</b> or <b>false</b></p> <div>  <b>Caution</b>  Do not enable this option unless instructed to do so by SAP Support. </div>
Inject System Property <code>injectSystemProperty</code>	<p>Enables runtime JVM system properties</p> <pre>-Ddpagent.system.key=&lt;value&gt;</pre> <pre>-Ddpagent.system.value=&lt;value&gt;</pre> <div>  <b>Caution</b>  Do not enable this option unless instructed to do so by SAP Support. </div>
Revert dpagent.ini to original state <code>setCleanParameter</code>	<p>Removes any changes to the agent runtime options and reverts the dpagent.ini to its original state.</p>

**Parent topic:** [Configure the Data Provisioning Agent \[page 49\]](#)

## Related Information

[Configuring the Agent in Command-Line Interactive Mode \[page 50\]](#)

[Configuring the Agent in Command Line Batch Mode \[page 69\]](#)

[Configuring the Agent in Graphical Mode \[Deprecated\] \[page 83\]](#)

[Managing Agent Groups \[page 94\]](#)

[Manage Agents from the Data Provisioning Agent Monitor \[page 103\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

[Replicating an Agent Configuration to Another Host \[page 110\]](#)

## 2.5.8 Replicating an Agent Configuration to Another Host

There are items that you need to consider when moving to a different host from one where your agent is configured.

If you are migrating to a different host, keep the following rules in mind:

- The agent install path must be the same. You cannot migrate to a different path because the path is hardcoded in many places.
- The host operating system should be the same. For example, you cannot migrate a configuration from Linux to Windows.
- If you are migrating an agent that was configured to talk to SAP HANA on cloud, you cannot have both agents running afterwards. SAP HANA does not support communication with two agents using the same configuration.

If the agent is the same version as the one on the old machine, then you can migrate the following objects:

- Folders: `Camel`, `configuration/com.sap.hana.dp.adapterframework`, `LogReader`, `sec`, `secure_storage`, `ssl`, `lib`
- Files: `dpagentconfig.ini`, `dpagent.ini`

If the agents are different versions, then you can migrate the following objects:

- Folders: `sec`, `secure_storage`, `ssl`, `lib`
- Files: `dpagentconfig.ini`

### Note

After the migration, be sure to update the `dpagentconfig.ini` file by editing the `agent.hostname` parameter to match the host the agent is now on.

**Parent topic:** [Configure the Data Provisioning Agent \[page 49\]](#)

## Related Information

[Configuring the Agent in Command-Line Interactive Mode \[page 50\]](#)

[Configuring the Agent in Command Line Batch Mode \[page 69\]](#)  
[Configuring the Agent in Graphical Mode \[Deprecated\] \[page 83\]](#)  
[Managing Agent Groups \[page 94\]](#)  
[Manage Agents from the Data Provisioning Agent Monitor \[page 103\]](#)  
[Agent Adapter Framework Preferences \[page 104\]](#)  
[Agent Runtime Options \[page 108\]](#)

## 2.6 Register Data Provisioning Adapters

After configuring the Data Provisioning Agent, register adapters.

### Prerequisites

- Install and configure the data provisioning agent.
- If necessary, download and install any necessary JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

### Procedure

1. Register the adapter.
2. Configure the source system to which the adapter connects.

For information about the remote source configuration steps necessary for each adapter, see “Configure Data Provisioning Adapters”.

### Next Steps

Create a remote source in SAP HANA.

#### ⚠ Caution

The OData adapter isn't part of the Data Provisioning Agent installation. The OData adapter is installed with the SAP HANA server and requires configuration that can't be done using the Data Provisioning Agent Configuration tool.

#### ! Restriction

When the target table is made with a column store and the option `CS_DATA_TYPENAME` is set to **ST\_MEMORY\_LOB**, then the in-memory size is limited to less than 1 GB. To prevent this limitation, set the option to **LOB**. This solution applies to all adapters.

**Task overview:** [Configure Smart Data Integration \[page 24\]](#)

**Previous:** [Configure the Data Provisioning Agent \[page 49\]](#)

**Next task:** [Create a Remote Source \[page 117\]](#)

## Related Information

[Register Adapters with SAP HANA \[page 112\]](#)

[Register Adapters with SAP HANA \[Command Line\] \[page 114\]](#)

[Manage Adapters from the Data Provisioning Agent Monitor \[page 115\]](#)

[Configure Data Provisioning Adapters \[page 153\]](#)

[OData \[page 344\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



## 2.6.1 Register Adapters with SAP HANA

Before you can connect to remote sources using an adapter, you must register the adapter with SAP HANA.

### Prerequisites

The HANA administrator user must have the following roles or privileges:

Table 33: Roles and Privileges

Action	Role or Privilege
Register an adapter	System privilege: ADAPTER ADMIN Application privilege: sap.hana.im.dp.admin::Administrator

#### i Note

This application privilege is required only for SAP HANA in the cloud.

#### i Note

Before registering the adapter with the SAP HANA system, ensure you have downloaded and installed the correct JDBC libraries. See the *SAP HANA smart data integration Product Availability Matrix (PAM)* for details. Place the files in the `<DPAgent_root>/lib` folder.

## Procedure

1. Start the Data Provisioning Agent Configuration tool and connect to SAP HANA.
2. For custom adapters, click [Deploy Adapter](#) and point to the adapter JAR files.

### i Note

Data provisioning adapters delivered by SAP are automatically deployed on the agent during agent installation.

3. Select the adapter to register and click [Register Adapter](#).
4. Configure the source system to which the adapter connects, if necessary.

For example, log reader adapters require source configuration to enable real-time replication.

For complete information about source system configuration, see the relevant section for each adapter in “Configure Data Provisioning Adapters”.

## Results

The selected adapter is registered with SAP HANA and can be selected when creating a remote source.

## Next Steps

### i Note

For SAP HANA in the cloud, you must restart the agent service to complete the registration of adapters. If the registration succeeds and the restart of the service fails, or the registration of all adapters fails, then the registration is rolled back.

## Related Information

[Configure Data Provisioning Adapters \[page 153\]](#)

[Start and Connect the Configuration Tool \[page 84\]](#)

[SAP ECC Adapter Preferences \[page 427\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



## 2.6.2 Register Adapters with SAP HANA [Command Line]

Before you can connect to remote sources using an adapter, you must register the adapter with SAP HANA.

### Prerequisites

The HANA administrator user must have the following roles or privileges:

Table 34: Roles and Privileges

Action	Role or Privilege
Register an adapter	System privilege: ADAPTER ADMIN Application privilege: sap.hana.im.dp.admin::Administrator

**i Note**  
This application privilege is required only for SAP HANA in the cloud.

#### i Note

Before registering the adapter with the SAP HANA system, ensure you have downloaded and installed the correct JDBC libraries. See the *SAP HANA smart data integration Product Availability Matrix (PAM)* for details. Place the files in the `<DPAgent_root>/lib` folder.

### Procedure

1. Start the command-line agent configuration tool and connect to SAP HANA.
2. Select **8** to enter the *Custom Adapters* menu.

#### i Note

Data provisioning adapters delivered by SAP are automatically deployed on the agent during agent installation.

- a. Select **1** to deploy a custom adapter.
  - b. Specify the location of the adapter's JAR files.
  - c. Select **b** to return to the main menu.
3. To enter the *Adapter Registration* menu, select **7**.
  4. To register an adapter, select **2**.
  5. Specify the name of the adapter to register with SAP HANA.

#### i Note

The adapter name must match the name displayed by the *Display Adapters* option.



6. Configure the source system to which the adapter connects, if necessary.

For example, log reader adapters require source configuration to enable real-time replication.

For complete information about source system configuration, see the relevant section for each adapter in “Configure Data Provisioning Adapters”.

## Results

The selected adapter is registered with SAP HANA and can be selected when creating a remote source.

## Next Steps

### Note

For SAP HANA in the cloud, you must restart the agent service to complete the registration of adapters. If the registration succeeds and the restart of the service fails, or the registration of all adapters fails, then the registration is rolled back.

## Related Information

[Configure Data Provisioning Adapters \[page 153\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[SAP ECC Adapter Preferences \[page 427\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



## 2.6.3 Manage Adapters from the Data Provisioning Agent Monitor

Use the Data Provisioning Agent Monitor to perform basic administration tasks, such as adding adapters to or removing adapters from a Data Provisioning Agent instance.

## Prerequisites

The user must have the following roles or privileges to manage adapters:

Table 35: Roles and Privileges

Action	Role or Privilege
Add adapter	<ul style="list-style-type: none"> <li>Role: sap.hana.im.dp.monitor.roles::Operations</li> <li>Application privilege: sap.hana.im.dp.monitor::AddLocationToAdapter</li> <li>System privilege: ADAPTER ADMIN</li> </ul>
Remove adapter	<ul style="list-style-type: none"> <li>Role: sap.hana.im.dp.monitor.roles::Operations</li> <li>Application privilege: sap.hana.im.dp.monitor::RemoveLocationFromAdapter</li> <li>System privilege: ADAPTER ADMIN</li> </ul>
Update adapters	<ul style="list-style-type: none"> <li>Role: sap.hana.im.dp.monitor.roles::Operations</li> <li>System privilege: ADAPTER ADMIN</li> </ul>

## Context

Use the buttons in the [Agent Monitor](#) and [Agent Adapter Mapping](#) tables to perform an action.

## Procedure

- To add adapters to an agent instance, select the agent and click [Add Adapters](#) in the [Agent Monitor](#) table.
  - Select the desired adapters from the list of adapters deployed on the agent instance.
  - Click [Add Adapters](#).

The selected adapters appear in the [Adapter Agent Mapping](#) table.
- To remove an adapter from an agent instance, select the adapter and click [Remove Location](#) in the [Adapter Agent Mapping](#) table.
  - If the adapter is registered on only one agent instance, you can remove it with [CASCADE option](#).
  - Click [Remove Location](#).

The adapter is removed from the [Adapter Agent Mapping](#) table.
- To update all adapters for an agent, select the agent and click [Update Adapters](#) in the [Agent Monitor](#). All adapters registered for the selected agent are refreshed, and any new capabilities can be used by SAP HANA.
- To update a single adapter, select the adapter and click [Update](#) in the [Adapter Agent Mapping](#) table. The selected adapter is refreshed, and any new capabilities can be used by SAP HANA.

## Related Information

[Assign Roles and Privileges \[page 25\]](#)

## 2.7 Create a Remote Source

Using SAP HANA smart data integration, you set up an adapter that can connect to your source database, then create a remote source to establish the connection.

### Prerequisites

- The user who creates the remote source must have the following roles or privileges:

Table 36: Roles and Privileges

Action	Role or Privilege
Create a remote source	System privilege: CREATE_REMOTE_SOURCE

- The Data Provisioning Server must be enabled.
- The Data Provisioning Agent must be installed and configured.
- The adapter must be configured and registered with SAP HANA.

### Context

You can create a remote source in more than one way.

[Create a Remote Source in the Web-Based Development Workbench \[page 118\]](#)

In SAP HANA smart data integration, you can create a remote source with the Web-based Development Workbench user interface.

[Create a Remote Source in the SQL Console \[page 119\]](#)

In SAP HANA smart data integration, you can create a remote source using the SQL console.

[Create Credentials for a Secondary User \[page 120\]](#)

The syntax for creating secondary user credentials for SAP HANA smart data integration adapters is different from the syntax for SAP HANA system adapters.

[Configure a Grantor for the HDI Container \[page 121\]](#)

To build and execute flowgraphs and replication tasks in SAP Web IDE, first configure the grantor privilege.

**Task overview:** [Configure Smart Data Integration \[page 24\]](#)

**Previous task:** [Register Data Provisioning Adapters \[page 111\]](#)

**Next:** [Set Up Data Provisioning Monitoring \[page 124\]](#)

## Related Information

### 2.7.1 Create a Remote Source in the Web-Based Development Workbench

In SAP HANA smart data integration, you can create a remote source with the Web-based Development Workbench user interface.

#### Prerequisites

The user who creates the remote source must have the following roles or privileges:

Table 37: Roles and Privileges

Action	Role or Privilege
Create a remote source	<ul style="list-style-type: none"><li>System privilege: <code>CREATE REMOTE SOURCE</code></li></ul>

#### Procedure

1. In the Web-based Development Workbench Catalog editor, expand the *Provisioning* node.
2. Right-click the *Remote Sources* folder and choose *New Remote Source*.
3. Enter the required information including the adapter and Data Provisioning Agent names.  
Regarding user credentials, observe the following requirements:
  - A remote source created with a secondary user can be used only for querying virtual tables.
  - If the remote source is used for designing a `.hdbreptask` or `.hdbflowgraph` enabled for real time, use **technical user**.
  - If you create a remote subscription using the `CREATE REMOTE SUBSCRIPTION` SQL statement, use **technical user**.
4. Select *Save*.

## Related Information

[Configure Data Provisioning Adapters \[page 153\]](#)

[CREATE REMOTE SOURCE Statement \[Smart Data Integration\] \(SAP HANA SQL and System Views Reference\) \[page 542\]](#)

## 2.7.2 Create a Remote Source in the SQL Console

In SAP HANA smart data integration, you can create a remote source using the SQL console.

### Prerequisites

The user who creates the remote source must have the following roles or privileges:

Table 38: Roles and Privileges

Action	Role or Privilege
Create a remote source	<ul style="list-style-type: none"><li>System privilege: CREATE_REMOTE_SOURCE</li></ul>

### Context

To create a remote source using the SQL console, you must know the connection information for your source. For an existing remote source, the connection information is in an XML string in the CONFIGURATION statement.

For your adapter, refer to the remote source configuration topic for that adapter in this guide to see its sample SQL code. Change the variables to the correct values for your remote source.

The example at the end of this topic illustrates the basic CONFIGURATION connection information XML string for a Microsoft SQL Server adapter.

After you create the remote source:

- If you've recently updated the Data Provisioning Agent, the connection information XML string could also have been updated for your adapter. Therefore, refresh the adapter to get up-to-date connection information.
- To view the connection information for an existing remote source, execute `SELECT * FROM "PUBLIC"."REMOTE_SOURCES"`. In the resulting view, look in the CONNECTION\_INFO column.

#### → Tip

To ensure you can view the entire XML string in the CONNECTION\_INFO column, in your SAP HANA preferences enable the setting [Enable zoom of LOB columns](#).

- To view all of the configuration parameters for a given adapter type, execute `SELECT * FROM "PUBLIC"."ADAPTERS"`. In the resulting view, look in the CONFIGURATION column. This information can be useful if you want to, for example, determine the PropertyEntry name for a given parameter in the user interface, shown as [displayName](#). For example:

```
<PropertyEntry name="pds_database_name" displayName="Database
Name"><database_name></PropertyEntry>
<PropertyEntry name="pdb_dcmode" displayName="Database Data Capture
Mode">MSCDC</PropertyEntry>
```

## Example

```
CREATE REMOTE SOURCE "MySQLServerSource" ADAPTER "MssqlLogReaderAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="data_type_conversion" displayName="Data Type Conversion">
  <PropertyEntry name="map_char_types_to_unicode" displayName="Always Map
Character Types to Unicode">false</PropertyEntry>
  <PropertyEntry name="map_time_to_timestamp" displayName="Map SQL Server Data
Type Time to Timestamp">true</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="database" displayName="Database">
  <PropertyEntry name="pds_server_name" displayName="Host">myserver.sap.corp</
PropertyEntry>
  <PropertyEntry name="pds_port_number" displayName="Port Number">1433</
PropertyEntry>
  <PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
</PropertyGroup>
<PropertyGroup name="cdc" displayName="CDC Properties">
  <PropertyEntry name="pdb_dcmode" displayName="Database Data Capture
Mode">MSCDC</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="logreader" displayName="LogReader">
  <PropertyEntry name="skip_lr_errors" displayName="Ignore log record
processing errors">false</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
'WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>myuser</user>
  <password>mypassword</password>
</CredentialEntry>'
```

## Related Information

[Configure Data Provisioning Adapters \[page 153\]](#)

[Update the Data Provisioning Agent \[page 145\]](#)

[CREATE REMOTE SOURCE Statement \[Smart Data Integration\] \[page 542\]](#)

## 2.7.3 Create Credentials for a Secondary User

The syntax for creating secondary user credentials for SAP HANA smart data integration adapters is different from the syntax for SAP HANA system adapters.

The syntax for creating secondary user credentials for SAP HANA smart data integration adapters is as follows.

```
create credential for user <user_name> component 'SAPHANAFEDERATION'
purpose <remote_source_name> type 'PASSWORD' using
<CredentialEntry name="credential">
  <user><user_name></user>
  <password><password></password>
```

```
</CredentialEntry>
```

## 2.7.4 Configure a Grantor for the HDI Container

To build and execute flowgraphs and replication tasks in SAP Web IDE, first configure the grantor privilege.

### Prerequisites

To configure the grantor privilege, you must have one or more remote sources already configured.

### Procedure

1. In SAP HANA, create a grantor database user with the rights to grant privileges to others.

If necessary, create the grantor user and role, and grant the role to the user.

#### **i** Note

Grant the role with ADMIN OPTION.

For example:

```
CREATE USER GEN_GRANTOR_USER PASSWORD Welcome1 NO
FORCE_FIRST_PASSWORD_CHANGE;
CREATE ROLE GEN_GRANTOR_ROLE;
GRANT GEN_GRANTOR_ROLE TO GEN_GRANTOR_USER WITH ADMIN OPTION;
```

2. Grant the following privileges on the remote sources to the grantor role.
  - CREATE VIRTUAL TABLE
  - CREATE VIRTUAL FUNCTION
  - CREATE REMOTE SUBSCRIPTION
  - LINKED DATABASE
  - PROCESS REMOTE SUBSCRIPTION EXCEPTION
  - ALTER
  - DROP
3. For the SAP HANA Service, use the SAP Cloud Platform cockpit to create a user-provided grantor service.
  - a. In the SAP Cloud Platform cockpit, navigate to your space and create a user-provided service instance.
  - b. Specify the name of the service credentials.

For example, a service named "remote\_system\_grant\_service" with the following credentials:

```
{
  "host": "<hostname>",
  "port": "<port_number>",
  "certificate": "<host_certificate>",
```

```

    "user": "GEN_GRANTOR_USER",
    "password": "Welcome1",
    "driver": "com.sap.db.jdbc.Driver",
    "tags": [
      "hana"
    ]
  }
}

```

For more information, see [Create User-Provided Service Instances Using the Cockpit](#).

4. For SAP HANA on-premise, log into SAP HANA as XSA\_ADMIN and create a user-provided grantor service.
  - a. Log in using the XS command-line interface.

For example:

```

xs login -a https://<hostname>:<port> --skip-ssl-validation -u XSA_ADMIN -
p <password> -s SAP

```

- b. If you use a different space for your SAP Web IDE project, change the space. Otherwise, the default is "SAP".

For example, to change to the "PROD" space:

```

xs t -s PROD

```

- c. Create a user-provided service (CUPS).

Create a service for the grantor database user with a service name of your choice.

For example, with a service named "remote\_system\_grant\_service":

```

xs cups remote_system_grant_service -p
"{\"host\":\"hostname\",\"port\":\"port_number\",\"user\":
\"GEN_GRANTOR_USER\",\"password\":\"
Welcome1\",\"driver\":\"com.sap.db.jdbc.Driver\",\"tags\":[\"hana\"]}"

```

5. Add the grantor service to the database module in your SAP Web IDE project.

In the MTA development descriptor (mta.yaml), add the grantor service as a resource and build the project.

```

modules:
- name: hdb1
  type: hdb
  path: hdb1
  requires:
    - name: hdi_hdb1
      properties:
        TARGET_CONTAINER: ~{hdi-container-name}
    - name: grant_service
resources:
- name: hdi_hdb1
  properties:
    hdi-container-name: ${service-name}
  type: com.sap.xs.hdi-container
- name: grant_service
  type: org.cloudfoundry.existing-service
  parameters:
    service-name: remote_system_grant_service

```

6. Create a grantor file in your project.

### Note

First create a database module in your project if one doesn't already exist.



- a. Right-click [src](#) and choose [New - File](#).

Specify the filename with an extension of "hdbgrants". For example, `grants.hdbgrants`.

### **i** Note

If you're creating the dictionary for object search, the ALTER privilege is required.

- b. In the grantor file, specify the grantor service name and any remote sources that you want to use.

For example, for a remote source named "HanaRemoteSource":

```
{
  "remote_system_grant_service": {
    "object_owner": {
      "roles": [
        "GEN_GRANTOR_ROLE"
      ],
      "global_object_privileges": [{
        "name": "HanaRemoteSource",
        "type": "REMOTE SOURCE",
        "privileges": [
          "CREATE VIRTUAL TABLE", "CREATE REMOTE SUBSCRIPTION"
        ]
      }]
    },
    "application_user": {
      "roles": [
        "GEN_GRANTOR_ROLE"
      ]
    }
  }
}
```

7. Build the database module.

### **→** Tip

To avoid errors, build starting from the database module instead of right-clicking the hdbgrants file and choosing [Build Selected File](#).

## Next Steps

After you have successfully built the module, you can create virtual table (hdbvirtualtable), flowgraph (hdbflowgraph), and replication task (hdbreptask) objects in the SAP Web IDE space.

## Related Information

[GRANT Statement \(Access Control\) \(SAP HANA SQL and System Views Reference\)](#)

## 2.8 Set Up Data Provisioning Monitoring

After you install SAP HANA smart data integration, you must take several actions to enable and access the monitoring user interfaces for Data Provisioning Agents, remote subscriptions, and tasks.

These actions allow you to access the Data Provisioning monitors by either typing the URL directly in your browser or through links in SAP HANA cockpit.

[Grant Roles to Users \[page 124\]](#)

Grant the appropriate roles to users who perform the various tasks in the Data Provisioning monitors.

**Parent topic:** [Configure Smart Data Integration \[page 24\]](#)

**Previous task:** [Create a Remote Source \[page 117\]](#)

**Next:** [Enabling Enterprise Semantic Services \[page 125\]](#)

### Related Information

[Download and Deploy the Data Provisioning Delivery Unit \[page 33\]](#)

[Monitoring Data Provisioning in the SAP HANA Web-based Development Workbench](#)

### 2.8.1 Grant Roles to Users

Grant the appropriate roles to users who perform the various tasks in the Data Provisioning monitors.

#### Prerequisites

Ensure that you've been granted the SYSTEM privilege USER ADMIN to be able to create, alter, or delete users.

#### Procedure

1. Log in to SAP HANA studio with a user name that has been granted the USER ADMIN system privilege.
2. Grant the role `sap.hana.im.dp.monitor.roles::Monitoring` to those that perform monitoring tasks.
  - a. In the *Systems* view, expand your SAP HANA server name and expand *Security*.
  - b. Double-click the user name.
  - c. On the *Granted Roles* tab, click the + icon in the upper left corner.

- d. On the [Select Roles](#) dialog, type **dp** in the search string box.
- e. Select role `sap.hana.im.dp.monitor.roles::Monitoring` and click *OK*.

This role `sap.hana.im.dp.monitor.roles::Monitoring` allows the user to access the user interfaces of SAP HANA Data Provisioning monitoring.

## Next Steps

Users can access the monitors from SAP HANA cockpit or view the monitors directly by entering the following URLs in a web browser:

- `<host name>:80<2 digit instance number>/sap/hana/im/dp/monitor/?view=DPAgentMonitor`
- `<host name>:80<2 digit instance number>/sap/hana/im/dp/monitor/?view=DPSubscriptionMonitor`
- `<host name>:80<2 digit instance number>/sap/hana/im/dp/monitor/?view=IMTaskMonitor`

## 2.9 Enabling Enterprise Semantic Services

Enterprise Semantic Services provides an API to enable searching for publication artifacts or run-time objects based on their metadata and contents. It is optional for SAP HANA smart data integration.

To enable Enterprise Semantic Services, an administrator does the following high-level tasks:

- Downloads the SAP HANA Enterprise Semantic Services delivery unit and installs it on the SAP HANA platform
- Grants roles and privileges to users
- Publishes datasets to the Enterprise Semantic Services knowledge graph, or in the case of an application that has already been configured to call the Enterprise Semantic Services REST API, the application populates the knowledge graph

### [Setting Up the SAP HANA Instance for Enterprise Semantic Services \[page 126\]](#)

The Enterprise Semantic Services component supports both on-premise multitenant and SAP HANA cloud platform deployments.

### [Download Enterprise Semantic Services Delivery Unit \[page 128\]](#)

Download the Enterprise Semantic Services delivery unit and deploy it to enable semantic searches of data sources.

### [Importing the Enterprise Semantic Services Delivery Unit \[page 128\]](#)

To install Enterprise Semantic Services (ESS), import the downloaded ESS delivery unit.

### [Install or Upgrade Enterprise Semantic Services \(install.html\) \[page 130\]](#)

After downloading and importing the Enterprise Semantic Services (ESS) delivery unit, install this component to enable semantic searches of data sources.

### [Grant Enterprise Semantic Services Roles and Privileges to Users \[page 132\]](#)

After installing Enterprise Semantic Services, grant the necessary roles to the SAP HANA users who will interact directly or indirectly with Enterprise Semantic Services.

[Uninstall Enterprise Semantic Services \[page 133\]](#)

You can permanently uninstall Enterprise Semantic Services, for example in the case of an upgrade.

**Parent topic:** [Configure Smart Data Integration \[page 24\]](#)

**Previous:** [Set Up Data Provisioning Monitoring \[page 124\]](#)

**Next:** [Enable SAP HANA Smart Data Integration REST API \[page 133\]](#)

## Related Information

[SAP HANA Enterprise Semantic Services JavaScript API Reference](#)

[SAP HANA Enterprise Semantic Services REST API Reference](#)

## 2.9.1 Setting Up the SAP HANA Instance for Enterprise Semantic Services

The Enterprise Semantic Services component supports both on-premise multitenant and SAP HANA cloud platform deployments.

For details on supported versions, see the applicable *Product Availability Matrix*.

## Related Information

[On-Premise Multitenant Deployment \[page 127\]](#)

[SAP HANA smart data quality and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 1.0](#) 

[SAP HANA smart data quality and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#) 

## 2.9.1.1 On-Premise Multitenant Deployment

For a multitenant deployment, Enterprise Semantic Services requires the SAP HANA script server and access to multitenant database containers.

### Prerequisites

- A SAP HANA instance has been installed with multiple containers
- At least one tenant database container has been created. For example, DBO.

### Procedure

1. Add the scriptserver service to the tenant database.

For example, in the Web-based Development Workbench or SAP HANA studio, enter the following SQL statement:

```
ALTER DATABASE DBO ADD 'scriptserver';
```

#### Note

If the SAP HANA smart data quality component is already installed, then the scriptserver service has already been added.

2. Configure HTTP access to multitenant database containers.

See the *SAP HANA Administration Guide*.


### Related Information

[Configure HTTP\(S\) Access to Tenant Databases via SAP HANA XS Classic \(SAP HANA Administration Guide\)](#)  
[Port Assignment in Tenant Databases \(SAP HANA Administration Guide\)](#)

## 2.9.2 Download Enterprise Semantic Services Delivery Unit

Download the Enterprise Semantic Services delivery unit and deploy it to enable semantic searches of data sources.

### Procedure

1. Go to the [SAP Software Download Center](#) .
2. Click [Access Downloads](#), under either [Installations & Upgrades](#) or [Support Packages & Patches](#).
3. In the search box at the top of the page, enter **hanaimess**.
4. From the list of available downloads, select the desired version. See the Product Availability Matrix > Product Infrastructure Dependency pages for a version of Enterprise Semantic Services that is compatible with your product version.
5. Click the [Add Selected Items to Download Basket](#) icon.
6. Select [Download Basket](#) and select the ZIP file to download it.
7. Within the downloaded ZIP file, locate the .tgz file and click [Extract](#) to put it into a folder of your choice.

### Related Information

[SAP HANA smart data integration Product Availability Matrix](#) 

## 2.9.3 Importing the Enterprise Semantic Services Delivery Unit

To install Enterprise Semantic Services (ESS), import the downloaded ESS delivery unit.

You can import the delivery using one of two interfaces:

- SAP HANA studio
- SAP HANA Application Lifecycle Management

### Related Information

[Import the ESS Delivery Unit with SAP HANA Studio \[page 129\]](#)

[Import the ESS Delivery Unit with SAP HANA Application Lifecycle Management \[page 129\]](#)

## 2.9.3.1 Import the ESS Delivery Unit with SAP HANA Studio

How to import the Enterprise Semantic Services (ESS) delivery unit using SAP HANA studio.

### Prerequisites

You have already downloaded the ESS delivery unit.

### Procedure

1. Log in to SAP HANA studio as user SYSTEM.
2. In the upper left corner, click **File** > **Import**.
3. On the **Import** dialog, type **delivery unit** into the search box for *Select an import source*.
4. Click **Next**.
5. Select **<your SAP HANA Server name>** for the target system, and click **Next**.
6. Select the **HANAIMESS.tgz** file that you downloaded.
7. Click **Finish**.
8. In **Job Log** view, the status should be **Completed successfully**.

## 2.9.3.2 Import the ESS Delivery Unit with SAP HANA Application Lifecycle Management

How to import the Enterprise Semantic Services (ESS) delivery unit using SAP HANA Application Lifecycle Management.





### Prerequisites

You have already downloaded the ESS delivery unit.

### Context

For multitenant database deployment, import the delivery unit on a tenant database, not on the system database.

## Procedure

1. If not already granted, grant the role `sap.hana.xs.lm.roles::Administrator` to the user name you will use to log in to SAP HANA Application Lifecycle Management.
  - a. In SAP HANA studio *Systems* view, expand the name of your SAP HANA server and choose  *Security*  *Users*  *System* .
  - b. On the *Granted Roles* tab, click the green + icon in the upper left corner.
  - c. On the *Select Roles* dialog, type `lm` in the search string box.
  - d. Select role `sap.hana.xs.lm.roles::Administrator` and click *OK*.
2. Open SAP HANA Application Lifecycle Management by entering the following URL in a web browser:  
`<host name>:80<2-digit instance number>/sap/hana/xs/lm`
3. Log in with the user name you authorized in step 1.  
The first time you log in, a pop-up window appears asking you to enter a name for this server.
4. On the *Home* tab, click the *Delivery Units* tile.
5. Click *Import*.
6. Click *Browse*, navigate to where you downloaded the delivery unit, select the `.tgz` file, and click *Open*.
7. Click *Import*.

## Results

After successful import, the name of the delivery unit displays in the list on the left.

### 2.9.4 Install or Upgrade Enterprise Semantic Services (install.html)

After downloading and importing the Enterprise Semantic Services (ESS) delivery unit, install this component to enable semantic searches of data sources.

## Prerequisites

If you are upgrading ESS:

- Upgrade your SAP HANA instance if you need to upgrade to a new SPS revision.
- If installed, uninstall the DEMO delivery unit.
- If you are upgrading from a version earlier than 1.0 SP03 Rev0 (1.3.0), first uninstall Enterprise Semantic Services.



## Context

- If you have ESS version SPS01 Patch 1, also known as 1.0 SP00 Rev1, or earlier, follow the procedure that requires the installation script `install.xsjs`.
- If you have ESS version SPS01 Patch 2, also known as 1.0 SP01 Rev2, or later, follow this procedure, which requires the installation script `install.html`.

## Procedure

1. Access the ESS installation URL using the following structure:

- For SAP HANA 1.0:

`http://<hostname>:port/sap/hana/im/ess/setup/install.html`

- For SAP HANA 2.0:

`http://<tenant db name>.<hostname>:port/sap/hana/im/ess/setup/install.html`

Refer to the *SAP HANA Administration Guide* for more information on HTTP access requirements regarding SSL, port numbers, and multitenant database containers.

2. Log in with the SYSTEM user. If the SYSTEM user is not available, then use any other administrative user and assign it the `sap.hana.im.ess.roles.setup::SE_Installer` role for the duration of the installation.
3. On the Welcome page, click [Run ESS Setup](#).  
  
You can monitor the details of the installation status.
4. Enter a password for ESS technical users and click [Submit](#).
5. Ensure the `_HANA_IM_ESS`, `_HANA_IM_ESS_CTID` and `_HANA_IM_ESS_PROFILING` technical users have been created by the installation script in SAP HANA.

## Results

Successful installation is indicated with the message `Setup completed` including a status table that lists each setting.

At any point in the installation you can monitor its status by accessing the `install.html` URL. Any errors display with messages for corrective actions.

## Related Information

[Uninstall Enterprise Semantic Services \[page 133\]](#)

[Maintaining HTTP Access to SAP HANA \(SAP HANA Administration Guide\)](#)

## 2.9.5 Grant Enterprise Semantic Services Roles and Privileges to Users

After installing Enterprise Semantic Services, grant the necessary roles to the SAP HANA users who will interact directly or indirectly with Enterprise Semantic Services.

### Procedure

1. Log in to SAP HANA with a user name that has the *EXECUTE* privilege on the *GRANT\_ACTIVATED\_ROLE* procedure on the *Object Privileges* of the user.
2. In the *Systems* view, expand *Security* in one of the following database names:
  - If you are installing on SAP HANA Version 1.0, select *<your SYSTEM database name>* and expand *Security*.
  - If you are installing on SAP HANA Version 2.0, select *<your TENANT database name>* and expand *Security*.
3. Grant the appropriate role to each user by following these steps:
  - a. Double-click the user name.
  - b. On the *Granted Roles* tab, click the “+” icon in the upper left corner.
  - c. On the *Select Roles* dialog, type *ess* in the search string box.
  - d. Select the appropriate role for this user and click *OK*.

Option	Description
<i>sap.hana.im.ess.roles::Administrator</i>	For users who will access the Enterprise Semantic Services Administration user interface
<i>sap.hana.im.ess.roles::Publisher</i>	For users who will access the Enterprise Semantic Services publication API to define content to be published in the knowledge graph.
<i>sap.hana.im.ess.roles::User</i>	For users who will access the Enterprise Semantic Services consumption (read-only) APIs such as Search, Autocomplete, and content-type identification (CTID).

4. Alternatively, you can open the SQL console of the SAP HANA studio and execute the following statements:

```
CALL
  "_SYS_REPO"."GRANT_ACTIVATED_ROLE"( 'sap.hana.im.ess.roles::Administrator ',
  '<USER_NAME> ')
```

```
CALL "_SYS_REPO"."GRANT_ACTIVATED_ROLE"( 'sap.hana.im.ess.roles::Publisher ',
  '<USER_NAME> ')
```

```
CALL "_SYS_REPO"."GRANT_ACTIVATED_ROLE"( 'sap.hana.im.ess.roles::User ',
  '<USER_NAME> ')
```

## 2.9.6 Uninstall Enterprise Semantic Services

You can permanently uninstall Enterprise Semantic Services, for example in the case of an upgrade.

### Prerequisites

- If SAP Agile Data Preparation is installed, uninstall it first.
- Add the role `sap.hana.im.ess.role::Administrator` to the SYSTEM user or the user performing the uninstall.

### Procedure

1. Remove the delivery unit.
  - a. Enter the following URL in a web browser:  
`http://<<your_HANA_instance:port>>/sap/hana/xs/lm`
  - b. Choose ► *Products* ► *Delivery Units* ►.
  - c. Select *HANA\_IM\_ESS*.
  - d. Click *Delete*.
  - e. Click the checkbox *including objects and packages*.
  - f. Confirm the deletion.

2. Remove the ESS users.

In the Web-based Development Workbench or SAP HANA studio, drop the Enterprise Semantic Services users. For example, in SAP HANA studio, enter the following SQL statements:

```
DROP USER _HANA_IM_ESS CASCADE;  
DROP USER _HANA_IM_ESS_PROFILING CASCADE;  
DROP USER _HANA_IM_ESS_CTID CASCADE
```

3. Remove the schema.

In the Web-based Development Workbench or SAP HANA studio, drop the HANA\_IM\_ESS schema. For example, in SAP HANA studio, enter the following SQL statement:

```
DROP SCHEMA SAP_HANA_IM_ESS CASCADE;
```

## 2.10 Enable SAP HANA Smart Data Integration REST API

Use the SAP HANA smart data integration REST API to programmatically execute and monitor flowgraphs and to process data for interactive data transformation within your application.

For more information, see the *SAP HANA Smart Data Integration REST API Developer Guide*.

**Parent topic:** [Configure Smart Data Integration \[page 24\]](#)

**Previous:** [Enabling Enterprise Semantic Services \[page 125\]](#)

## 3 Configure Smart Data Quality

To take advantage of SAP HANA smart data quality functionality, you must perform a few tasks.

### Procedure

1. Add the `scriptserver` service to the SAP HANA tenant database.
2. Download and deploy the smart data quality directories.
3. Configure the operation cache.
4. Set monitoring alerts to inform you when the directories expire.

### Related Information

[Directories \[page 135\]](#)

[Add or Remove Services in a Tenant Database \(SAP HANA Administration Guide\)](#)

[Configuring the Operation Cache](#)

[Creating Monitoring Alerts](#)

[Monitoring Alerts \(SAP HANA Administration Guide\)](#)

### 3.1 Directories

Download and deploy directories to take advantage of smart data quality functionality.

### Context

The Cleanse and Geocode nodes rely on reference data found in directories that you download and deploy to the SAP HANA server.

If reference data isn't provided, the Cleanse node performs parsing, but doesn't perform assignment. Additionally, you're able to create and activate flowgraphs that include the Geocode node, but their execution fails.

You may need to download multiple directories, depending on your license agreement.

### i Note

Before you install your directories, stop the Script Server, and then restart it once the installation is complete. Make sure that you don't have any running flowgraph tasks.

## Related Information

[Install or Update Directories on the SAP HANA Host Using Lifecycle Manager \[page 136\]](#)

[Install or Update Directories from a Web Browser Using Lifecycle Manager \[page 138\]](#)

[Integrate Existing Directories into Lifecycle Manager \[page 141\]](#)

[Uninstall Directories \[page 144\]](#)

[Address Directories & Reference Data](#) 

## 3.1.1 Install or Update Directories on the SAP HANA Host Using Lifecycle Manager

Follow these steps the first time you install the directories on an SAP HANA host or update the directories after you have a release-dated folder.

### Procedure

1. Log into the SAP HANA machine.
2. Create a new folder for the directories. For example, `<filepath>/Directories`.

### i Note

The default location is where SAP HANA is installed. Choose a different directory path, so the directories and reference data are separate from the SAP HANA installation. If you decide to uninstall SAP HANA with the directories in the default path, then the directories are uninstalled also.

3. Set the directory folder owner to `sudo chown <sid>adm:sapsys/Directories`.

### i Note

In this document, when referring to the “sidadm”, the “sid” is lowercase. When referring to the “SID”, the “SID” is uppercase.

4. Open the SAP HANA Platform Lifecycle Management Web site `https://<hostname>:1129/lms1/HDBLCM/<SID>/index.html`. Log in with your `<sidadm>` user name and password.
5. Click [Download Components](#) and specify the download mode as [Download Archives on the SAP HANA Host](#), and then click [Next](#).
6. Enter your user ID and password, and click [Next](#).

Your user ID begins with an "S" followed by 10 digits and is tied to an account with active directories. For example, "S0123456789".

7. Click ► [Show Components](#) ► [Installable and Updatable Components](#) ►.
8. Select ► [Component Type](#) ► [Address Directories and Reference Data](#) ►.  
The list of directories that you can update or install appears. Select the directory and reference data to install or update. Click [Next](#).
9. If you're updating the directories, you can skip this step because the path is already set. Otherwise, enter the directory path that you created in steps 2. Click [Next](#).  
The directories are in a compressed file that must be extracted. You can specify the same extract directory as the download directory.

### Note

10. Verify the settings in the summary, then click [Download](#).
11. After you've downloaded and extracted the directories, click [Prepare Update](#).
12. On the [Select Components](#) window, choose the data to install or update and click [Next](#).
13. In the [Specify Authorization](#) window, enter the system administrator password, database user name, and database user password. Click [Next](#) until you get to the [Define Reference Data Properties](#) window.
14. In the [Define Reference Data Properties](#) window, set the installation path for address directories and reference data. For example, `<filepath>/Directories/installed`. The location you specify here is the reference data path. Click [Next](#).
15. On the [Review & Confirm](#) window, verify that the information is correct and then click [Update](#).
16. Click [Close](#) to return to the [Lifecycle Manager](#) window.
17. (Optional) To verify that the directory is installed, open SAP HANA Studio and connect to the SYSTEM database.
18. Right-click on the system name and select ► [Configuration and Monitoring](#) ► [Open Administration](#) ►.
19. On the Configuration tab, enter **dq** in the filter and press **Enter**.

The `dq_reference_data_path` is set with the reference data path you defined under the [Default](#) column. This path automatically has a dated folder at the end. For example, `<filepath>/Directories/2017-07/`.

20. (Optional) To delete old directory data, open a file browser and navigate to the directory location. Select the old release-dated folder and press [Delete](#).

### Caution

Some directory data is updated monthly and other directory data is updated quarterly. Therefore, the monthly release folders can contain a link to the directories in an older release folder rather than to the actual directory data. Before deleting, be sure that those directories aren't in use.

21. Configure the operations cache to improve performance. See "Configuring the Operation Cache" in the *SAP HANA Smart Data Integration and Smart Data Quality Administration Guide*.
22. Set alerts to be notified of when the directories expire. Configure monitoring alerts from SAP HANA cockpit. For more information, see "Monitoring Alerts" in the *SAP HANA Administration Guide*.

## Related Information

[Configuring the Operation Cache](#)  
[Creating Monitoring Alerts](#)

### 3.1.2 Install or Update Directories from a Web Browser Using Lifecycle Manager

Follow these steps the first time you install the directories using a web browser or update the directories using a web browser after you have a release-dated folder.

#### Procedure

1. Log into the SAP HANA machine.
2. Create a new folder for the directories. For example, `<filepath>/Directories`.

##### i Note

The default location is where SAP HANA is installed. Choose a different directory path, so the directories and reference data are separate from the SAP HANA installation. If you decide to uninstall SAP HANA with the directories in the default path, then the directories are uninstalled also.

3. Set the directory folder owner to `sudo chown <sid>adm:sapsys/Directories`.

##### i Note

In this document, when referring to the “sidadm”, the “sid” is lowercase. When referring to the “SID”, the “SID” is uppercase.

4. Open the SAP HANA Platform Lifecycle Management Web site `https://<hostname>:1129/lms1/HDBLCM/<SID>/index.html`. Log in with your `<sidadm>` user name and password.
5. Click [Download Components](#) and specify the download mode as [Download Archives via the Web Browser](#), and then click [Next](#).
6. Enter your user ID and password, and click [Next](#).  
  
Your user ID begins with an “S” followed by 10 digits and is tied to an account with active directories. For example, “S0123456789”.
7. Click [Show Components](#) [Installable and Updatable Components](#).
8. Select [Component Type](#) [Address Directories and Reference Data](#).  
  
The list of directories that you can install or update appears. Select the directory and reference data to install or update. Click [Next](#).
9. Click [Download](#). If there are multiple directories, click [Download All](#). Wait for the directories to complete downloading.



10. Click [Upload/Extract Components](#).
11. Choose one of the methods:
  - [The Archives are Accessible from the SAP HANA Host](#). Copy the Address Directories to a location that can be accessed by the <sidadm>. We recommend that the <sidadm> creates this directory, so the permissions are correct.
  - [Upload Archives to the SAP HANA Host](#). See the steps for uploading archives in the topic [Upload Archives to the SAP HANA Host \[page 140\]](#).
12. Enter the shared location.

#### **i** Note

If the location box turns red, either there's an invalid path or the location doesn't have the required permission for the <sidadm>.

13. Click Next to extract the Address Directories.

#### **i** Note

If the location box turns red, either there's an invalid path or the location doesn't have the required permission for the <sidadm>.

14. Review and confirm the information, and then click [Next](#).
15. Click [Close](#) after the [Upload/Extract Components](#) is finished.
16. Click [Install or Update Additional Components](#).
17. Click [Add Software Locations](#).
18. Enter the path to the extracted folder from the previous step, and then click [Search also in Subfolder](#). Click [Next](#).
19. Select the Address Directories that you want to install or click [Select All](#).

#### **i** Note

If a warning about "too loose permissions" is shown, you may ignore the message.

20. Enter the system administrator password, database user name, and database user password in the [Specify Authorization](#) window.
21. Set the installation path for address directories and reference data in the [Define Reference Data Properties](#) window. For example, <filepath>/Directories/installed. The location you specify here is the reference data path. Click [Next](#).
22. Verify that the information is correct on the [Review & Confirm](#) window, and then click [Update](#).
23. Click [Close](#) to return to the Lifecycle Manager window.

## Next Steps

To verify that the directories are installed:

1. Open SAP HANA Studio and connect to the SYSTEM database.
2. Right-click the system name and select ► [Configuration and Monitoring](#) ► [Open Administration](#) ►.

3. Type **dq** in the filter on the Configuration tab, and then press [Enter](#).  
The `dq_reference_data_path` is set with the reference data path you defined under the [Default](#) column. This path automatically has a dated folder at the end. For example, `<filepath>/Directories/2017-07/`.
4. If you use Operation Caches, we recommend that you restart them:

#### Sample Code

```
ALTER SYSTEM ALTER CONFIGURATION ('scriptserver.ini', 'SYSTEM') SET  
  
('adapter_operation_cache', 'enable_adapter_operation_cache') = 'no' WITH  
RECONFIGURE
```

#### Sample Code

```
ALTER SYSTEM ALTER CONFIGURATION ('scriptserver.ini', 'SYSTEM') SET  
  
('adapter_operation_cache', 'enable_adapter_operation_cache') = 'yes' WITH  
RECONFIGURE
```

## Related Information

[Upload Archives to the SAP HANA Host \[page 140\]](#)

### 3.1.2.1 Upload Archives to the SAP HANA Host

If you installed or updated directories from a web browser using Lifecycle Manager and want to upload the archives to the SAP HANA Host, follow these steps.

## Procedure

1. Click [Select Archives for Upload](#). Enter the path to the location where the Address Directories were downloaded and select all ZIP files.
2. Click [Upload](#).
3. Confirm the [Temporary Extract Path](#), and then click [Next](#).

#### Note

Make a note of this path, because you'll use it when adding software locations.

4. Click [Extract](#), and then [Close](#).
5. Click [Install or Update Additional Components](#).

6. Click [Add Software Locations](#), and enter the [Temporary Extract Path](#) from the earlier step.
7. Click the [Search also in subfolders](#) checkbox, and then click [Add](#).
8. Click [Next](#).
9. Click the Address Directories you want to install or click [Select All](#), and then click [Next](#).

#### **i** Note

If a warning about “too loose permissions” is shown, you can ignore the message.

10. Enter the system administrator password, database user name, and database user password in the [Specify Authorization](#).
11. Set the installation path for address directories and reference data in the [Define Reference Data Properties](#) window. For example, <filepath>/Directories/installed. The location you specify here is the reference data path. Click [Next](#).
12. Verify that the information is correct on the [Review & Confirm](#) window, and then click [Update](#).
13. Click [Close](#) to return to the [Lifecycle Manager](#) window.

## Next Steps

You can verify that the directories are installed by following the instructions at the end of the [Install or Update Directories from a Web Browser Using Lifecycle Manager \[page 138\]](#) topic.

## 3.1.3 Integrate Existing Directories into Lifecycle Manager

If you downloaded your directories from the Support Portal using Download Manager, use this procedure to update your directories.

### Prerequisites

You've downloaded your directories from the Support Portal.

### Context

Lifecycle Manager organizes your reference data to make installing and updating your directories easier by creating release-dated folders.

## Procedure

1. Open SAP HANA Studio and connect to the SYSTEM database.
2. On the *Configuration* tab, enter **dq** in the filter, and press **Enter**.
  - If a path is empty for the System and Databases columns, then continue to the next step.
  - If the paths for the System and Databases columns are different from each other, then update the System column to be the master reference data path by double-clicking the value in the System column. In the System section, enter the path in the *New Value* option. Delete any paths in the *New Value* option under the Databases section.

### i Note

If you have multiple tenants that require different reference data paths, you can manage them outside of SAP HANA Lifecycle Manager.

3. Log into the SAP HANA machine.
4. Create a new folder for the directories. For example, `<filepath>/Directories`.

### i Note

Choose a different directory path from the location where SAP HANA is installed. Separate locations ensure that the directories and reference data are separate from the SAP HANA installation. If you decide to uninstall SAP HANA with the directories in the same path as SAP HANA, then the directories are uninstalled also.

5. Set the directory folder owner to `sudo chown <sid> adm:sapsys/Directories`.

### i Note

In this document, when referring to the “sidadm”, the “sid” is lowercase. When referring to the “SID”, the “SID” is uppercase.

6. Open the SAP HANA Platform Lifecycle Management Web site `https://<hostname>:1129/lmsl/HDBLCM/<SID>/index.html`. Log in with your `<sidadm>` username and password.
7. Click *Download Components* and specify the download mode.
8. Enter your user ID and password, and click *Next*.

Your user ID begins with an “S”, followed by 10 digits, and it’s tied to an account with active directories. For example, “S0123456789”.

9. Click ► *Show Components* ► *Installable and Updatable Components* ►.
10. Select ► *Component Type* ► *Address Directories and Reference Data* ►.

The list of directories that you can update or install appears. Select the directory and reference data to install or update. Click *Next*.

11. If you’re updating the directories, you can skip this step, because the path is already set. Otherwise, enter the directory path that you created in steps 4 through 5. Click *Next*.

The directories are in a compressed file that must be extracted. You can specify the same extract directory as the download directory.

### i Note

12. Verify the settings in the summary, then click [Download](#).
13. After you've downloaded and extracted the directories, click [Prepare Update](#).
14. On the [Select Components](#) window, choose the data to install or update and click [Next](#).
15. In the [Specify Authorization](#) window, enter the system administrator password, database user name, and database user password. Click [Next](#) until you get to the [Define Reference Data Properties](#) window.
16. In the [Define Reference Data Properties](#) window, set the installation path for address directories and reference data. For example, `<filepath>/Directories/installed`. Use the path that you specified at the beginning of this procedure. The location you specify here is the reference data path. Click [Next](#).

#### Note

If you have set the path at the beginning of this procedure, you may not see this window.

17. On the [Review & Confirm](#) window, verify that the information is correct and then click [Update](#).
18. Click [Close](#) to return to the [Lifecycle Manager](#) window.
19. (Optional) To verify that the directory is installed, open SAP HANA Studio and connect to the SYSTEM database.
20. (Optional) On the [Configuration](#) tab, enter `dq` in the filter and press [Enter](#).

The `dq_reference_data_path` is set with the reference data path you defined under the [Default](#) column. This path automatically has a dated folder at the end. For example, `<filepath>/Directories/2017-07/`.

21. (Optional) To delete old directory data, open a file browser, and navigate to the directory location. Select the old release-dated folder and press [Delete](#).

#### Caution

Some directory data is updated monthly and other directory data is updated quarterly. Therefore, the monthly release folders may contain a link to the directories in an older release folder, rather than to the actual directory data. Before deleting, be sure that those directories aren't in use.

22. Configure the operations cache to improve performance. See "Configuring the Operation Cache" in the *SAP HANA Smart Data Integration and Smart Data Quality Administration Guide*.
23. Set alerts to be notified of when the directories expire. Configure monitoring alerts from the SAP HANA cockpit. For more information, see "Monitoring Alerts" in the *SAP HANA Administration Guide*.

## Related Information

[Configuring the Operation Cache](#)  
[Creating Monitoring Alerts](#)

## 3.1.4 Uninstall Directories

When you're finished using the directory information, you can uninstall the directories from the system.

### Procedure

1. Open SAP HANA Studio and connect to the SAP HANA Server as the SYSTEM user.
2. Right-click the system name and select ► [Configuration and Monitoring](#) ► [Open Administration](#) ►.
3. Click the [Configuration](#) tab and type `dq` in the [Filter](#) option.  
The `dq_reference_data_path` in the `scriptserver.ini` file appears in the list. Make a note of the system path. For example, `/<filepath>/Directories/installed/2017-05/`.
4. Right-click `dq_reference_data_path`, and then click [Delete](#).
5. Select the system, and then click [Delete](#).
6. Open a file browser and delete the folder that was in the `dq_reference_data_path`.
7. (Optional) To verify that the directories were deleted, click ► [View System Information](#) ► [Installed Components](#) ►.

## 4 Update Smart Data Integration

When updating your SAP HANA Smart Data Integration landscape to a new version, consider the steps that must be taken for each component.

[Update the Data Provisioning Agent \[page 145\]](#)

Update the Data Provisioning Agent by running the installation program in update mode.

[Install or Upgrade Enterprise Semantic Services \(install.html\) \[page 148\]](#)

After downloading and importing the Enterprise Semantic Services (ESS) delivery unit, install this component to enable semantic searches of data sources.

### Related Information

## 4.1 Update the Data Provisioning Agent

Update the Data Provisioning Agent by running the installation program in update mode.

### Prerequisites

Before you update the Data Provisioning Agent, ensure that your SAP HANA server has already been updated to the same revision.

If your agent has remote source subscriptions for real-time data capture, you must also suspend capture before upgrading the agent. To suspend active remote source subscriptions, use the SQL console in the SAP HANA Studio or Web-based Development Workbench:

```
ALTER REMOTE SOURCE <remote_source_name> SUSPEND CAPTURE
```

#### Note

To verify the success of the upgrade for log reader adapters, set the adapter framework logging level to **INFO**. To change the adapter framework logging level, choose **Preferences > Adapter Framework > Logging Level** in the SAP HANA Data Provisioning Agent Configuration tool.

## Procedure

1. Download and extract the software to an empty directory.
2. Stop the existing SAP HANA Data Provisioning Agent service.
  - On Windows, use the Services manager in Control Panel.
  - On Linux, navigate to `<DPAgent_root>/bin`, and run `./dpagent_service.sh stop`.

### Note

Stop the service using the Data Provisioning Agent installation owner. The installation owner is the same user that is used to start the agent service.

3. Navigate to the directory where you unpacked the software.
4. Call the installation manager.
  - On Windows, right-click on `hdbsetup.exe` and choose *Run as administrator*.
  - On Linux, run `./hdbsetup`.  
Use the same user and privileges as the original installation owner.  
For example, if `sudo` was used during the original installation, log in as the installation owner and run `sudo ./hdbsetup`. If you call the installation manager with a different user or privileges, the existing installation may not be recognized.

### Tip

To upgrade the agent in command-line mode, use `hdbinst.exe` on Windows or `./hdbinst` on Linux.

5. Choose *Update SAP HANA Data Provisioning Agent* and select the path of the existing agent that you want to update.  
  
In command-line mode, enter the number of the existing agent as listed by the installation program.
6. On Windows, specify the unique agent name and the agent service username and password.  
You can specify a new unique name or use the same one as before, but it must be different than any names already used by other agent instances on the same host system.
7. On Linux, start the agent service.

### Tip

On Windows, the agent service is re-created and started automatically.

### Note

Start the service using the Data Provisioning Agent installation owner. The installation owner is the same user that is normally used to start the agent service.

- a. Navigate to the `<DPAgent_root>/bin` directory.
  - b. Run `./dpagent_service.sh start`.
8. Apply new adapter capabilities.

To allow SAP HANA to detect any new adapter capabilities, use the SQL console.

- a. Retrieve a list of the adapters configured in your environment.

```
select * from "SYS"."ADAPTERS" where "IS_SYSTEM_ADAPTER" like 'FALSE'
```



- b. Refresh each adapter listed by the previous command.

```
ALTER ADAPTER "<adapter_name>" REFRESH AT LOCATION AGENT"<agent_name>"
```

### Note

If you have multiple agents in your SAP HANA environment, refresh each adapter only a single time with an upgraded agent. Refreshing the adapters with each agent isn't necessary.

## Results

The Data Provisioning Agent is updated to the new version.

## Next Steps

### → Tip

After updating the Data Provisioning Agent, we recommend that you review the update log file for any errors, and take any necessary corrective actions.

If you suspended capture for remote source subscriptions on the agent, you can now resume capture.

### ⚠ Caution

Before resuming capture, you must first upgrade all agents in your SAP HANA environment. If you haven't upgraded all agents, do that first and then return to this section.

After all agents have been upgraded, use the SQL console to resume capture:

```
ALTER REMOTE SOURCE <remote_source_name> RESUME CAPTURE
```

Repeat the command for each remote source subscription in your environment.

### → Tip

After you resume a remote source subscription, additional automatic upgrade steps take approximately 10 minutes to complete. To verify that the process has completed successfully, view the Data Provisioning Agent framework log:

- When the adapter upgrade has been completed, you should see the message  
`<remote_source_name> has been upgraded successfully.`
- When the real-time replication has been resumed, you should see the message  
`<remote_source_name> is resumed successfully.`

## 4.2 Install or Upgrade Enterprise Semantic Services (install.html)

After downloading and importing the Enterprise Semantic Services (ESS) delivery unit, install this component to enable semantic searches of data sources.

### Prerequisites

If you are upgrading ESS:

- Upgrade your SAP HANA instance if you need to upgrade to a new SPS revision.
- If installed, uninstall the DEMO delivery unit.
- If you are upgrading from a version earlier than 1.0 SP03 Rev0 (1.3.0), first unininstall Enterprise Semantic Services.

### Context

- If you have ESS version SPS01 Patch 1, also known as 1.0 SP00 Rev1, or earlier, follow the procedure that requires the installation script `install.xsjs`.
- If you have ESS version SPS01 Patch 2, also known as 1.0 SP01 Rev2, or later, follow this procedure, which requires the installation script `install.html`.

### Procedure

1. Access the ESS installation URL using the following structure:

- For SAP HANA 1.0:  
`http://<hostname>:port>/sap/hana/im/ess/setup/install.html`
- For SAP HANA 2.0:  
`http://<tenant db name>.<hostname>:port>/sap/hana/im/ess/setup/install.html`

Refer to the *SAP HANA Administration Guide* for more information on HTTP access requirements regarding SSL, port numbers, and multitenant database containers.

2. Log in with the SYSTEM user. If the SYSTEM user is not available, then use any other administrative user and assign it the `sap.hana.im.ess.roles.setup:SE_Installer` role for the duration of the installation.
3. On the Welcome page, click [Run ESS Setup](#).  
  
You can monitor the details of the installation status.
4. Enter a password for ESS technical users and click [Submit](#).
5. Ensure the `_HANA_IM_ESS`, `_HANA_IM_ESS_CTID` and `_HANA_IM_ESS_PROFILING` technical users have been created by the installation script in SAP HANA.

## Results

Successful installation is indicated with the message `Setup completed` including a status table that lists each setting.

At any point in the installation you can monitor its status by accessing the `install.html` URL. Any errors display with messages for corrective actions.

## Related Information

[Uninstall Enterprise Semantic Services \[page 133\]](#)

[Maintaining HTTP Access to SAP HANA \(SAP HANA Administration Guide\)](#)

# 5 Uninstall Smart Data Integration

To uninstall SAP HANA Smart Data Integration, perform the required uninstallation tasks for each component in the landscape.

[Uninstall the Data Provisioning Agent \[page 150\]](#)

Uninstall the Data Provisioning Agent from a host system using the uninstallation manager.

[Uninstall Enterprise Semantic Services \[page 152\]](#)

You can permanently uninstall Enterprise Semantic Services, for example in the case of an upgrade.

## Related Information

### 5.1 Uninstall the Data Provisioning Agent

Uninstall the Data Provisioning Agent from a host system using the uninstallation manager.

#### Context

The uninstallation manager supports graphical and command-line modes on Windows and Linux platforms.

#### Procedure

- Uninstall the agent from a Windows host in graphical mode.

Call the uninstallation manager from the Control Panel:

► *Programs and Features* ► *SAP HANA Data Provisioning Agent* ► *Uninstall* ►

- Uninstall the agent from a Windows host in command-line mode.

- a. Navigate to the `<DPAgent_root>/install` directory.

For example, `C:\usr\sap\dataprovagent\install`.

- b. Call the installation manager.

`hdbuninst.exe --path "<DPAgent_root>"`

- Uninstall the agent from a Linux host in graphical or command-line mode.

- a. Navigate to the `<DPAgent_root>/install` directory.

For example, `/usr/sap/dataprovagent/install`.

- b. Call the uninstallation manager.
  - For graphical mode: `./hdbuninst --main SDB::Install::App::Gui::Uninstallation::main --path "<DPAgent_root>"`
  - For command-line mode: `./hdbuninst --path "<DPAgent_root>"`

#### → Tip

To ensure that all installation entries are removed correctly, use the same user and privileges as the original installation owner.

For example, if `sudo` was used during the original installation, log in as the installation owner and run `sudo ./hdbuninst <...>`.

## Results

The Data Provisioning Agent is uninstalled from the system.

## Next Steps

After uninstalling the agent, several files and directories generated by the agent during runtime are left in place. If you choose, you can safely remove these remaining files and directories manually.

Remove the following files and directories from `<DPAgent_root>`:

- `configTool/`
- `configuration/`
- `install/`
- `log/`
- `LogReader/`
- `workspace/`

## 5.2 Uninstall Enterprise Semantic Services

You can permanently uninstall Enterprise Semantic Services, for example in the case of an upgrade.

### Prerequisites

- If SAP Agile Data Preparation is installed, uninstall it first.
- Add the role `sap.hana.im.ess.role::Administrator` to the SYSTEM user or the user performing the uninstall.

### Procedure

1. Remove the delivery unit.
  - a. Enter the following URL in a web browser:  
`http://<<your_HANA_instance:port>>/sap/hana/xs/lm`
  - b. Choose **Products** > **Delivery Units**.
  - c. Select `HANA_IM_ESS`.
  - d. Click **Delete**.
  - e. Click the checkbox *including objects and packages*.
  - f. Confirm the deletion.

2. Remove the ESS users.

In the Web-based Development Workbench or SAP HANA studio, drop the Enterprise Semantic Services users. For example, in SAP HANA studio, enter the following SQL statements:

```
DROP USER _HANA_IM_ESS CASCADE;  
DROP USER _HANA_IM_ESS_PROFILING CASCADE;  
DROP USER _HANA_IM_ESS_CTID CASCADE
```

3. Remove the schema.

In the Web-based Development Workbench or SAP HANA studio, drop the HANA\_IM\_ESS schema. For example, in SAP HANA studio, enter the following SQL statement:

```
DROP SCHEMA SAP_HANA_IM_ESS CASCADE;
```

## 6 Configure Data Provisioning Adapters

Data provisioning adapters can connect to a variety of sources to move data into SAP HANA, and well as other use cases.

The adapters in the following table are delivered with the Data Provisioning Agent. For information about configuring your adapter, see the documentation about each adapter in this guide.

### **i** Note

Before configuring your adapters and remote sources, make sure that the Data Provisioning Agent is configured and that the necessary JDBC libraries are installed.

For information about using adapters for replication or transformation, see the *Modeling Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality*.

If the source you're using isn't covered by the adapters listed, use the Adapter SDK to create custom adapters to suit your needs. See the *Adapter SDK Guide for SAP HANA Smart Data Integration* for more information.

See the Product Availability Matrix for information about supported versions.

Adapter Name	Description
ABAPAdapter	Retrieves data from virtual tables through RFC for ABAP tables and ODP extractors. It also provides change data capture for ODP extractors.
ASEAdapter	Retrieves data from SAP ASE. It can also receive changes that occur to tables in real time. You can also write back to a virtual table.
AseECCAdapter	Retrieves data from an SAP ERP system running on SAP ASE. It can also receive changes that occur to tables in real time.
BWAdapter	This adapter is available for use only with SAP Agile Data Preparation.
CamelAccessAdapter	Retrieves data from a Microsoft Access source. The Camel Access adapter is a predelivered component that is based on the Apache Camel adapter.
CamelFacebookAdapter	The Camel Facebook adapter is a predelivered component that is based on the Apache Camel adapter. Use the Camel Facebook component to connect to and retrieve data from Facebook.
CamelInformixAdapter	Retrieves data from an Informix source. It can also write back to an Informix virtual table. The Camel Informix adapter is a predelivered component that is based on the Camel adapter.
CamelJdbcAdapter	<p>The Camel JDBC adapter is a predelivered component that is based on the Apache Camel adapter.</p> <p>Use the Camel JDBC adapter to connect to most databases for which SAP HANA smart data integration doesn't already provide a predelivered adapter.</p> <p>In general, the Camel JDBC adapter supports any database that has SQL-based data types and functions, and a JDBC driver.</p>
CassandraAdapter	Retrieves data from an Apache Cassandra remote source. You can also write to an Apache Cassandra target.

Adapter Name	Description
CloudDataIntegrationAdapter	This adapter is available for use only with SAP Data Warehouse Cloud.
DB2ECCAdapter	Retrieves data from an SAP ERP system running on IBM DB2. It can also receive changes that occur to tables in real time. The only difference between this adapter and the DB2LogReaderAdapter is that this adapter uses the data dictionary in the SAP ERP system when browsing metadata.
DB2LogReaderAdapter	Retrieves data from IBM DB2. It can also receive changes that occur to tables in real time. You can also write back to a virtual table.
DB2MainframeAdapter	Retrieves data from IBM DB2 for z/OS. IBM DB2 iSeries, formerly known as AS/400, is also supported.
ExcelAdapter	Retrieves data from Microsoft Excel.  You can also access SharePoint source data.
FileAdapter	Retrieves data from formatted text files. You can also write back to a virtual table.  You can also access SharePoint source data, as well as write to an HDFS target file.
FileAdapterDatastore SFTPAdapterDatastore	File datastore adapters use the SAP Data Services engine as the underlying technology to read from a wide variety of sources.
HanaAdapter	This adapter provides real-time changed-data capture capability in order to replicate data from a remote SAP HANA database to a target SAP HANA database. You can also write back to a virtual table. Use this adapter to extract data from an ECC on an SAP HANA source.
HiveAdapter	Retrieves data from HADOOP.
ImpalaAdapter	Retrieves data from an Apache Impala source. The Apache Impala adapter is a predelivered component that is based on the Apache Camel adapter.
MssqlECCAdapter	Retrieves data from an SAP ERP system running on Microsoft SQL Server. It can also receive changes that occur to tables in real time. The only difference between this adapter and the MssqlLogReaderAdapter is that this adapter uses the data dictionary in the SAP ERP system when browsing metadata.
MssqlLogReaderAdapter	Retrieves data from Microsoft SQL Server. It can also receive changes that occur to tables in real time, be it through log reading or triggers. You can also write back to a virtual table.
ODataAdapter	Retrieves data from an OData service. You can also write to an OData target.
OpenConnectorAdapter	This adapter is available for use only with SAP Data Warehouse Cloud.
OracleECCAdapter	Retrieves data from an SAP ERP system running on Oracle. It can also receive changes that occur to tables in real time. The only difference between this adapter and the OracleLogReaderAdapter is that this adapter uses the data dictionary in the SAP ERP system when browsing metadata.
OracleLogReaderAdapter	Retrieves data from Oracle. It can also receive changes that occur to tables in real time, be it through log reading or triggers. You can also write back to a virtual table.
OutlookAdapter	Retrieves data from Microsoft Outlook.
PostgreSQLLogReaderAdapter	Use this adapter to batch-load or replicate change data in real time from a PostgreSQL database to SAP HANA.



Adapter Name	Description
SDIDB2MainframeLog-ReaderAdapter	This adapter provides real-time replication functionality for DB2 for z/OS sources.
	<b>i Note</b> This adapter is referred to in the documentation as “SDI DB2 Mainframe” adapter. Also, this adapter is similar to the “DB2 Mainframe” adapter, in name and functionality. The main difference between this adapter and the “DB2 Mainframe” adapter is that the “SDI DB2 Mainframe” adapter supports real-time replication.
SoapAdapter	This adapter is a SOAP web services client that can talk to a web service using the HTTP protocol to download the data. The SOAP adapter uses virtual functions instead of virtual tables to expose server-side operations as it closely relates to how the operation is invoked.
TeradataAdapter	Retrieves data from Teradata. It can also receive changes that occur to tables in real time. You can also write back to a virtual table.
TwitterAdapter	Retrieves data from Twitter. It can also receive new data from Twitter in real time.

### i Note

Data provisioning adapters allow specifying virtual IP addresses for source systems as a parameter for the remote source, and they allow changing the virtual IP addresses when the remote source is suspended.

## Strong Encryption for Security and Authentication

If you're using either TLS/SSL or Kerberos, and you require stronger encryption than 128-bit key length, you must update the existing JCE policy files.

## Related Information

[Configure Adapter Preferences \[page 156\]](#)

[Custom Adapters \[page 157\]](#)

[Apache Camel Facebook \[page 158\]](#)

[Apache Camel Informix \[page 160\]](#)

[Apache Camel JDBC \[page 163\]](#)

[Apache Camel Microsoft Access \[page 169\]](#)

[Apache Cassandra \[page 172\]](#)

[Apache Impala \[page 181\]](#)

[File \[page 187\]](#)


[File Datastore Adapters \[page 222\]](#)

[Hive \[page 244\]](#)

[IBM DB2 Log Reader \[page 254\]](#)

[IBM DB2 Mainframe \[page 283\]](#)

[Microsoft Excel \[page 288\]](#)

[Microsoft Outlook \[page 299\]](#)  
[Microsoft SQL Server Log Reader \[page 301\]](#)  
[OData \[page 344\]](#)  
[Oracle Log Reader \[page 349\]](#)  
[PostgreSQL Log Reader \[page 396\]](#)  
[SAP ABAP \[page 405\]](#)  
[SAP ASE \[page 419\]](#)  
[SAP ECC \[page 424\]](#)  
[SAP HANA \[page 442\]](#)  
[SDI DB2 Mainframe \[page 460\]](#)  
[SOAP \[page 478\]](#)  
[Teradata \[page 481\]](#)  
[Twitter \[page 491\]](#)  
[Modeling Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality Adapter Functionality](#)  
[Update JCE Policy Files for Stronger Encryption \[page 518\]](#)  
[Data Provisioning Adapter SDK Guide](#)  
[SAP HANA Smart Data Integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)  
  
[Register Data Provisioning Adapters \[page 111\]](#)

## 6.1 Configure Adapter Preferences

Use the `configAdapters` function of the Data Provisioning Agent configuration tool to adjust adapter settings specific to your sources.

### Procedure

1. At the command line, navigate to `<DPAgent_root>/bin`.
2. Start the configuration tool with the `configAdapters` parameter.
  - On Windows, **`agentcli.bat --configAdapters`**
  - On Linux, **`./agentcli.sh --configAdapters`**
3. Select **2** to enter the *Set Adapter Preferences* menu.

#### **i** Note

Select **1** if you want to display the current preferences instead of changing the configured values.

4. Select the entry for the adapter that you want to configure.
5. Specify values for the preferences for your adapter.

## 6.1.1 Configure Adapter Preferences in Discrete Command Mode

Use the `configAdapters` function of the Data Provisioning Agent configuration tool to adjust adapter settings specific to your sources.

Configure one or more adapter preferences by specifying the adapter configuration function and the adapter preferences as additional `function` parameters.

For example, to configure adapter preferences for the File Adapter:

```
./agentcli.sh --configAdapters --function setFileAdapter -
DAdapterHashedToken.password=<password_file>
```

```
./agentcli.sh --configAdapters --function setFileAdapter -
DUI.config.rootdir=<root_directory> -
DUI.config.fileformatdir=<file_format_directory> -
DAdapterHashedToken.password=<password_file>
```

### i Note

For security, you must use a password file to set passwords in discrete command mode. Save the password in a file and specify the location of the file as the value for the password preference.

## Available Adapter Functions and Preferences

- To display a list of available adapter configuration functions, use the `help` function.

```
./agentcli.sh --configAdapters --help
```

The configuration tool displays the configuration function for each available adapter.

- To display a list of available preferences for an adapter, specify the adapter function name with the `help` parameter.

```
./agentcli.sh --configAdapters --function <adapter_function> --help
```

The configuration tool displays the available configuration preferences, prerequisites, and a configuration example for the specified adapter.

## 6.2 Custom Adapters

Use the Adapter SDK to create your own custom adapters.

The adapters described in this document that come installed with the Data Provisioning Agent were created using the Adapter SDK.

You can use the Adapter SDK to create your own custom adapters to connect to virtually any source. An administrator then registers the custom adapter on the appropriate agent.

## Related Information

[Data Provisioning Adapter SDK Guide](#)

[Register Data Provisioning Adapters \[page 111\]](#)

## 6.3 Apache Camel Facebook

Overview of this SAP HANA Smart Data Integration adapter's features and functionality

The Apache Camel Facebook adapter is created based on Camel Adapter. The adapter uses the Facebook component (<http://camel.apache.org/facebook.html>) to access Facebook APIs. Facebook data of the configured Facebook user such as friends, families, and movies, are exposed to SAP HANA server by virtual tables by the Camel Facebook Adapter.

This adapter supports the following functionality:

- Virtual table as a source
- CAP\_SELECT

## Related Information

[Set up the Camel Facebook Adapter \[page 158\]](#)

[Camel Facebook Adapter Remote Source Configuration \[page 159\]](#)

### 6.3.1 Set up the Camel Facebook Adapter

By default, Camel Facebook Adapter is not available in Data Provisioning Agent. To use it, you must perform setup tasks.

## Procedure

1. Open `<DPAgent_root>/camel/adapters.xml` and uncomment the configuration of Camel Facebook Adapter.

```
<Adapter type="CamelFacebookAdapter" displayName="Camel Facebook Adapter">
```

```

<RemoteSourceDescription>
  <PropertyGroup name="configuration" displayName="Configuration"/>
  <CredentialEntry name="app_credential" displayName="App Credential"
userDisplayName="App ID" passwordDisplayName="App Secret"/>
  <CredentialEntry name="user_credential" displayName="User Credential"
userDisplayName="User ID" passwordDisplayName="User Access Token"/>
</RemoteSourceDescription>
<Capabilities>
  CAP_SELECT,
  CAP_WHERE,
  CAP_SIMPLE_EXPR_IN_WHERE,
  CAP_EXPR_IN_WHERE,
  CAP_NESTED_FUNC_IN_WHERE,
  CAP_METADATA_DICTIONARY,
  CAP_METADATA_ATTRIBUTE
</Capabilities>
<RouteTemplate>facebook.xml</RouteTemplate>
</Adapter>

```

2. Download the Facebook Component JAR file, which is located in the Apache Camel ZIP file, and put it in the `<DPAgent_root>/camel/lib` directory.
3. Download Facebook4J, and put it in the `<DPAgent_root>/camel/lib` directory.

#### Note

See the SAP HANA Smart Data Integration Product Availability Matrix for information about version compatibility with these downloads.

## Related Information

[Product Availability Matrix](#) ➡

[Facebook4J](#) ➡

[Apache Camel downloads](#) ➡

## 6.3.2 Camel Facebook Adapter Remote Source Configuration

Configuration settings for accessing a Camel Facebook source. Also included is sample code for creating a remote source using the SQL console.

The Camel Facebook adapter has the following remote source configuration parameters. You use all of these parameters to configure Facebook component options; See `<DPAgent_root>/camel/facebook.xml`. If you need to specify non-default values for Facebook component options, you can add more remote source parameters in the adapter configuration in `adapters.xml`, and update the Facebook component bean in `<DPAgent_root>/camel/facebook.xml` accordingly. See <http://camel.apache.org/facebook.html> ➡ for a complete list of these options.

Facebook requires the use of OAuth for all client application authentication. To use the Camel Facebook adapter with your account, you need to create a new application within Facebook at <https://developers.facebook.com/apps> ➡ and grant the application access to your account. The Facebook application's ID and secret allow access to Facebook APIs that do not require a current user. A user access

token is required for APIs that require a logged in user. You can find more information about obtaining a user access token at <https://developers.facebook.com/docs/facebook-login/access-tokens/> .

Category	Option	Description
App Credential	App ID	Facebook application ID
	App Secret	Facebook application Secret
User Credential	User ID	Facebook user ID
	User Access Token	The user access token.

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyFacebookSource" ADAPTER "CamelFacebookAdapter" AT
LOCATION AGENT "MyAgent" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configuration">
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="app_credential">
<user>myappuserid</user>
<password>myappusertoken</password>
</CredentialEntry>
<CredentialEntry name="user_credential">
<user>myuserid</user>
<password>myusertoken</password>
</CredentialEntry>';
```

## Related Information

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

## 6.4 Apache Camel Informix

Use the Camel Informix adapter to connect to an IBM Informix remote source.

### Note

Before registering the adapter with the SAP HANA system, ensure you have downloaded and installed the correct JDBC libraries. See the *SAP HANA smart data integration Product Availability Matrix (PAM)* for details. Place the files in the `<DPAgent_root>/lib` folder.

This adapter supports using a virtual table as a source.

## Related Information

[Set Up the Camel Informix Adapter \[page 161\]](#)

[Camel Informix Remote Source Configuration \[page 162\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)




### 6.4.1 Set Up the Camel Informix Adapter

By default, Camel Informix Adapter is not available in Data Provisioning Agent. To use it, you must perform setup tasks.

#### Procedure

1. Open `<DPAgent_root>/camel/adapters.xml` and uncomment the configuration of Camel Informix Adapter.

```
<Adapter type="CamelDatabaseAdapter" displayName="Camel database Adapter">
  <RemoteSourceDescription>
    <PropertyGroup name="configuration" displayName="Configuration">
      <PropertyEntry name="host" displayName="Host"
description="Host name" isRequired="true"/>
      <PropertyEntry name="port" displayName="Port"
description="Port number" isRequired="true"/>
      <PropertyEntry name="dbname" displayName="Database"
description="Database Name" isRequired="true"/>
      <PropertyEntry name="servername" displayName="Server Name"
description="Server Name" isRequired="false"/>
      <PropertyEntry name="delimident" displayName="delimident"
description="delimident" isRequired="false"/>
    </PropertyGroup>
    <CredentialEntry name="db_credential" displayName="Credential"
userDisplayName="user" passwordDisplayName="password"/>
  </RemoteSourceDescription>
  <Capabilities>
    <Informix List of Capabilities>
  </Capabilities>
  <RouteTemplate>jdbc.xml</RouteTemplate>
</Adapter>
```

2. Copy `<DPAgent_root>/camel/samples/sample-jdbc.xml` to `<DPAgent_root>/camel/` and rename to `jdbc.xml`.
3. Download `camel-jdbc.jar` from <http://camel.apache.org/download.html> , and copy it to the `<DPAgent_root>/camel/lib` directory.
4. Download the Informix jdbc driver `ifxjdbc.jar`, and put it in the `<DPAgent_root>/camel/lib` directory.

## 6.4.2 Camel Informix Remote Source Configuration

Configure the following options in SAP HANA smart data access to configure your connection to an Informix remote source. Also included is sample code for creating a remote source using the SQL console.

Category	Option	Description
Configuration	Host	Host name
	Port	Port number
	Database Name	Database name
	Server Name	Server name
	Delimident	If set to <i>True</i> , the Informix database object name is enclosed with double quotation marks.
Configuration > Security	Use Agent Stored Credential	Set to <i>True</i> to use credentials that are stored in the DP Agent secure storage.  The default value is <i>False</i> .
Credentials	Credentials Mode	<i>Technical user</i> or <i>Secondary user</i>  Select one of the choices depending on the purpose of the remote source you want to create.
User Credential	User	The Informix user name
	Password	The Informix user name's password

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyInformixSource" ADAPTER "CamelInformixAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="generic" displayName="Generic">
<PropertyEntry name="instance_name" displayName="Instance Name"
isRequired="true">MyInformixSource</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="host" displayName="Host"
isRequired="true">myhost.sap.corp</PropertyEntry>
<PropertyEntry name="port" displayName="Port Number" isRequired="true">32566</
PropertyEntry>
<PropertyEntry name="dbname" displayName="Database Name"
isRequired="true">mydb</PropertyEntry>
<PropertyEntry name="servername" displayName="Server name"
isRequired="true">myserver</PropertyEntry>
```



```
<PropertyEntry name="delimident" displayName="delimident"
isRequired="true">true</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="db_credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>';
```

## Related Information

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

## 6.5 Apache Camel JDBC

Use the Camel JDBC adapter to connect to most databases for which SAP HANA smart data integration does not already provide a pre-delivered adapter.

In general, the Camel JDBC adapter supports any database that has SQL-based data types and functions, and a JDBC driver.

If you are using MS Access or IBM Informix, use the Camel adapters specific to those databases.

## Adapter Functionality

This adapter supports the following functionality:

- SELECT, INSERT, UPDATE, and DELETE
- Virtual table as a source
- Virtual table as a target using a Data Sink node in a flowgraph

## Related Information

[Set up the Camel JDBC Adapter \[page 164\]](#)

[Camel JDBC Remote Source Configuration \[page 166\]](#)

[Connect to MySQL Using the Camel JDBC Adapter \[page 168\]](#)

[Disable Adapter Write-back Functionality \[page 168\]](#)

[Apache Camel Microsoft Access \[page 169\]](#)

[Apache Camel Informix \[page 160\]](#)

## 6.5.1 Set up the Camel JDBC Adapter

By default, Camel JDBC Adapter is not available in Data Provisioning Agent. To use it, you must perform setup tasks.

### Procedure

1. Open `<DPAgent_root>/camel/adapters.xml` and uncomment the configuration of Camel JDBC Adapter.

```
<Adapter type="CamelJdbcAdapter" displayName="Camel Jdbc Adapter">
  <RemoteSourceDescription>
    <PropertyGroup name="configuration" displayName="Configuration">
      <PropertyEntry name="dbtype" displayName="Database Type"
description="Database Type" defaultValue="other" isRequired="true">
        <Choices>
          <Choice name="access" displayName="Access"/>
          <Choice name="informix" displayName="Informix"/>
          <Choice name="other" displayName="Other"/>
        </Choices>
      </PropertyEntry>
      <PropertyEntry name="filepath" displayName="Access file path"
description="Access file path" isRequired="false">
        <Dependencies>
          <Dependency name="dbtype" value="access"/>
        </Dependencies>
      </PropertyEntry>
      <PropertyEntry name="filename" displayName="Access file name"
description="Access file name" isRequired="false">
        <Dependencies>
          <Dependency name="dbtype" value="access"/>
        </Dependencies>
      </PropertyEntry>
      <PropertyEntry name="host" displayName="Host"
description="Host name" isRequired="false"/>
      <PropertyEntry name="port" displayName="Port"
description="Port number" isRequired="false"/>
      <PropertyEntry name="dbname" displayName="Database"
description="Database Name" isRequired="false"/>
      <PropertyEntry name="servername" displayName="Server Name"
description="Server Name" isRequired="false"/>
      <PropertyEntry name="delimident" displayName="delimident"
description="delimident" defaultValue="false" isRequired="false">
        <Choices>
          <Choice name="true" displayName="True"/>
          <Choice name="false" displayName="False"/>
        </Choices>
      </PropertyEntry>
      <PropertyEntry name="driverClass" displayName="JDBC Driver
Class" description="JDBC Driver Class" isRequired="false"/>
      <PropertyEntry name="url" displayName="JDBC URL"
description="JDBC URL" isRequired="false"/>
    </PropertyGroup>
    <CredentialEntry name="db_credential" displayName="Credential"
userDisplayName="user" passwordDisplayName="password"/>
  </RemoteSourceDescription>
  <Capabilities>
    CAP_AND_DIFFERENT_COLUMNS,
    CAP_TRUNCATE_TABLE,
    CAP_LIKE,
    CAP_IN,
    CAP_AND,
```

```

CAP_OR,
CAP_DISTINCT,
CAP_HAVING,
CAP_ORDERBY,
CAP_ORDERBY_EXPRESSIONS,
CAP_GROUPBY,
CAP_SELECT,
CAP_INSERT,
CAP_UPDATE,
CAP_DELETE,
CAP_EXCEPT,
CAP_INTERSECT,
CAP_AGGREGATES,
CAP_AGGREGATE_COLNAME,
CAP_DIST_AGGREGATES,
CAP_INSERT_SELECT,
CAP_JOINS,
CAP_JOINS_OUTER,
CAP_BI_SUBSTRING,
CAP_BI_NOW,
CAP_BI_UPPER,
CAP_BI_LOWER,
CAP_BI_LCASE,
CAP_BI_UCASE,
CAP_BI_CONCAT,
CAP_BI_LTRIM,
CAP_BI_RTRIM,
CAP_BI_TRIM,
CAP_WHERE,
CAP_SIMPLE_EXPR_IN_PROJ,
CAP_EXPR_IN_PROJ,
CAP_NESTED_FUNC_IN_PROJ,
CAP_SIMPLE_EXPR_IN_WHERE,
CAP_EXPR_IN_WHERE,
CAP_NESTED_FUNC_IN_WHERE,
CAP_SIMPLE_EXPR_IN_INNER_JOIN,
CAP_EXPR_IN_INNER_JOIN,
CAP_NESTED_FUNC_IN_INNER_JOIN,
CAP_SIMPLE_EXPR_IN_LEFT_OUTER_JOIN,
CAP_EXPR_IN_LEFT_OUTER_JOIN,
CAP_NESTED_FUNC_IN_LEFT_OUTER_JOIN,
CAP_SIMPLE_EXPR_IN_ORDERBY,
CAP_EXPR_IN_ORDERBY,
CAP_NESTED_FUNC_IN_ORDERBY,
CAP_NONEQUAL_COMPARISON,
CAP_OR_DIFFERENT_COLUMNS,
CAP_PROJECT,
CAP_BI_SECOND,,
CAP_BI_MINUTE,
CAP_BI_HOUR,
CAP_BI_MONTH,
CAP_BI_YEAR,
CAP_BI_COT,
CAP_BI_ABS,
CAP_BI_ACOS,
CAP_BI_ASIN,
CAP_BI_ATAN,
CAP_BI_ATAN2,
CAP_BI_CEILING,
CAP_BI_COS,
CAP_BI_EXP,
CAP_BI_FLOOR,
CAP_BI_LN,
CAP_BI_CEIL,
CAP_BI_LOG,
CAP_BI_MOD,
CAP_BI_POWER,
CAP_BI_SIGN,

```

```

CAP_BI_SIN,
CAP_BI_SQRT,
CAP_BI_TAN,
CAP_BI_ROUND,
CAP_BI_ASCII,
CAP_BI_RIGHT,
CAP_BI_LEFT,
CAP_BI_TO_BIGINT,
CAP_BI_TO_DECIMAL,
CAP_BI_TO_DOUBLE,
CAP_BI_TO_REAL,
CAP_BI_TO_SMALLINT,
CAP_BI_TO_INT,
CAP_BI_TO_INTEGER
CAP_BI_COALESCE,
CAP_BI_IFNULL,
CAP_BI_NULLIF,
CAP_BIGINT_BIND
</Capabilities>
<RouteTemplate>jdbc-general.xml</RouteTemplate>
</Adapter>
</Adapters>

```

2. Download the appropriate JDBC file, and copy it to the `<DPAgent_root>/camel/lib` directory.

## 6.5.2 Camel JDBC Remote Source Configuration

Configure the following options to create a connection to a remote database. Also included is sample code for creating a remote source using the SQL console.

Category	Option	Description
Configuration	Database Type	Specifies the type of database to which you will connect.
	JDBC Driver Class	Specifies the JDBC driver class for the database you are using.
	JDBC URL	Specifies the URL for the JDBC driver.
Configuration > Security	Use Agent Stored Credential	Set to <a href="#">True</a> to use credentials that are stored in the Data Provisioning Agent secure storage.  The default value is <a href="#">False</a> .
Credentials	Credentials Mode	Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials. <ul style="list-style-type: none"> <li>• <a href="#">Technical User</a>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li>• <a href="#">Secondary User</a>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
User Credentials	Database user name	Specifies the database user name.
	Database user password	Specifies the password for the database user.

## Example SQL Configuration for Netezza

```
CREATE REMOTE SOURCE "MyNetezzaSource" ADAPTER "CamelJdbcAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configuration">
  <PropertyEntry name="dbtype" displayName="Database Type"
isRequired="true">netezza</PropertyEntry>
  <PropertyEntry name="driverClass" displayName="JDBC Driver Class"
isRequired="false">org.netezza.Driver</PropertyEntry>
  <PropertyEntry name="url" displayName="JDBC URL"
isRequired="false">jdbc:netezza://<host name>:<port number>/<database name></
PropertyEntry>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="db_credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry
```

## Example SQL Configuration for Vertica

```
CREATE REMOTE SOURCE "MyVerticaSource" ADAPTER "CamelJdbcAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configuration">
<PropertyEntry name="dbtype" displayName="Database Type"
isRequired="true">vertica</PropertyEntry>
<PropertyEntry name="driverClass" displayName="JDBC Driver Class"
isRequired="false">com.vertica.jdbc.Driver</PropertyEntry>
<PropertyEntry name="url" displayName="JDBC URL"
isRequired="false">jdbc:vertica://<host name>:<port number>/<database name></
PropertyEntry>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="db_credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry
```

## Related Information

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

## 6.5.3 Connect to MySQL Using the Camel JDBC Adapter

You can connect to MySQL using the Camel JDBC adapter.

### Procedure

1. To allow MySQL to treat double quotes (") as an identifier quote character, append the property string ?  
`sessionVariables=sql_mode=ANSI_QUOTES` to the *JDBC URL* parameter in the remote source configuration.
2. Download and place the `mysql-connector-java-<version>-bin.jar` file under `<DPAgent_root>/camel/lib` folder. If there is no `/lib` folder, create one.
3. Restart the Data Provisioning Agent.

### Related Information

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



[Camel JDBC Remote Source Configuration \[page 166\]](#)

## 6.5.4 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

#### Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

### Procedure

1. Start the Data Provisioning Agent configuration tool.
2. Navigate to the Agent Adapter Framework Preferences.
  - In graphical mode, choose **Config > Preferences**, and then select *Adapter Framework*.
  - In command-line interactive mode, choose *Set Agent Preferences* in the *Agent Preferences* menu.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start and Connect the Configuration Tool \[page 84\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

## 6.6 Apache Camel Microsoft Access

Read Microsoft Access data.

The Apache Camel Microsoft Access adapter is created based on Camel Adapter. Using the adapter, you can access Microsoft Access database data via virtual tables.

### i Note

The Camel Access adapter can be used only when the Data Provisioning Agent is installed on Microsoft Windows.

This adapter supports the following functionality:

- Virtual table as a source

## Related Information

[Set Up the Camel Microsoft Access Adapter \[page 170\]](#)

[Microsoft Access Remote Source Configuration \[page 170\]](#)

## 6.6.1 Set Up the Camel Microsoft Access Adapter

Set up the Camel Microsoft Access adapter.

### Context

By default, Camel Microsoft Access adapter is not available in Data Provisioning Agent. To use it, you must do the following:

### Procedure

1. In Microsoft Access, in the Tables window, right-click *MSysObjects*, and select *Navigation Options* to show system objects.
2. In the Info window of Microsoft Access, right-click the *Users and Permissions* button, and select *User and Group Permissions* to give an admin user all permissions on MSysObjects.
3. Enable macros in the Microsoft Access Trust Center.
4. Run the following command:

```
Sub currentuser()  
  strDdl = "GRANT SELECT ON MSysObjects TO Admin;"  
  CurrentProject.Connection.Execute strDdl  
End Sub
```

5. Open `<DPAgent_root>/camel/adapters.xml` and uncomment the configuration of CamelAccessAdapter.

Uncomment the following:

```
<Adapter type="CamelAccessAdapter" displayName="Camel access Adapter">  
  ...  
</Adapter>
```

## 6.6.2 Microsoft Access Remote Source Configuration

Configure the following options in smart data access to configure your connection to a Microsoft Access remote source. Also included is sample code for creating a remote source using the SQL console.



Category	Option	Description
Configuration	Access File Path	Specifies the path to the Microsoft Access database file.
	Access File Name	Specifies the name of the Microsoft Access database file.
Configuration > Security	Use Agent Stored Credential	Set to <i>True</i> to use credentials that are stored in the DP Agent secure storage.  The default value is <i>False</i> .
	Credentials Mode	<i>Technical user</i> or <i>Secondary user</i>  Select one of the choices depending on the purpose of the remote source you want to create.
Credentials	User	The user name for the Microsoft Access account.
	Password	The password for the Microsoft Access account.

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyAccessSource" ADAPTER "CamelAccessAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="table" displayName="table">
<PropertyEntry name="filepath" displayName="Access file path">C:/access_data</
PropertyEntry>
<PropertyEntry name="filename" displayName="Access file name">database1.mdb</
PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="db_credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>';
```

## Related Information

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

## 6.7 Apache Cassandra

Apache Cassandra is a free and open-source distributed NoSQL database management system designed to handle large amounts of data across many commodity servers, providing high availability with no single point of failure.

The Cassandra adapter is specially designed for accessing and manipulating data from Cassandra Database.

### Note

The minimum supported version of Apache Cassandra is 1.2.

### Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Virtual table as a target using a Data Sink node in a flowgraph
- Kerberos authentication
- SSL support

In addition, this adapter supports the following capabilities:

- SELECT, INSERT, DELETE, UPDATE, WHERE, DISTINCT, LIMIT, ORDERBY

### Related Information

[Cassandra SSL Configuration \[page 172\]](#)

[Enable Kerberos Authentication \[page 175\]](#)

[Cassandra Remote Source Configuration \[page 177\]](#)

[Disable Adapter Write-back Functionality \[page 180\]](#)

[SAP HANA Smart Data Integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



### 6.7.1 Cassandra SSL Configuration

Configure SSL for connecting to your Cassandra remote source.

To enable SSL, on Cassandra you must import the server certificates and enable client authentication.

## Related Information

[Enable SSL on Cassandra \[page 173\]](#)

[Enable Client Authentication \[page 174\]](#)

[Update JCE Policy Files for Stronger Encryption \[page 518\]](#)

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

[Connect to SAP HANA On-Premise with SSL \[page 512\]](#)

### 6.7.1.1 Enable SSL on Cassandra

You must enable SSL on your Cassandra remote source before you can connect to it.

#### Procedure

1. Prepare the server certificates.
2. Edit the `cassandra.yaml` file as follows:

```
client_encryption_options:
  enabled: true
  optional: false
  keystore: .keystore
  keystore_password: Sybase123
  require_client_auth: false
  truststore: .truststore
  truststore_password: Sybase123
  # More advanced defaults below:
  protocol: ssl
  store_type: JKS
  cipher_suites: [TLS_RSA_WITH_AES_128_CBC_SHA,
TLS_RSA_WITH_AES_256_CBC_SHA]
```

3. Export the certificates from all Cassandra nodes and copy them to the Data Provisioning Agent host.

```
keytool -export -alias dse_node0 -file dse_node0.cer -keystore .keystore
```

4. Import the certificates into the Data Provisioning Agent truststore.

```
$ keytool -import -v -trustcacerts -alias dse_node0 -file dse_node0.cer -
keystore <installation_path>/ssl/cacerts
$ keytool -import -v -trustcacerts -alias dse_node1 -file dse_node1.cer -
keystore <installation_path>/ssl/cacerts
```

5. Restart Cassandra.
6. In the SAP HANA smart data integration Cassandra remote source configuration options, set `Use SSL` to `True`, and set `Use Client Authentication` as desired.

## Related Information

[Cassandra Remote Source Configuration \[page 177\]](#)

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

### 6.7.1.2 Enable Client Authentication

Enable client authentication when you are using SSL.

#### Context

To enable client authentication, you must edit a Cassandra file and properly configure your remote source.

#### Procedure

1. Edit the `cassandra.yaml` file.

```
client_encryption_options:
  enabled: true
  optional: false
  keystore: .keystore
  keystore_password: Sybase123
  require_client_auth: true
  truststore: .truststore
  truststore_password: Sybase123
  # More advanced defaults below:
  protocol: ssl
  store_type: JKS
  cipher_suites: [TLS_RSA_WITH_AES_128_CBC_SHA,
TLS_RSA_WITH_AES_256_CBC_SHA]
  # More advanced defaults below:
  protocol: ssl
  store_type: JKS
  cipher_suites: [TLS_RSA_WITH_AES_128_CBC_SHA,
TLS_RSA_WITH_AES_256_CBC_SHA]
```

2. Generate the private and public key pair for the Data Provisioning Agent node.

```
keytool -genkey -alias dpagent -keyalg RSA -keystore cacerts
```

Leave the key password the same as the keystore password, and export the public key.

```
keytool -export -alias dpagent -file dpagent.cer -keystore cacerts
```

3. Copy the `dpagent.cer` file to each Cassandra node, and import it into the Cassandra truststore.

```
keytool -import -v -trustcacerts -alias dpagent -file dpagent.cer -
keystore .truststore
```

- Restart Cassandra.
- Enable client authentication when creating a remote source by setting the *Use Client Authentication* parameter to *True*.

## Related Information

[Cassandra Remote Source Configuration \[page 177\]](#)

## 6.7.2 Enable Kerberos Authentication

The Cassandra adapter by default allows user name and password authentication. However, you can improve security by enabling Kerberos authentication.

### Procedure

- On each node, confirm DNS is working:

```
$ hostname
node1.example.com
```

- On each node, confirm that NTP is configured and running:

```
$ ntpq -p
remote           refid              st t when poll reach  delay  offset
=====
*li506-17.member 209.51.161.238    2  u 331 1024  377   80.289   1.384   1.842
-toock.eoni.com  216.228.192.69    2  u 410 1024  377   53.812   1.706  34.692
+time01.muskegon 64.113.32.5       2  u 402 1024  377   59.378  -1.635   1.840
-time-a.nist.gov .ACTS.            1  u 746 1024  151  132.832  26.931  55.018
+golem.canonical 131.188.3.220     2  u 994 1024  377  144.080  -1.732  20.072
```

- Install the Kerberos client software.

RHEL-based systems

```
$ sudo yum install krb5-workstation krb5-libs krb5-pkinit-openssl
```

Debian-based systems

```
$ sudo apt-get install krb5-user krb5-config krb5-pkinit
```

SUSE systems

```
$ sudo zypper install krb5-client
```

- Edit the `/etc/krb5.conf` file to add the KDC domain configuration.

5. Create a user for the client.

```
cassandra@cqlsh:dp_test> create user 'cass@EXAMPLE.COM' with password
'Sybase123' superuser;
```

6. Prepare the keytab for each Cassandra node.

```
addprinc -randkey cassandra/node1.example.com
addprinc -randkey HTTP/node1.example.com
addprinc -randkey cassandra/node2.example.com
addprinc -randkey HTTP/node2.example.com
...
ktadd -k dse.keytab cassandra/FQDN
ktadd -k dse.keytab HTTP/FQDN
```

7. Copy keytabs to the related Cassandra nodes, and edit the `dse.yaml` file.

```
kerberos_options:
  keytab: resources/dse/conf/dse.keytab
  service_principal: cassandra/_HOST@EXAMPLE.COM
  http_principal: HTTP/_HOST@EXAMPLE.COM
  qop: auth
```

8. Edit the `cassandra.yaml` file.

```
authenticator: com.datastax.bdp.cassandra.auth.KerberosAuthenticator
```

9. Restart Cassandra.
10. Prepare the keytab for the DP Agent. The principal must have the value of the user created previously in this procedure.

```
addprinc -randkey cass@EXAMPLE.COM
ktadd -k dpagent.keytab cass@EXAMPLE.COM
```

11. Copy the `dpagent.keytab` file to the DP Agent host, and create your remote source.

## Related Information

[Cassandra Remote Source Configuration \[page 177\]](#)

[Update JCE Policy Files for Stronger Encryption \[page 518\]](#)

## 6.7.3 Cassandra Remote Source Configuration

Configure the following options for a connection to an Apache Cassandra remote source. Also included is sample code for creating a remote source using the SQL console.

Category	Option	Description
Connection	Hosts	<p>The list of host names and ports Cassandra used to connect to the Cassandra cluster.</p> <p>The hosts and ports should be provided in the following format:</p> <pre>host1[:port1] [,host2[:port2],host3[:port3]...]  If the port number is not provided for a host, the default port 9042 will be used for the host.<p>Only one host is needed to discover the cluster topology, but it is usually a good idea to provide more so the driver can revert if the first one is down.</p></pre>
	Authentication Mechanism	<p><i>User Name and Password</i> (Default): Use user name and password to perform the authentication.</p> <p><i>Kerberos</i>: Use Kerberos to perform the authentication.</p>
	Paging Status	<p>Specify whether to enable paging when getting the results of a query from Cassandra. The default value is <i>On</i>.</p>
	Read Timeout (milliseconds)	<p>Specify the number of milliseconds the driver waits for a response from a given Cassandra node, before considering it unresponsive.</p>
	Connect Timeout (milliseconds)	<p>Specify the number of milliseconds the driver waits to establish a new connection to a Cassandra node before giving up.</p>
	Data Type Conversion	<p>Map TEXT/VARCHAR to NVARCHAR (5000)</p> <p>Cassandra data types TEXT and VARCHAR are mapped to NCLOB in HANA, which makes it impossible to use these columns as query conditions in a WHERE clause. Set the value to <i>True</i> to map to NVARCHAR instead. The default value is <i>False</i>.</p>
	Map ASCII to VARCHAR (5000)	<p>The Cassandra data type ASCII is mapped to CLOB in HANA, which makes it impossible to use these columns as query conditions in a WHERE clause. Set the value to <i>True</i> to map to VARCHAR instead. The default value is <i>False</i>.</p>
Load Balancing Policy	Use Round Robin Policy	<p>Specify whether to use the Round Robin Policy. The default value is <i>False</i>.</p> <p>You can use either <i>Round Robin Policy</i> or <i>DC Aware Round Robin Policy</i>, but not both.</p>

Category	Option	Description
	Use DC Aware Round Robin Policy	<p>Specify whether to use the DC Aware Round Robin Policy. The default value is <i>False</i>.</p> <p>You can use either <i>DC Aware Round Robin Policy</i> or <i>DC Aware Round Robin Policy</i>, but not both.</p>
	Use Token Aware Policy	<p>Specify whether to use the Token Aware Policy. The default value is <i>False</i>.</p> <p>Either <i>Round Robin Policy</i> or <i>DC Aware Round Robin Policy</i> must be used as your child policy if this parameter is set to <i>True</i>.</p>
	Use Latency Aware Policy	<p>Specify whether to use the Latency Aware Policy. The default value is <i>False</i>.</p> <p>Either <i>Round Robin Policy</i> or <i>DC Aware Round Robin Policy</i> must be used as your child policy if this parameter is set to <i>True</i>.</p>
Security	Use SSL	Specify whether to connect to Cassandra using SSL. The default value is <i>False</i> .
	Use Client Authentication	<p>Specify whether to connect to Cassandra using client authentication. The default value is <i>False</i>.</p> <p>This parameter works only if <i>Use SSL</i> is set to <i>True</i>.</p>
	Use Agent Stored Credential	Set to <i>True</i> to use credentials that are stored in the DP Agent secure storage.
Kerberos	Realm	Optional when using Kerberos. Authenticate using a principal from this realm instead of the systems default realm. The <i>Realm</i> option must be used together with the Key Distribution Center ( <i>KDC</i> ).
	KDC	Optional when using Kerberos. The address of the KDC to be used with the specified Realm, which has to be used together with <i>Realm</i> .
	Service Name	The SASL protocol name to use, which should match the user name of the Kerberos service principal used by the DSE server.
	Use Keytab	<p>Set this to <i>True</i> if you want the module to get the technical user's key from the keytab. The default value is <i>False</i>.</p> <p>If <i>Key Tab</i> is not set, then the module locates the keytab from the Kerberos configuration file. If it is not specified in the Kerberos configuration file, then the module looks for the file <code>&lt;user.home&gt;&lt;file.separator&gt;krb5.keytab</code>.</p>
	Keytab	Set this to the file name of the keytab to get the technical user's secret key.



Category	Option	Description
	Use Ticket Cache	<p>Set this to true if you want the ticket-granting ticket (TGT) to be obtained from the ticket cache. Set this option to <i>False</i> if you do not want this module to use the ticket cache. The default value is <i>False</i>.</p> <p>This module searches for the ticket cache in the following locations:</p> <ul style="list-style-type: none"> <li>On Solaris and Linux, in <code>/tmp/krb5cc_&lt;uid&gt;</code>, where the uid is a numeric user identifier.</li> <li>If the ticket cache is not available in <code>/tmp/krb5cc_&lt;uid&gt;</code>, or if you are on a Windows platform, the module looks for the cache as <code>&lt;user.home&gt;&lt;file.separator&gt;krb5cc_&lt;user.name&gt;</code>. You can override the ticket cache location by using the <i>Ticket Cache</i> parameter.</li> <li>For Windows, if a ticket cannot be retrieved from the file ticket cache, the module uses Local Security Authority (LSA) API to get the TGT.</li> </ul>
	Ticket Cache	Set this to the name of the ticket cache that contains the user's TGT. If this is set, <i>Use Ticket Cache</i> must also be set to true; otherwise, a configuration error is returned.
Credentials	Credentials Mode	Select <i>Technical user</i> or <i>Secondary user</i> depending on the purpose of the remote source you want to create.
	User	The user used to connect to Cassandra database. If Kerberos is used, the user should be the client principal and also a Cassandra user.
	Password	The password of the Cassandra user.

## SQL

```
CREATE REMOTE SOURCE "cassandra_rs" ADAPTER "CassandraAdapter" AT LOCATION AGENT
"CassandraAgent" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="connection" displayName="Connection">
    <PropertyEntry name="hosts" displayName="Host names and
ports">oakl00548161a.amer.global.corp.sap</PropertyEntry>
    <PropertyEntry name="auth_mech" displayName="Authentication
Mechanism">user_password</PropertyEntry>
    <PropertyEntry name="paging_status" displayName="Paging Status">true</
PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="load_balancing_policy" displayName="Load Balancing
Policy">
```

```

        <PropertyEntry name="use_rr_policy" displayName="Use Round Robin
Policy">false</PropertyEntry>
        <PropertyEntry name="use_dc_aware_rr_policy" displayName="Use DC Aware
Round Robin Policy">false</PropertyEntry>
        <PropertyEntry name="shuffle_replicas" displayName="Shuffle
Replicas">true</PropertyEntry>
        <PropertyEntry name="use_latency_aware_policy" displayName="Use Latency
Aware Policy">false</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="security" displayName="Security">
        <PropertyEntry name="use_ssl" displayName="Use SSL">false</PropertyEntry>
        <PropertyEntry name="use_client_auth">false</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="kerberos" displayName="Kerberos">
        <PropertyEntry name="krb_realm" displayName="Realm"
allowAlterWhenSuspended="true"></PropertyEntry>
        <PropertyEntry name="krb_kdc" displayName="KDC"
allowAlterWhenSuspended="true"></PropertyEntry>
        <PropertyEntry name="krb_protocol" displayName="Protocol"
allowAlterWhenSuspended="true"></PropertyEntry>
        <PropertyEntry name="krb_use_keytab" displayName="Use Key Tab"
allowAlterWhenSuspended="true"></PropertyEntry>
        <PropertyEntry name="krb_keytab" displayName="Key Tab" description="Key
Tab" allowAlterWhenSuspended="true"></PropertyEntry>
        <PropertyEntry name="krb_use_ticket_cache" displayName="Use Ticket
Cache" allowAlterWhenSuspended="true"></PropertyEntry>
        <PropertyEntry name="krb_ticket_cache" displayName="Ticket Cache"
allowAlterWhenSuspended="true"></PropertyEntry>
    </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
    <user>cassandra</user>
    <password>cassandra</password >
</CredentialEntry>';

```

## Related Information

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

[Enable SSL on Cassandra \[page 173\]](#)

[Enable Client Authentication \[page 174\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

## 6.7.4 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode.

Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. Navigate to the Agent Adapter Framework Preferences.
  - In graphical mode, choose **Config > Preferences**, and then select *Adapter Framework*.
  - In command-line interactive mode, choose *Set Agent Preferences* in the *Agent Preferences* menu.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start and Connect the Configuration Tool \[page 84\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

## 6.8 Apache Impala

The Apache Impala adapter is a data provisioning adapter that is used to access Apache Impala tables.

An Impala table can be internal table, external table, or partition table. Impala tables could be stored as data files with various file formats. Also, they can be Kudu tables stored by Apache Kudu. Different table types have

different sets of operations to support. For example, tables stored as data files do not support UPDATE and DELETE SQL, as well as PRIMARY KEY. However, Kudu tables support them.

An Impala table type is transparent to the Impala adapter. The Impala adapter supports all of these types of tables and cares about column metadata only. The Impala adapter supports operations that are legal to the back end Impala table.

## Required JDBC Drivers

The Impala adapter requires you to install the Impala JDBC connector in DPAgent. Follow the steps below to install the Impala JDBC connector:

1. Download the latest Impala JDBC connector from <https://www.cloudera.com/downloads/connectors/impala/jdbc.html>.
2. From that ZIP file, unzip `Cloudera_ImpalaJDBC41_<version_number>.zip`, and put all jar files into the `<DPAgent_root>/lib/impala` directory. Create the directory if it does not exist.

## Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- SELECT, WHERE, JOIN, DISTINCT, TOP, LIMIT, ORDER BY, GROUP BY

## Related Information

[Apache Impala Remote Source Configuration \[page 182\]](#)

[Kerberos Realm and KDC \[page 186\]](#)

[Update JCE Policy Files for Stronger Encryption \[page 518\]](#)

### 6.8.1 Apache Impala Remote Source Configuration

Configure the following options for a connection to an Apache Impala remote source. Also included is sample code for creating a remote source using the SQL console.

Category	Option	Description
Connection	Host	Impala host name or IP address.
		Impala server port. Default value is 21050.

Category	Option	Description
		<p>Authentication mechanism that is used to connect to the Impala Server. Choose from the following values:</p> <ul style="list-style-type: none"> <li>No Authentication (0 in SQL)</li> <li>Kerberos (1 in SQL)</li> <li>User Name (The LDAP bind name) (2 in SQL)</li> <li>User Name and Password (Default) (Used for LDAP authentication) (3 in SQL)</li> </ul>
Security	Enable SSL Encryption	<p>Specify whether to connect to Impala Server using SSL.</p> <div> <p><b>Note</b></p> <p>The CA certificate for the remote source must be imported into the adapter truststore on the Data Provisioning Agent host.</p> </div>
	Use Agent Stored Credential	Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage.
	Allow Self-Signed Server SSL Certificate	Specify whether to allow the server to use a self-signed SSL certificate. This property is meaningful only if SSL is enabled.
	Require Certificate Name Match Server Host Name	Specify whether to require that a CA-issued SSL certificate name must match the Impala Server host name. This property is meaningful only if SSL is enabled.
Kerberos	Realm	Optional. If specified, you can omit the realm part (for example @EXAMPLE.COM) of the <i>Impala Service Principal</i> and <i>User Principal</i> properties.
	KDC	Kerberos Key Distribution Center (KDC). This property is optional and meaningful only if the <i>Realm</i> parameter is specified. If the <i>Realm</i> parameter is not specified, the parameter must be manually configured in <code>&lt;DPAgent_root&gt;/krb5/krb5.conf</code> for the realm of <i>Impala Service Principal</i> and <i>User Principal</i> .
	Impala Service Principal	Specify the Kerberos principal of the Impala service.
	User Principal	Specify the Kerberos principal of the connection user.
	Use Keytab	<p>Set this to <i>True</i> if you want the module to get the technical user's key from the keytab. The default value is <i>False</i>.</p> <p>If <i>Key Tab</i> is not set, then the module locates the keytab from the Kerberos configuration file. If it is not specified in the Kerberos configuration file, then the module looks for the file <code>&lt;user.home&gt;&lt;file.separator&gt;krb5.keytab</code>.</p>
	Keytab	Set this to the file name of the keytab to get the technical user's secret key.

Category	Option	Description
	Use Ticket Cache	<p>Set this to true if you want the ticket-granting ticket (TGT) to be obtained from the ticket cache. Set this option to <i>False</i> if you do not want this module to use the ticket cache. The default value is <i>False</i>.</p> <p>This module searches for the ticket cache in the following locations:</p> <ul style="list-style-type: none"> <li>On Solaris and Linux, in <code>/tmp/krb5cc_&lt;uid&gt;</code>, where the uid is a numeric user identifier.</li> <li>If the ticket cache is not available in <code>/tmp/krb5cc_&lt;uid&gt;</code>, or if you are on a Windows platform, the module looks for the cache as <code>&lt;user.home&gt;&lt;file.separator&gt;krb5cc_&lt;user.name&gt;</code>. You can override the ticket cache location by using the <i>Ticket Cache</i> parameter.</li> <li>For Windows, if a ticket cannot be retrieved from the file ticket cache, the module uses Local Security Authority (LSA) API to get the TGT.</li> </ul>
	Ticket Cache	<p>Set this to the name of the ticket cache that contains the user's TGT. If this is set, <i>Use Ticket Cache</i> must also be set to true; otherwise, a configuration error is returned.</p>
Data Type Mapping	Map Impala STRING to	<p>Specify to which SAP HANA type the Impala STRING is mapped. Choose from the following values:</p> <ul style="list-style-type: none"> <li><i>CLOB</i></li> <li><i>VARCHAR(5000)</i></li> </ul>
	Map Impala VARCHAR(length > 5000) to	<p>Specify to which SAP HANA type the Impala VARCHAR(length &gt; 5000) is mapped. Choose from the following values:</p> <ul style="list-style-type: none"> <li><i>NCLOB</i></li> <li><i>NVARCHAR(5000)</i></li> </ul>
Schema Alias Replacements	Schema Alias	<p>Schema name to be replaced with the schema given in <i>Schema Alias Replacement</i>.</p> <p>If given, accessing tables under this alias is considered to be accessing tables under the schema given in <i>Schema Alias Replacement</i></p>
	Schema Alias Replacement	<p>Schema name to be used to replace the schema given in <i>Schema Alias</i>.</p>

Category	Option	Description
Credentials	Credentials Mode	Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials. <ul style="list-style-type: none"> <li><b>Technical User:</b> A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><b>Secondary User:</b> A unique access credential on the remote source assigned to a specific user.</li> </ul>
<div> <div>i Note</div> <p>Depending on the value you chose for the <b>Authentication Mechanism</b> parameter, the credentials that appear will be different.</p> </div>		
	Credential (User Name and Password) > User Name	User name. Required only if the <b>Authentication Mechanism</b> parameter is set to <b>User Name and Password</b> .
	Credential (User Name and Password) > Password	Password. Required only if the <b>Authentication Mechanism</b> parameter is set to <b>User Name and Password</b> .
	Credential (User Name) > User Name	User name. Required only if the <b>Authentication Mechanism</b> parameter is set to <b>User Name</b> .
	Credential (Kerberos) > Password	Kerberos password. Required only if the <b>Authentication Mechanism</b> parameter is set to <b>Kerberos</b> .

## User and Password Parameters for LDAP Authentication

The Impala adapter's **User Name** and **Password** remote source parameters are used when the Impala server requires LDAP authentication. The **User Name** parameter is the LDAP user name. The **Password** parameter is the LDAP bind password. Depending on the LDAP bind name pattern configuration in Impala Server, you may need to provide values for either of these parameters:

- If **ldap\_domain** is configured, the **User Name** is replaced with a string `username@ldap_domain`;
- If **ldap\_baseDN** is configured, the **User Name** is replaced with a distinguished name (DN) of the form `uid=userid,ldap_baseDN`. This is equivalent to a Hive option.
- If **ldap\_bind\_pattern** is configured, the **User Name** is replaced with the string `ldap_bind_pattern`, where all instances of the string `#UID` are replaced with the user ID. For example, an **ldap\_bind\_pattern** of `user=#UID,OU=house,CN=boat` with a user name of `Customer1` constructs a bind name of `user=Customer1,OU=house,CN=boat`.

See [https://www.cloudera.com/documentation/enterprise/latest/topics/impala\\_ldap.html](https://www.cloudera.com/documentation/enterprise/latest/topics/impala_ldap.html) for more information.

## Sample SQL Remote Source Configuration

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyImpalaSource" ADAPTER "ImpalaAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="connection" displayName="Connection">
    <PropertyEntry name="host" displayName="Host" >myhost.sap.corp</PropertyEntry>
    <PropertyEntry name="port" displayName="Port">21050</PropertyEntry>
    <PropertyEntry name="auth_mech" displayName="Authentication Mechanism">0</
    PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="data_type_mapping">
    <PropertyEntry name="string_to_default">true</PropertyEntry>
    <PropertyEntry name="varchar_5000plus_to_default">true</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>myuser</user>
  <password>mypassword</password>
</CredentialEntry>';
```

### Related Information

[Using a Schema Alias \[page 277\]](#)

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

## 6.8.2 Kerberos Realm and KDC

You can configure the Kerberos environment, known as its context, either through the `krb5.conf` file or through remote source parameters.

You must configure the Kerberos realm's Key Distribution Center (KDC) host name or address through either the `krb5.conf` file or adapter remote source parameters.

### Through the `krb5.conf` File

`<DPAgent_root>/krb5/krb5.conf` is a standard Kerberos V5 configuration file. Initially, it is an empty configuration file containing `[libdefaults]`, `[realms]` and `[domain_realm]` headers. You can configure



KDC under the `[realms]` section. Also, if the default realm is not configured in the file, you need to configure it under the `[libdefaults]` section. The following is an example, where the configured realm is `EXAMPLE.COM`.

```
[libdefaults]
    default_realm = EXAMPLE.COM
[realms]
    EXAMPLE.COM = {
        kdc = kdc.example.com
    }
[domain_realm]
```

### **i Note**

Do not remove any existing configurations in this file. Changes to this file take effect immediately without the need to restart the Data Provisioning Agent.

## **Through Adapter Remote Source Parameters**

You can configure the realm and KDC through the adapter remote source parameters *Realm* and *KDC*; you need to specify both. This is a shortcut to editing `<DPAgent_root>/krb5/krb5.conf`. The adapter writes the configuration to the `krb5.conf` if absent when the adapter connects to KDC.

## **6.9 File**

Use the File adapter to read formatted and free-form text files.

The File adapter enables SAP HANA users to read formatted and free-form text files. In contrast to the File Datastore adapters, use the File adapter for the following scenarios:

- SharePoint access
- SharePoint on Office365
- Pattern-based reading; reading multiple files in a directory that match a user-defined partition
- Five system columns are included, including row num, file location, and so on
- Real-time file replication

To specify a file format such as a delimiter character, you must create a configuration file with the extension `.cfg` to contain this information. Then each file can be read and parsed through this format, returning the data in columns of a virtual table.

For free-form, unstructured text files, you do not need to designate a file format definition, and you can use the `FILECONTENTROWS` virtual table to view the data.

## Authorizations

Keep the following in mind when accessing files:

- Ensure that the user account under which the Data Provisioning Agent is running has access to the files on the local host, a shared directory, or a SharePoint site.
- If the files are located on the same host as the Data Provisioning Agent, the files must be located in the same directory, or a subdirectory, of the Data Provisioning Agent root directory.

## Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Virtual table as a target using a Data Sink in a flowgraph; only INSERT is supported.

### i Note

Writing to SharePoint is not supported.

- SharePoint source support
- HDFS target file support, except from SharePoint
- Kerberos authentication for HDFS target files
- Real-time change data capture

### i Note

Only rows appended to a file initiate the capture. Only APPEND is supported. Using any other command, such as DELETE, UPDATE, and so on, may shut down replication altogether.

Also, the addition of a file to the virtual table's directory initiates the capture. This functionality is not supported for HDFS source files.

In addition, this adapter supports the following capabilities:

- SELECT, INSERT

## Related Information

[Configure the File Adapter \[page 189\]](#)

[File Adapter Remote Source Configuration \[page 190\]](#)

[Configuration Files \[page 198\]](#)

[Remote Source Tables \[page 215\]](#)

[Connect to a SharePoint Remote Source \[page 215\]](#)

[Access SharePoint Using HTTPS/SSL \[page 217\]](#)

[Accessing Files On a Shared Network \[page 218\]](#)

[Disable Adapter Write-back Functionality \[page 219\]](#)

[Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365 \[page 220\]](#)

[Configure Your Microsoft Azure Application \[page 221\]](#)

[File Datastore Adapters \[page 222\]](#)

## 6.9.1 Configure the File Adapter

The File adapter is already deployed with the Data Provisioning Agent that you installed. However, you must configure and register the adapter.

### Procedure

1. Launch `dpagentconfigtool.exe` under `<DPAgent_root>/configTool`.
2. Go to **Configure** > **Preferences** and select *FileAdapter*.
3. Enter the configuration information for your adapter.
4. Click *Apply* to save the changes.

### Next Steps

Now, you can register your adapter with the Data Provisioning Agent.

### Related Information

[File Adapter Preferences \[page 189\]](#)

[Register Data Provisioning Adapters \[page 111\]](#)

#### 6.9.1.1 File Adapter Preferences

Configuration parameters for the File adapter.

Parameter	Description
Root directory	The root directory for your data files. No remote source can reach beyond this directory for data files.
File format root directory	The root directory for your file format definitions. No remote source can reach beyond this directory for format files.

Parameter	Description
Access Token	A password. An access token protects the files from access from different agents. Use this password when creating a remote source.

## 6.9.2 File Adapter Remote Source Configuration

Determine the configuration parameters for your File adapter remote source. You can use the code samples below for creating a remote source using the SQL console.

The available parameters might change depending on which options you choose.

### i Note

To use a Data Provisioning Agent installed on Linux to connect to the SharePoint site, enable basic authentication on the SharePoint server.

Category	Option	Description
ConnectionInfo	Source Options	<ul style="list-style-type: none"> <li><a href="#">Local File System</a>: Specifies that the source is a file on a local system.</li> <li><a href="#">SharePoint Server</a>: Specifies that the source is on a SharePoint server.</li> <li><a href="#">SharePoint on Office365</a>: Specifies that the Microsoft Excel source is on an Office365 server.</li> </ul>

### i Note

Whichever you select [Local File System](#), [SharePoint Server](#), or [SharePoint on Office365](#), the File adapter remote source only displays the file format definitions (.cfg files) under the Data Provisioning Agent local folder that you specify in the remote source. It never displays files or directories on the SharePoint server directly, which is different than the Excel Adapter with SharePoint scenario. You need to provide the path to the source file on the SharePoint site in the CFG file, then create the virtual table in the file format definitions.

Category	Option	Description
	Target Options	<p>The path to the folder that you want to access on the local file system where the Data Provisioning Agent is deployed.</p> <p><i>Remote HDFS</i>: Specifies that the target file is on a remote HDFS system.</p>
	Root Directory	<p>The root directory for your data files. This is used for security. No remote source can reach beyond this directory for data files. The root directory must exist before you can create a remote source.</p> <div> <p><b>i Note</b></p> <p>Do not use a link directory or directory shortcut for a value in this parameter.</p> </div> <p>If you are using a shared network directory, enter the path as follows:</p> <pre>\\&lt;host_name&gt;\&lt;directory&gt;</pre>
	Directory of the file format definitions	<p>Location where you store your file format definition files. This directory must exist before you can create a remote source. Include the full path and file name.</p> <div> <p><b>i Note</b></p> <p>Do not use a linked directory or directory shortcut for a value in this parameter.</p> </div>
SharePoint on Office365 Configuration	Authentication Mode	<p>Choose the type of credentials needed to access SharePoint on Office365</p> <ul style="list-style-type: none"> <li>Client Credential (default):</li> <li>Username Password:</li> </ul>
	Site URL	<p>Enter the site URL, in the form of <code>https://&lt;company&gt;.sharepoint.com/sites/&lt;siteName&gt;</code></p>
	Application ID	<p>Enter the application ID, as defined in the Microsoft Azure Portal.</p>

Category	Option	Description
	Tenant ID	Enter the tenant ID, as defined in the Microsoft Azure Portal.
	Local Folder Path	The path to the folder that you want to access on the local file system where the Data Provisioning Agent is deployed.
ConnectionInfo > HDFS Configuration	Host Name	The remote URL to connect to the remote HDFS, usually defined in <code>core-site.xml</code> .
	Port Number	Port number to connect to the remote HDFS, usually defined in <code>core-site.xml</code> .
	Target File Location	The location to store copied target files in a remote HDFS. For example, you might want to copy a target file from a local to a remote HDFS.
	Hadoop User Name	The user of the Hadoop system when logging in. This can also be the owner of the file location where you want to put the copied target files. Make sure you have the proper permissions to access this location.
	HDFS Authentication Mechanism	Choose <a href="#">Kerberos</a> to implement Kerberos authentication. You are then required to complete the necessary parameters in the <a href="#">Kerberos Configuration for HDFS</a> option group.  Choose <a href="#">No Authentication</a> if you are not using Kerberos.
Kerberos Configuration for HDFS	Realm	(Optional when using Kerberos) Authenticate using a principal from this realm instead of the systems default realm. Specify the realm for the technical user.  The <a href="#">Realm</a> option must be used together with KDC.
	KDC	(Optional when using Kerberos) The address of the technical user's KDC (Key Distribution Center) to be used with the specified realm. This must be used together with the <a href="#">Realm</a> option.

Category	Option	Description
	HDFS Principal	The HDFS Service principal name.
	Client Principal	Specify the Kerberos principal of the connection user.
	Use Keytab	<p>Set this to <i>True</i> if you want the module to get the technical user's key from the keytab. The default value is <i>False</i>.</p> <p>If <i>Key Tab</i> is not set, then the module locates the keytab from the Kerberos configuration file. If it is not specified in the Kerberos configuration file, then the module looks for the file <code>&lt;user.home&gt;&lt;file.separator&gt;krb5.keytab</code>.</p>
	Keytab	Set this to the path and file name of the keytab to get the technical user's secret key.
	Use Ticket Cache	<p>Set this to true if you want the ticket-granting ticket (TGT) to be obtained from the ticket cache. Set this option to <i>False</i> if you do not want this module to use the ticket cache. The default value is <i>False</i>.</p> <p>This module searches for the ticket cache in the following locations:</p> <ul style="list-style-type: none"> <li>On Solaris and Linux, in <code>/tmp/krb5cc_&lt;uid&gt;</code>, where the uid is a numeric user identifier.</li> <li>If the ticket cache is not available in <code>/tmp/krb5cc_&lt;uid&gt;</code>, or if you are on a Windows platform, the module looks for the cache as <code>&lt;user.home&gt;&lt;file.separator&gt;krb5cc_&lt;user.name&gt;</code>. You can override the ticket cache location by using the <i>Ticket Cache</i> parameter.</li> <li>For Windows, if a ticket cannot be retrieved from the file ticket cache, the module uses Local Security Authority (LSA) API to get the TGT.</li> </ul>

Category	Option	Description
	Ticket Cache	Set this to the name of the ticket cache that contains the user's TGT. If this is set, <i>Use Ticket Cache</i> must also be set to true; otherwise, a configuration error is returned.
ConnectionInfo > SharePoint Server Configuration	Server URL	<p>Enter the URL for the server where the SharePoint source is located.</p> <p>If you create a new SharePoint site on the server, be sure to include the name of the site at the end of the URL. For example, if your server name is <code>http://&lt;server_name&gt;/</code> and your new site name is site1, your URL would be <code>http://&lt;server_name&gt;/site1</code>.</p>
	Local Folder Path	<p>The download folder path. This folder is created under the <code>&lt;DPAgent_root&gt;/</code> directory automatically.</p> <p>The local folder path is the location on the Data Provisioning Agent computer's local drive where you want to place your source data files, which the Data Provisioning Agent will download from the SharePoint server.</p> <p>For example, if you enter a value for this parameter such as <code>download/sharepoint</code>, create the following path: <code>&lt;DPAgent_root&gt;/download/sharepoint</code>.</p>
Credentials	Credentials Mode	<p><i>Technical user</i> or <i>Secondary user</i></p> <p>Select one of the choices depending on the purpose of the remote source you want to create.</p>
Credentials > AccessTokenEntry	Password	A password. An access token protects the files from access from different agents. Use this password when creating a remote source.
Credentials > SharePoint Login	SharePoint User (Domain\Username)	The domain and user name for the SharePoint account.



Category	Option	Description
	SharePoint Password	The password for the SharePoint account.
Credentials > Credential (Kerberos)	Password	The password for the Kerberos-protected HDFS.
SharePoint on Office365 Credential	Client Credential	Enter the client secret you created on the Microsoft Azure Portal.
SharePoint on Office365 Username Password	Username	Enter the username of your Microsoft account.
	Password	Enter the password of your Microsoft account.

## Kerberos Setup for HDFS Target

- If you use Keytab and not Ticket Cache, specify the keytab file path in the [Keytab](#) parameter.
- If you are using Ticket Cache and not Keytab, specify the ticket cache file path in the [Ticket Cache](#) parameter. Then, you can use any password (such as “abc” or “123” for the [Credential \(Kerberos\)](#) parameter, because a password is required in Web IDE.
- Also, if you are using Ticket Cache and not Keytab, you can leave the ticket cache file path blank, but then you must use the correct password for the [Password of Credential \(Kerberos\)](#) option

## Remote Source Configuration Using the SQL Console

The following code samples illustrate how to create a remote source using the SQL console.

### Example: Local file system

#### Sample Code

```
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
  <PropertyEntry name="rootdir">myrootdir</PropertyEntry>
  <PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
  <PropertyEntry name="source_options">local</PropertyEntry>
  <PropertyEntry name="target_options">local</PropertyEntry>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="AccessTokenEntry">
  <password>mytoken</password>
</CredentialEntry>';
```

## Example: Local file system with real-time

### Sample Code

```
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
  <PropertyEntry name="rootdir">myrootdir</PropertyEntry>
  <PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
  <PropertyEntry name="usecdc">true</PropertyEntry>
  <PropertyEntry name="source_options">local</PropertyEntry>
  <PropertyEntry name="target_options">local</PropertyEntry>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="AccessTokenEntry">
  <password>mytoken</password>
</CredentialEntry>';
```

## Example: HDFS as target

### Sample Code

```
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
  <PropertyEntry name="rootdir">myrootdir</PropertyEntry>
  <PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
  <PropertyEntry name="target_options">hdfs</PropertyEntry>
  <PropertyEntry name="host">hdfs:/myhost.sap.corp</PropertyEntry>
  <PropertyEntry name="port_number">8020</PropertyEntry>
  <PropertyEntry name="target_hdfs_file_location">/user/sap</PropertyEntry>
  <PropertyEntry name="hadoop_user_name">myuser</PropertyEntry>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="AccessTokenEntry">
  <password>mytoken</password>
</CredentialEntry>';
```

## Example: SharePoint location

### Sample Code

```
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
  <PropertyEntry name="rootdir">myrootdir</PropertyEntry>
  <PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
  <PropertyEntry name="source_options">SharePoint</PropertyEntry>
  <PropertyEntry name="target_options">local</PropertyEntry>
  <PropertyGroup name="SharePoint">
    <PropertyEntry name="spurl">http://myhost.sap.corp/mysharepointsite</
PropertyEntry>
    <PropertyEntry name="spdir">download/sharepoint</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="AccessTokenEntry">
  <password>mytoken</password>
</CredentialEntry>
<CredentialEntry name="sharePointCredential">
  <user>mydomain\mysharepointuser</user>
  <password>mypassword</password>
</CredentialEntry>';
```

## Example: Microsoft SharePoint on Office365

```
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
  <PropertyEntry name="rootdir">myrootdir</PropertyEntry>
  <PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
  <PropertyEntry name="source_options">SharePoint365</PropertyEntry>
  <PropertyEntry name="target_options">local</PropertyEntry>
  <PropertyGroup name="SharePoint365">
    <PropertyEntry name="authenticationMode">ClientCredential</PropertyEntry>
    <PropertyEntry name="siteUrl">https://mycompany.sharepoint.com/sites/
mysharepointsite</PropertyEntry>
    <PropertyEntry name="applicationId">myApplicationID</PropertyEntry>
    <PropertyEntry name="tenantId">myTenantId</PropertyEntry>
    <PropertyEntry name="sp365dir">download/sharepoint</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="AccessTokenEntry">
  <password>mytoken</password>
</CredentialEntry>
<CredentialEntry name="sharePoint365ClientCredential">
  <password>myClientSecret</password>
</CredentialEntry>';
```

## Related Information

[HDFS Target Files](#)

[Accessing Files On a Shared Network \[page 218\]](#)

[Connect to a SharePoint Remote Source \[page 215\]](#)

[Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365 \[page 220\]](#)

[Configure Your Microsoft Azure Application \[page 221\]](#)

## 6.9.3 Configuration Files

Configuration files enable the application to read the file format accurately. You must have a configuration file when using the File adapter.

You can create file format configuration files either within SAP HANA Web IDE using the command line or by creating a text file.

Using Web IDE can speed up the process of creating your file format configuration files. Using the command line or a text file to create the configuration file requires that you use a separate text editor to enter the options and values manually into an empty file.

## Related Information

[File Format Configuration Files \[page 198\]](#)

[Generate the Configuration File with SAP Web IDE \[page 205\]](#)

[Generate the Configuration File With a Command-Line Utility \[page 211\]](#)

[Generate the Configuration File When Creating a Virtual Table \[page 214\]](#)

### 6.9.3.1 File Format Configuration Files

Create a file format configuration file to work with the data file used by the File adapter.

Each configuration file is a text file and must match the following format:

- The first line must contain a comment or a description. This line is ignored during processing.
- A set of key-value pairs to specify the various parsing options.
- A set of `COLUMN=<name>;<SAP HANA datatype>;<optional description>`

## Example

```
File format to read US census data, see https://www.census.gov/econ/cbp/download/
FORMAT=CSV
FORCE_FILENAME_PATTERN=us_county_census_%.txt
FORCE_DIRECTORY_PATTERN=
CODEPAGE=
LOCALE=
COLUMN_DELIMITER=,
ROW_DELIMITER=\r\n
ESCAPE_CHAR=
TEXT_QUOTES="
TEXT_QUOTES_ESCAPE_CHAR=
SKIP_HEADER_LINES=1
QUOTED_TEXT_CONTAIN_ROW_DELIMITER=false
DATEFORMAT=yyyy.MM.dd HH:mm:ss
COLUMN=FIPSTATE;VARCHAR(2);FIPS State Code
COLUMN=EMP;INTEGER;Total Mid-March Employees with Noise
COLUMN=QP1_NF;VARCHAR(1);Total First Quarter Payroll Noise Flag
COLUMN=CENSTATE;VARCHAR(2);Census State Code
COLUMN=CENCTY;VARCHAR(3);Census County Code
COLUMN=PARTITION
COLUMNSTARTENDPOSITION=
```

## Fixed-Format Files

Fixed file formats are also supported (FORMAT=fixed). The formatting can be specified using the COLUMSTARTENDPOSITION parameter or the ROW\_DELIMITER and ROWLENGTH parameters.

## Example

```
Fixed file format
FORMAT=FIXED
FORCE_FILENAME_PATTERN=fixed%.txt
CODEPAGE=UTF-8
LOCALE=
ROW_DELIMITER=\r\n
SKIP_HEADER_LINES=1
COLUMNSSTARTENDPOSITION=0-1;2-7;8-15
ROWLENGTH=16
COLUMN=COL1;VARCHAR(2)
COLUMN=COL2;VARCHAR(6)
COLUMN=COL3;VARCHAR(8)
```

## SharePoint Format Files

The FORCE\_FILENAME\_PATTERN and FORCE\_DIRECTORY\_PATTERN parameters are important when working with a SharePoint source.

## Example

If your file exists in a subfolder, be sure to include that in the path for the FORCE\_DIRECTORY\_PATTERN parameter.

```
FORCE_FILENAME_PATTERN=<file_name>.txt  
FORCE_DIRECTORY_PATTERN=<root_directory><local_folder_path>/<folder_name>
```

### i Note

The FORCE\_DIRECTORY\_PATTERN should be an absolute path that includes the root directory, local folder path, and folder path on the Sharepoint server.

## Related Information

[Format Parameters \[page 201\]](#)

## 6.9.3.1.1 Format Parameters

Format parameters for files.

### Global

Parameter	Description and Examples
FORCE_FILENAME_PATTERN	<p>You might want to execute a simple <code>select * from &lt;virtualtable&gt;</code> without a WHERE clause on a directory. In that case, every file in the root directory and subdirectories is read according to this virtual table format definition. That process might take a while and produce many errors.</p> <p>However, if the virtual table maps to files in a particular directory or directory tree, or only to particular file names, you can specify this information in the virtual table directly. For example:</p> <ul style="list-style-type: none"><li>• Reading all files in that directory only:</li></ul> <pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata</pre> <ul style="list-style-type: none"><li>• Reading all files in that directory and subdirectories:</li></ul> <pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata/%</pre> <ul style="list-style-type: none"><li>• Reading all files in directories that start with "plan":</li></ul> <pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plan%:</pre> <ul style="list-style-type: none"><li>• Reading a file such as <code>plan20120101.txt</code>:</li></ul> <pre>FORCE_FILENAME_PATTERN=plan%.txt</pre> <ul style="list-style-type: none"><li>• Reading files inside the directory and matching the provided name pattern:</li></ul> <pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata FORCE_FILENAME_PATTERN=plan%.txt</pre>
FORCE_DIRECTORY_PATTERN	

i Note

The path you use in the FORCE\_DIRECTORY\_PATTERN parameter is case sensitive. For example, if you set the Root Directory remote source parameter to "C:\", you must match that case in the FORCE\_DIRECTORY\_PATTERN parameter.

Parameter	Description and Examples
FORMAT	<p>Specifies the format of the data source file:</p> <ul style="list-style-type: none"> <li>• CSV (default)</li> <li>• FIXED</li> <li>• XML</li> <li>• JSON</li> </ul>
CODEPAGE	<p>The character encoding with which the file is read. By default, the operating system default codepage is used. In case the file has a Byte Order Mark, this codepage is always used. Valid values of the Java installation can be found by creating a virtual table for CODEPAGE and querying its contents.</p>
ROW_DELIMITER	<p>A character sequence indicating the end of a row in the file. In case they are non-printable characters, they can be provided when encoded as /d65536 or /xFFFF or as Unicode notation /u+FFFF. Alternatively, the typical \r and \n are supported as well. Examples:</p> <ul style="list-style-type: none"> <li>• \n Unix standard</li> <li>• \r\n Windows standard</li> <li>• \d13\d10 Windows standard, but characters provided as a decimal number</li> <li>• \x0D\x0A Windows standard, but characters provided as a hex number</li> </ul>
SKIP_HEADER_LINES	<p>In case the file has a header, the number of lines to be skipped is entered here.</p> <p>When SKIP_HEADER_LINES=0, it means that the writer will not add a header to the newly created data file.</p> <p>When SKIP_HEADER_LINES&gt;0, it will add a header to the newly created data file.</p>
ERROR_ON_COLUMNCOUNT	<p>By default, a row with fewer columns than defined is considered okay. By setting this parameter to true, it is expected that all rows of the file have the number of columns defined.</p>
LOCALE	<p>The decimal and date conversion from the strings in the file into native numbers or dates might be locale-specific. For example, the date "14. Oktober 2000" when you are using a German locale works. However, for all other languages, this date does not work.</p> <p>Valid values for the locale can be found by querying a virtual table based on the LOCALE table of the adapter.</p>
WRITEBACK_NUMBER_FORMAT	<p>Instructs the File adapter to respect the LOCALE parameter when writing decimal values.</p> <p>Default: <i>True</i></p> <p>The decimal number follows the column definition of the CFG file if set to <i>True</i>. If WRITEBACK_NUMBER_FORMAT=false, the decimal number is plain and keeps the origin fraction digits, and it does not follow the decimal definition in the CFG file.</p>



Parameter	Description and Examples
DATEFORMAT	The file format can use these data types for date/time-related values. Each can have a different format string. The syntax of the format string is the Java SimpleDateFormat syntax.
TIMEFORMAT	
SECONDDATEFORMAT	
TIMESTAMPFORMAT	
LENIENT	Controls automatic date and time format conversion when the value exceeds the range.  For example, when this parameter is set to <i>True</i> , the 14th month of 2016 is converted to the second month of 2017.
EXPONENTIAL	Defines the exponential character used for decimal numbers.  For example, <i>e</i> for 1.05097214923805e-06 or <i>E</i> for 1.05097214923805E-06.  Default: <i>E</i>
COLUMN	Multiple entries consist of the columnname;datatype, where the data type is any normal SAP HANA data type.

## CSV only

Parameter	Description and Examples
COLUMN_DELIMITER	The character sequence indicating the next column. If non-printable characters are used, then either the \d65536, \xFFFF, or \u+FFFF encoding works. The default value is "". In addition: <ul style="list-style-type: none"> <li>• ";" as the column separator; for example, 2000;IT Costs;435.55</li> <li>• " " uses the pipe character as a delimiter</li> <li>• "\d09" uses an ASCII tab character as a delimiter</li> </ul>
TEXT_QUOTES	Sometimes text data is enclosed in quotes so a column delimiter inside the text does not break the format. The line 2000;IT Costs; software related only;435.55 would appear as 4 columns because the text contains a semicolon as well. If the file was created with quotes like 2000;"IT Costs; software related only";435.55, then there is no such issue, but the file parser must act more carefully and not just search for the next column delimiter. It must check if the text is inside the text quote character or outside.
ESCAPE_CHAR	Another way to deal with inline special characters is to escape them; for example, 2000;IT Costs\; software related only;435.55. Here the \ is an escape character and indicates that the subsequent character is to be taken literally, not as a column delimiter.

Parameter	Description and Examples
TEXT_QUOTES_ESCAPE_CHAR	How to make quotes appear inside the text; for example, <code>IT Costs; "software related" only</code> . One option the file creator might have used is to use the global escape character: <code>2000;"IT Costs; \"software related\" only";435.55</code> . Another popular method is to have the quotes escaped by another quote like in <code>2000;"IT Costs; ""software related"" only";435.55</code> . In that case, both the <code>TEXT_QUOTE="</code> and the <code>TEXT_QUOTE_ESCAPE_CHAR="</code> are set to the <code>"</code> character.
QUOTED_TEXT_CONTAIN_ROW_DELIMITER	The default value is <i>False</i> , which tells the parser that regardless of any quotes or escape characters, the text inside a row never contains the row delimiter character sequence. In this case, the parser can break the file into rows faster, can search only for the character sequence, and only the column parsing has to consider the escape and quote characters. If set to true, parsing is slower.

## Fixed-Width only

Parameter	Description and Examples
COLUMNSSTARTENDPOSITION	<p>In a fixed-width file, the column positions must be specified for each column. Examples:</p> <ul style="list-style-type: none"> <li>• <code>0-3;4-11;12-37;38-53</code> defines that the first 4 characters are the first column, the next 8 contain the data for the second column, and so on. Columns must be in the proper order.</li> <li>• <code>0;4;12;38</code> is equivalent to the previous example, but the last column ends with the line end</li> <li>• <code>0;4;12;38-53</code> can be used as well. In fact, for every column you can either specify the start and end position or just the start.</li> </ul>
ROWLENGTH	<p>In fixed-width files, there does not need to be a row delimiter. Often the file has some and then they must be stripped away. The following examples assume that the last data character is at index 53 as specified the COLUMNSSTARTENDPOSITION example.</p> <ul style="list-style-type: none"> <li>• <code>ROWLENGTH=56 ROW_DELIMITER=</code> would work for a file that has a row delimiter. The payload text ranges from 0..53; therefore, it is 54 characters long plus two characters for <code>\r\n</code>. The last column does not contain the <code>\r\n</code> because it is instructed to end at index 53.</li> <li>• <code>ROWLENGTH=54 ROW_DELIMITER=\r\n</code> is equivalent to the previous example. Each row is expected to be 54 characters plus 2 characters long. The main advantage of this notation is that <code>COLUMNSSTARTENDPOSITION=0;4;12;38</code> would work and the trailing <code>\r\n</code> is stripped away. In the previous example, the last column would start at 38 and end at index 55 due to <code>rowlength=56</code> and therefore contain the <code>\r\n</code> characters in the last column.</li> </ul>

## XML and JSON only

Parameter	Description and Examples
SCHEMA_LOCATION	The absolute path to the XML schema file <code>&lt;filename&gt;.xsd</code> . For example: <pre>SCHEMA_LOCATION=Z:\FileAdapter\XMLSchema\example.xsd</pre>
TARGET_NAMESPACE	The target namespace defined in the XML schema. For example: <pre>TARGET_NAMESPACE=NISTSchema-negativeInteger-NS</pre>
ROOT_NAME	The XML node to use to display the hierarchy structure. For example: <pre>ROOT_NAME=root</pre>
CIRCULAR_LEVEL	The maximum recursive level in the XML schema to display. For example: <pre>CIRCULAR_LEVEL=3</pre>

### 6.9.3.2 Generate the Configuration File with SAP Web IDE

Use SAP Web IDE to create file format configuration files so that your CSV and fixed-format files can be used in processing your data in the Flowgraph Editor.

#### Prerequisites

Ensure the SAP HANA database (HDB) module exists. For more information, see the *SAP HANA Developer Guide for XS Advanced Model*.

#### Context

To create a file format configuration file in SAP Web IDE:

#### Procedure

1. Create a virtual table by right-clicking the `src` folder and choosing **New > File**, then enter a file name with the `.hdbvirtualtable` extension. For example, `myVT.hdbvirtualtable`.
2. Right-click the `.hdbvirtualtable` file, and then choose **Open With > File Format Editor**.

The File Format Editor is separated into three panes. The options pane shows all of the settings for the file location and file content. The required settings have an asterisk (\*) next to them. In the top-right pane, you can copy and paste a few lines from your data file to test the options you have set in the left pane. For a complete list of options and descriptions, see [File Format Options \[page 207\]](#).

3. Enter the remote source name and remote object identifier. These identifiers help determine the location and the configuration file that it references. In this example, the remote source name is Remote and the remote object identifier is Object: VIRTUAL TABLE DUMMY AT  
"REMOTE"."<NULL>"."<NULL>". "OBJECT"
4. Enter a file name pattern. This action associates all files with this pattern to the file format definition. For example, `% .txt` applies to all files with a TXT extension. `123% .txt` applies to all TXT files that begin with the value "123".
5. Choose the file format type.

Option	Description
CSV	Uses the comma-separated value format.
Fixed	Uses the fixed-width format.

6. Set the required options based on the file format type selected in the previous step.
  - If you chose the [CSV](#) format, set the column delimiter that is used to separate the values in your file. Frequently, this delimiter is a comma (,), but you can also use other values such as a semicolon (;), colon(:), pipe (|), and so on.
  - If you chose the [Fixed](#) format, enter the row length and the column start and end numbers. The row length should be the value of the entire row, including spaces and delimiters. The column start and end numbers are the length of each column. You can enter the span of the column, or only the starting number of the column. For example, 0-3;4-14;15-27 and 0;4;15 each return three columns with a total row length of 28.
7. In the [Virtual Table Columns](#) section, add one or more columns of your virtual table or enter column heading names by clicking the + icon and setting the name, description, and type of each new column. Depending on the type you selected, you may also need to enter length, precision, and scale options. If you choose to test your settings, you can see the columns you have added in the Simulation pane.

You can run the simulation on your file and copy the detected header information as columns in the [Virtual Table Columns](#) section.

8. To test your settings, copy several lines from your data file and paste them into the top-right pane. Click the [Run Simulation](#) icon above this pane to see the simulated results in the bottom-right pane.
9. When you have completed the settings, click [Save](#).  
You can either create a configuration file that serves as the file format definition, or you can use the virtual table as the file format definition. The advantage of a virtual table is that you can use the table as an object in your flowgraph. For example, you can reference it as a HANA Object in the Data Source and Data Target, and in any nodes where you can call a procedure in the flowgraph. If you created a virtual table, the configuration file is automatically created and placed in the file adapter with the name `<remote_object_identifier>.cfg`. If you are creating a configuration file, continue with the following steps.
10. (Optional) If you want to create a configuration file:
  1. Right-click the `.hdbvirtualtable` file and choose [Configuration \(.cfg.txt\)](#).
  2. Export the configuration file by right-clicking the `.cfg.txt` file, and choose [Export](#) to place the file in your file adapter.

3. On the file adapter, right-click the `.cfg.txt` file, choose [Rename](#), then delete the `.txt` extension from the filename so that it ends in `.cfg`. For example, you would rename the file `northwest_sales.cfg.txt` to `northwest_sales.cfg`.

## Related Information

[File Format Options \[page 207\]](#)

[Create an HDB Module \(SAP HANA Developer Guide for SAP HANA XS Advanced Model\)](#)

### 6.9.3.2.1 File Format Options

Lists the options available for generating the file format definition in SAP Web IDE.

#### Remote Source

Option	Description
Remote Source Name	Enter the name of the remote source, which helps locate the remote source.
Remote Object Identifier	Enter the ID of the object on the remote source, which helps identify the configuration file that it references. If the configuration file does not exist under that identifier, a configuration file is created when the virtual table is deployed.
Description	Enter an optional description of the remote source.

#### File Location

Option	Description
Filename Pattern	Enter a file name pattern that indicates the files that are used automatically with this file format definition. For example, if you enter <code>123%</code> , all files that begin with <code>123</code> automatically use this file format definition.

Option	Description
Directory Pattern	<p>Enter a directory pattern that indicates the location of the files used with this file format definition. You can use the directory pattern alone, or with the filename pattern setting, to narrow the virtual tables that use this file format definition. You might want to execute a simple <code>select * from &lt;virtualtable&gt;</code> without a WHERE clause on a directory and name of the file. In that case, every single file in the root directory and subdirectories is read and parsed according to this virtual table format definition. Processing might take a while and produce many errors. However, if the virtual table maps to files in a particular directory, directory tree, or to particular file names only, you can specify this information in the virtual table directly. For example:</p> <ul style="list-style-type: none"> <li>Read all files in one directory only: Directory Pattern=/usr/sap/FileAdapter/FileServer/plandata</li> <li>Read all files in the directory and subdirectories: Directory Pattern=/usr/sap/FileAdapter/FileServer/plandata/%</li> <li>Read all files in directories that start with “plan” Directory Pattern=/usr/sap/FileAdapter/FileServer/plan%:</li> <li>Read files like plan20120101.txt Filename Pattern=plan%.txt</li> <li>Read files inside the directory and match the provided name pattern</li> </ul> <pre>Directory Pattern=/usr/sap/FileAdapter/FileServer/plandata Filename Pattern=plan%.txt</pre>
Number of Partitions	Enter the number of partitions for parallel processing, which can improve performance. Entering 0 means that the data is run serially.

## File Content Specification (general options)

Option	Description
Format	Choose the data source file type, CSV (comma-separated value), or Fixed (fixed-width files). The option you select here displays format-specific options.
Code Page	Select the character encoding for the file. By default, the operating system default is used. When the file has a Byte Order Mark, this code page is always used. Valid values of the Java installation can be found by creating a virtual table for the code page and querying its contents. If you chose JSON or XML as the format, then set the code page to UTF-8.
Locale	The locale option sets the decimal and date conversion from the strings in the file into native numbers or dates. For example, the month and day “14. Oktober 2017” are valid in German, but is not valid in other languages. Valid values for the locale can be found by querying a virtual table based on the LOCALE table of the adapter.
Skipped Leader Lines	If the file contains header information such as metadata that is not used in the actual data columns, enter the number of lines to be skipped.

Option	Description
Row Delimiter	<p>Enter the character sequence indicating the end of a row in the file. When the delimiters are nonprintable characters, they can be provided encoded as /d65536 or /xFFFF or as Unicode notation /u+FFFF. Alternatively, the typical \r and \n are supported as well. Examples:</p> <ul style="list-style-type: none"> <li>• \n Unix standard</li> <li>• \r\n Windows standard</li> <li>• \d13\d10 Windows standard, but characters provided as a decimal number</li> <li>• \x0D\x0A Windows standard, but characters provided as a hex number</li> </ul>

## File Content Specification (CSV only)

Option	Description
Column Delimiter	<p>Enter the character sequence indicating the next column. If nonprintable characters are used, then encoding \d65536, \xFFFF, or \u+FFFF works.</p> <ul style="list-style-type: none"> <li>• ; The semicolon is the column separator, so a line looks like 2000;IT Costs; 435.55</li> <li>•   Use the pipe character as the delimiter</li> <li>• \d09 Use an ASCII tab character as the delimiter</li> </ul>
Escape Character	<p>If you have special characters in your data such as quotation marks or semicolons, enter an escape character to use the character literally. For example, 2000;IT Costs \; software related only;435.55. In this example, the \ char is an escape char and indicates that the subsequent character, the semicolon (;), is to be taken literally, not as a column delimiter.</p>
Text Quotes Character	<p>If you have text data enclosed in quotes, you can specify a character to indicate that the quotes are part of the data, and not a delimiter. The line 2000;IT Costs; software related only;435.55 would appear as 4 columns because the text contains a semicolon as well. If the file was created with quotes like 2000;"IT Costs; software related only";435.55, then the semicolon within the quotes is not interpreted as a column delimiter.</p>
Text Quotes Escape Character	<p>Specify how to make quotes appear inside the text, like in IT Costs; "software related" only. One option the file creator might have used is to use the global escape character: 2000;"IT Costs; \"software related\" only"; 435.55. Another popular method is to have the quotes escaped by another quote like in 2000;"IT Costs; ""software related"" only";435.55. In that case both the Character for Text Quotes=" and the Text Quotes Escape Character=" are set to the " character.</p>
Quoted Text Contains Row Delimiter	<p>When disabled (off), indicates that any quotes or escape characters in text inside a row does not contain the row delimiter character. In this case, processing is faster. When enabled (on), processing is slower because the system looks for quotes or escape characters in the rows.</p>

## File Content Specification (Fixed Format only)

Option	Description
Row Length	<p>In fixed width files, you do not need to set a row delimiter. Often the file has some delimiters, and then they must be stripped away. The following examples show that the last data character is at index 53:</p> <ul style="list-style-type: none"><li>Setting <code>RowLength</code> to 56 and leaving the <code>Row Delimiter</code> setting empty works for a file that has a row delimiter. The payload text ranges from 0 to 53 (therefore is 54 characters long when counting the 0) plus two characters for <code>\r\n</code>. However, the last column does not contain the <code>\r\n</code>, and is told to index at 53.</li><li>Setting <code>RowLength</code> to 54 and <code>Row Delimiter</code> to <code>\r\n</code> is equivalent to the example in the previous bullet. Each row is expected to be 54 characters plus 2 characters long. The main advantage of this notation is that setting the <code>Columns Start and End Position</code> parameter to 0;4;12;38 works well, because the trailing <code>\r\n</code> is stripped away. In the example in the previous bullet, the last column would start at 38 and end at index 55, because the row length is 56 and contain the <code>\r\n</code> characters in the last column.</li></ul>
Columns Start and End Position	<p>Enter the column positions for each column. Example:</p> <ul style="list-style-type: none"><li>0-3;4-11;12-37;38-53 defines that the first 4 characters are the first column, the next 8 contain the data for the second column, and so on. Columns must be in the proper order.</li><li>0;4;12;38 is equivalent to the example in the previous bullet. The last column ends with the line end.</li><li>0;4;12;38-53 can be used as well. In fact, every single column can either specify the start and end position or just the start.</li></ul>

## Virtual Table Format Settings

Option	Description
Exponential Character	Enter a character that identifies any exponents in the data.
Date Format	Choose from the available date and time formats or enter a custom date or time format. Each option can have a different format string. The syntax of the format string is the Java <code>SimpleDateFormat</code> syntax.
Seconddate Format	
Time Format	
Timestamp Format	
Convert Invalid Date or Time	Enable the option to correct automatically invalid date or time values. For example, the 27th hour changes to 3 am.



## Virtual Table Columns (Add Columns dialog)

Option	Description
Name	Enter the column name.
Description	Enter a description of the column.
Type	Select the column type based on the data in the column.
Length	Enter the number of characters of the longest value in the column.
Precision	Enter the total number of digits in the value. Used for Decimal data types.
Scale	Enter the number of digits to the right of the decimal. Used for Decimal data types.

### 6.9.3.3 Generate the Configuration File With a Command-Line Utility

Use a Data Provisioning utility to create the CFG file.

#### Procedure

1. Navigate to `<DPAgent_root>\agentutils`.
2. Run the following from the command line:

For Windows:

```
createfileformat.bat -file <PATH TO DATA FILE> -cfgdir <DIRECTORY TO STORE  
GENERATED CFG FILES> <OPTION> <VALUE>.....
```

For UNIX:

```
createfileformat.sh -file <PATH TO DATA FILE> -cfgdir <DIRECTORY TO STORE  
GENERATED CFG FILES> <OPTION> <VALUE>.....
```

Only the `-file`, `-cfgdir`, and `-format` (when using a CSV file) parameters are required.

The value for the `-file` parameter is the path to the directory containing one or more data files or the path to a single file name for which the configuration files must be generated. The value for `-cfgdir` is the path to the output directory where the generated configuration files are stored.

A number of options and value pairs can be provided as extra parameters. The following are supported:

Parameter	Description
<code>-colDelimiter</code>	The column delimiter
<code>-rowDelimiter</code>	The row delimiter

Parameter	Description
-txtDelimiter	Text quotes
-escChar	Escape character
-txtEscChar	Quote escape character
-dateformat	Default date format
-timeformat	Default time format
-secondDateformat	Default second date format
-format	The format of the file
-firstRowAsColumnName	<p>Specifies whether to use the first row in a data file as the column names when generating a CFG file with the <code>createfileformat.sh/bat</code> tool.</p> <p>If set to TRUE, <code>createfileformat.sh/bat</code> uses the row above the real data as the column name. Otherwise, <code>createfileformat.sh/bat</code> sets the row names as COL1, COL2, ... by default. The default value is FALSE.</p> <p>/17</p> <div> <p><b>i Note</b></p> <p>To use this parameter together with <code>-skipHeaderLine</code>, the row containing the column names should be included in the <code>-skipHeaderLine</code> count. If you set <code>-firstRowAsColumnName</code> to true and did not configure <code>-skipHeaderLine</code>, <code>-skipHeaderLine</code> is set automatically to 1.</p> </div> <div> <p><b>i Note</b></p> <ul style="list-style-type: none"> <li>○ FIXED format files do not support <code>-firstRowAsColumnName</code>.</li> <li>○ The count of column name in the column name line must be correct.</li> <li>○ If there are two-column names, but there are 3 columns in the file data, the last column is ignored.</li> <li>○ The column delimiter also applies to the column name line.</li> </ul> </div>
-skipHeaderLine	Skips header lines

Parameter	Description
-columnStartEndPosition	<p>FIXED file column start end position. For example, -columnStartEndPosition 0-10;11-20.</p> <p>Handle this parameter differently for Windows and Linux systems. The following is an example for Windows:</p> <pre>./createfileformat.sh -file /dpagent/text/test.txt - cfgdir /dpagent/cfg -rowLength 16 -columnStartEndPosition 0-14;14-15 - format "FIXED"</pre> <p>For Linux, you must enclose the semicolon in double quotes:</p> <pre>./createfileformat.sh -file /dpagent/text/test.txt - cfgdir /dpagent/cfg -rowLength 16 -columnStartEndPosition 0-14";"14-15 - format "FIXED"</pre>
-rowLength	FIXED file row length
-quotedTxtContainsRowDelimiter	Quoted text contains the row delimiter (TRUE or FALSE)
-locale	Default locale
-codePage	Default code page

If no options are provided as parameters, the default delimiters are:

Delimiter	Character
Column delimiter	,
Row delimiter	\n (UNIX) \r\n (Windows)
Escape character	\
Quote escape character	"
Default text quotes	"

### **i** Note

Only one format of each type (date, time, second date) is allowed per file. If you have two columns containing different formatted dates in it, only the first one is recognized. The second is Varchar.

## Example

Run this tool to generate a configuration file named `call_center.dat` that has ';' as a column delimiter and '\n' as a row delimiter:

```
createfileformat.sh -file C:\usr\sap\dataprovgent\sasi\FileServer
\call_center.dat
-cfgdir C:\usr\sap\dataprovgent\sasi\FileDefinitions -colDelimiter ; -
rowDelimiter \n
```

### 6.9.3.4 Generate the Configuration File When Creating a Virtual Table

You can generate a CFG file when you create a virtual table using SQL.

A convenient way to generate the necessary configuration file is to do so when creating a virtual table using SQL. By including the appropriate parameters in the SQL, a CFG file is generated and inserted into the appropriate directory that you specified when creating the File adapter remote source.

For example, the following sample code generates a file named `v_plan_2.cfg` that is created in the file format directory.

```
create virtual table v_plan2 at "fileAdapter"."<NULL>". "<NULL>". "v_plan_2"
REMOTE PROPERTY 'dataprovisioning_parameters'=
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<Parameters>
<Parameter name="COMMENT">First line must be a comment</Parameter>
<Parameter name="FORCE_FILENAME_PATTERN">fixed%.txt</Parameter>
<Parameter name="FORCE_DIRECTORY_PATTERN"></Parameter>
<Parameter name="FORMAT">FIXED</Parameter>
<Parameter name="CODEPAGE">UTF-8</Parameter>
<Parameter name="ROW_DELIMITER">\n</Parameter>
<Parameter name="SKIP_HEADER_LINES">1</Parameter>
<Parameter name="COLUMNSSTARTENDPOSITION">0-1;2-7;8-15</Parameter>
<Parameter name="ROWLENGTH">16</Parameter>
<Parameter name="COLUMN">COL1;VARCHAR(2)</Parameter>
<Parameter name="COLUMN">COL2;VARCHAR(6)</Parameter>
<Parameter name="COLUMN">COL3;VARCHAR(8)</Parameter>
</Parameters>';
```

## Related Information

[File Adapter Remote Source Configuration \[page 190\]](#)

[Format Parameters \[page 201\]](#)

## 6.9.4 Remote Source Tables

The remote source provides tables that reflect the content of the CFG files, and they can be imported as virtual tables.

After a remote source is created, you can browse the remote source. Each of the configured CFG files is shown as a remote table under the remote source and can be imported as a virtual table. The following tables are always included:

Table	Description
CODEPAGES	Use this table to retrieve all supported code pages of the Java installation and optionally specify one in the various file format configuration files. The code page controls the character encodings of the source files.
FILECONTENT	This virtual table has one row per file and the entire file content is inside a BLOB column. Use this table for unstructured data files.
FILECONTENTROWS	Similar to FILECONTENT, this table returns the data as is, without any conversion, but splits the file into rows at every <code>&lt;newline&gt;</code> character.
FILECONTENTROWSTEXT	Similar to FILECONTENTROWS, this table also uses a character buffer for improved performance when handling lines with a length less than or equal to MAX_CLOB_IN-LINE_LOB_LENGTH(43690).  For lines with a greater length, this table behaves the same as FILECONTENTROWS.
FILECONTENTTEXT	This virtual table has one row per file, and the entire file content is inside an NCLOB column. Use this table for unstructured data files. In case the file has no ByteOrderMark (BoM) header to identify the code page, or the operating system default code page is not the proper one, you can supply the reader option CODEPAGE.
FILEDIRECTORY	Returns a list of all files in the remote source configured root directory and its subdirectories.
LOCALES	This table returns all supported Java locales, and the values can be used to control the locale of the file read, which impacts the decimal format, the month names of a date format, and so on.
STATISTICS_CHAR	Calculates the number of occurrences of each character in the files. Characters that occur often usually are column delimiters, optional text quotes, and row delimiter characters.

## 6.9.5 Connect to a SharePoint Remote Source

Information about retrieving source data from a SharePoint server.

### Procedure

1. Configure the remote source, making sure that you set the appropriate parameters.

At a minimum, you will need to configure the following remote source parameters, :

Parameter	Comment
Source Options	
Target Options	
Root Directory	
Directory of the file format definitions	
Server URL	SharePoint server URL
Local Folder Path	The download folder path. This folder will be created under the <DPAgent_root>/ directory automatically. The local folder path is the location on the Data Provisioning Agent machine local drive where you want to place your source data files that the Data Provisioning Agent will download from the SharePoint server.

See the remote source configuration topic for more information about these parameters.

- Replicate data from, for example, the following SharePoint server URL: `http://<host name>/sharepoint_site1/SharedDocuments/myCSVfile.txt`.
- In the local CFG file, add the following:

```
FORCE_FILENAME_PATTERN=myCSVfile.txt
FORCE_DIRECTORY_PATTERN=<root directory>\download\sharepoint\SharedDocuments
```

## Results

Data Provisioning Agent will download `myCSVfile.txt` from the SharePoint Server URL `SharedDocuments` folder and store the file locally in `<root directory>\download\sharepoint\SharedDocuments`.

### Note

When you execute a query, the Data Provisioning Agent downloads the file and places it in the download folder. If you execute the same query to obtain the same file, the system downloads the file again and replaces the existing file in the download folder.

## Related Information

[File Adapter Remote Source Configuration \[page 190\]](#)

## 6.9.6 Access SharePoint Using HTTPS/SSL

Information about how to access SharePoint using HTTPS/SSL.

### Context

You can access the SharePoint server using HTTPS or SSL. You first must download the SharePoint certificate (CER) and configure your system.

### Procedure

1. Navigate to `<DPAgent_root>/ssl` folder.
2. Run the command to change the default keystore password `changeit`.

```
c:\<user>\dpagent\ssl>keytool -storepasswd -keystore cacerts
Enter keystore password:changeit
New keystore password:
Re-enter new keystore password:
```

#### i Note

Keytool is in the `jre/bin` folder. Add it to the `$PATH` environment. For example, `C:\Program Files\Java\jre7\bin\keytool.exe`

3. Import the certificate that you exported.

```
c:\<user>\dpagent\ssl>keytool.exe -importcert -keystore c:\user\dpagent\ssl
\cacerts
-storepass <New Key Store Password> -file C:\<user>\dpagent\ssl
\SharePointSSL.cer
Owner: CN=RQA16CWIN2.sjc.sap.corp
Issuer: CN=RQA16CWIN2.sjc.sap.corp
Serial number: 34973632d6cb31934fdfbe04352cc5dc
Valid from: Thu Jan 05 01:29:45 PST 2017 until: Thu Jan 04 16:00:00 PST 2018
Certificate fingerprints:
    MD5: 0C:7E:CA:38:1B:1E:2A:2A:47:21:78:86:50:1C:85:CE
    SHA1: 25:CE:CF:F8:9A:2C:70:0A:66:CD:39:D5:C5:EC:10:4D:57:42:28:0B
    SHA256: 40:80:A0:E1:56:1A:9A:F4:9F:63:20:37:F3:41:B0:27:B6:1F:9C:
33:3C:
0A:E8:79:0B:91:7E:E6:6B:E8:08:3A
    Signature algorithm name: SHA1withRSA
    Version: 3
Extensions:
#1: ObjectId: 2.5.29.37 Criticality=false
ExtendedKeyUsages [
    serverAuth
]
#2: ObjectId: 2.5.29.15 Criticality=false
KeyUsage [
    Key_Encipherment
    Data_Encipherment
]
Trust this certificate? [no]: yes
```

```
Certificate was added to keystore
```

4. Open the dpagentconfig tool in `<DPAgent>_root/configTool/dpagentconfigtool.exe`. Click [Configure SSL](#) and input the keystore file path and password that you used in the previous step.
5. If you are not using the TCP SSL connection between SAP HANA and the DP Agent, clear the [Use SSL to communicate with HANA on Cloud](#) and [Enable SSL for Agent to HANA communication on TCP](#) parameters.
6. Open `<DPAgent_root>/dpagent.ini`, and add the following configuration:

```
-Djavax.net.ssl.trustStore=<keystore file path>
```

For example: `-Djavax.net.ssl.trustStore=C:\<user>\dpagent\ssl\cacerts`

7. Restart the DP Agent.

## 6.9.7 Accessing Files On a Shared Network

Information about how to use a shared network directory for data files with the File adapter.

You can access data and format files in a shared directory if you follow these guidelines:

### Windows

When using Windows, make sure that you manually access the network folder first using a user name and password before you try to connect by creating a remote source.

### Linux

To access a Linux network folder, mount the folder under the Data Provisioning Agent root installation directory.

## File Adapter Remote Source Parameters

Observe the instructions for the [Root Directory](#) and [Directory of the file format definitions](#) parameters when creating your File remote source.

## Related Information

[File Adapter Remote Source Configuration \[page 190\]](#)



## 6.9.8 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. Navigate to the Agent Adapter Framework Preferences.
  - In graphical mode, choose **Config** > **Preferences**, and then select **Adapter Framework**.
  - In command-line interactive mode, choose **Set Agent Preferences** in the **Agent Preferences** menu.
3. For the **Read-only Adapters** property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start and Connect the Configuration Tool \[page 84\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

## 6.9.9 Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365

You must register an application on Microsoft Azure Portal as a precondition for using the Microsoft Graph API, which is what allows you to access SharePoint on Office365 using the File or Microsoft Excel adapters.

### Procedure

1. Go to <https://portal.azure.com> and sign in with your Microsoft account.
2. Navigate to *Azure Active Directory*, and click *App registrations*.
3. Click *New registration*.
4. Choose a name for your Data Provisioning Agent--for example, *sdi-dpagent*--to use as the name for your application.
5. Choose the proper *Supported account types*: either *Account in this organizational directory only* or *Accounts in any organizational directory*.
6. Leave *Redirect URL* empty, and click *Register*.

### Next Steps

After registration, note the application (client) ID and Directory (tenant) ID, which you use during remote source configuration.

## Related Information

[File Adapter Remote Source Configuration \[page 190\]](#)

[Configure Your Microsoft Azure Application \[page 221\]](#)

## 6.9.10 Configure Your Microsoft Azure Application

Configure your Azure application to set up your credentials and Microsoft Graph API.

### Context

Further configuration of your Azure application is necessary to create credentials for when you create a remote source. You must also grant permissions for using the Microsoft Graph API.

### Procedure

1. Click [Authentication](#) to configure the client type.

If you want to authenticate using the username and password mode, set the *Default client type* to [Yes](#).

If you want to authenticate the Client Credential mode, set the *Default client type* to [No](#).

- a. If you chose to authenticate using Client Credential mode, create a credential by clicking [Certificates & secrets](#). If you chose to authenticate using the username and password mode, skip to step 2.
  - b. Click [New client secret](#), give it a name and an expiration time, and click [Add](#).
  - c. Note the secret password for use during remote source creation.
2. Add permissions by clicking [API permissions](#) on the application page, and then clicking [Add a permission](#).
  3. Click [Microsoft Graph](#).
  4. If you use the Client Credential mode, click [Application Permission](#). If you use the Username and password mode, click [Delegated permission](#).
  5. Add the following permissions:
    - Directory.Read.All
    - Files.Read.All
    - Group.Read.All
    - Sites.Read.All
    - User.Read.All
  6. Grant consent for these permissions.

If you have an administrator role, click [Grant consent](#).

If you do not have an administrator role, ask your administrator to grant permission for you.

#### **i** Note

If permissions are not granted, you will not be able to access SharePoint Office365.

Every time a permission is changed, you should redo the grant operations.

## Next Steps

You can now create your remote source, using the information created while setting up your Microsoft Azure Portal application.

## Related Information

[File Adapter Remote Source Configuration \[page 190\]](#)

[Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365 \[page 220\]](#)

## 6.10 File Datastore Adapters

Use the File Datastore adapters to read text files.

File Datastore adapters leverage the SAP Data Services engine as the underlying technology to read from a wide variety of file sources. SAP Data Services uses the concept of datastore as a connection to a source. These adapters provide features including:

- Auto-detect file formats
- Route rows that failed to be read to another file
- Read CFG files from SFTP sources
- Automatic CFG file generation via virtual procedure or data file importation

The file datastore adapters include:

- FileAdapterDatastore
- SFTPAdapterDatastore

## Adapter Functionality

Datastore adapters support the following functionality:

- Virtual table as a source
- SELECT, WHERE, TOP, or LIMIT

## Related Information

[Authorizations \[page 223\]](#)

[Configuring Access to Your Data and Configuration Files \[page 223\]](#)

[File Format Configuration Files \[page 224\]](#)

[Format Parameters for File Datastore Adapters \[page 226\]](#)

[Virtual Procedures \[page 230\]](#)

[FileAdapterDatastore \[page 236\]](#)

[SFTPAdapterDatastore \[page 240\]](#)

[File \[page 187\]](#)

## 6.10.1 Authorizations

Authorization requirements for accessing remote sources with a File Datastore Adapter.

Keep the following in mind when accessing files:

- Ensure the user account under which the Data Provisioning Agent is running has access to the files on the local host.
- If the files are located on the same host as the Data Provisioning Agent, the files must be located in the same directory or in a subdirectory of the Data Provisioning Agent root directory.

## 6.10.2 Configuring Access to Your Data and Configuration Files

How the File Datastore Adapter locates data files and configuration files.

By default, the adapter has access to the `<DPAgent_root>/workspace` directory. To enable browsing your files, you can either put your data and configuration files in the default workspace directory, or you can configure the location of the files in `dpagentconfig.ini`. For example, add the following to the `<DPAgent_root>/dpagentconfig.ini` file:

```
#Number of paths that could be browsed in SAP HANA via this adapter
dsadapter.fileadapter.dirCount=2
dsadapter.fileadapter.dir1=C:\\TEST1\\UAT
dsadapter.fileadapter.dir2=C:\\TEST2\\QA
```

Then, browse to your data file and right-click to add it as virtual table. The adapter creates a corresponding configuration file in the same folder. For example, when you add `employee.csv` to SAP HANA, the adapter creates an `employee.cfg` file in the same folder.

Alternately, you can create your own configuration files through virtual procedures or create them manually:

- To use the Create Configuration File virtual procedure, in the SAP HANA Web Development Workbench: Catalog, navigate to **Provisioning > Remote Sources > <remote\_source> > File Operations > CFG Utilities**. Right-click *Create Configuration File* and *Add as Virtual Procedure*.
- To create the configuration files manually, execute CREATE VIRTUAL PROCEDURE SQL.

You can then use the virtual table in a flowgraph or SQL execution.

## Related Information

[Virtual Procedures \[page 230\]](#)

[Virtual Procedure: Create Configuration File \[page 233\]](#)

### 6.10.3 File Format Configuration Files

Create a file format configuration file to work with your data file (File Datastore adapters).

Each configuration file is a text file and must match the following format:

- The first line must contain a comment or a description. This line is ignored during processing.
- A set of key-value pairs to specify the various parsing options
- A set of `COLUMN=<name>;<SAP HANA datatype>;<optional description>;<optional date type format>;<optional column width>`

The date type format is necessary only if the SAP HANA data type of this column is date-related. Column width is necessary only if the data file is a fixed-format file.

#### Example

```
File format to read US census data, see https://www.census.gov/econ/cbp/download/
FORMAT=CSV
FORCE_FILENAME_PATTERN=us_county_census_%.txt
FORCE_DIRECTORY_PATTERN=
CODEPAGE=
LOCALE=
COLUMN_DELIMITER=,
ROW_DELIMITER=\r\n
ESCAPE_CHAR=
TEXT_QUOTES="
TEXT_QUOTES_ESCAPE_CHAR=
SKIP_HEADER_LINES=1
QUOTED_TEXT_CONTAIN_ROW_DELIMITER=false
DATEFORMAT=yyyy.MM.dd HH:mm:ss
COLUMN=FIPSTATE;VARCHAR(2);FIPS State Code
COLUMN=EMP;INTEGER;Total Mid-March Employees with Noise
COLUMN=QP1_NF;VARCHAR(1);Total First Quarter Payroll Noise Flag
COLUMN=CENSTATE;VARCHAR(2);Census State Code
COLUMN=CENCTY;VARCHAR(3);Census County Code
COLUMN=CENTIME;TIMESTAMP;Payroll Time; yyyy.MM.dd HH:mm:ss
COLUMN=PARTITION
COLUMNSTARTENDPOSITION=
```

#### Fixed-Format Files

Fixed file formats where `FORMAT=fixed` are supported. You can specify the formatting using the `<optional column width>` parameter. For example, in `COLUMN=COL3;VARCHAR(8);Description;;8`, the last column value of 8 indicates the width.

## Example

```
Fixed file format
FORMAT=FIXED
FORCE_FILENAME_PATTERN=fixed%.txt
CODEPAGE=UTF-8
LOCALE=
ROW_DELIMITER=\r\n
SKIP_HEADER_LINES=1
COLUMN=COL1;VARCHAR(2);Description;;2
COLUMN=COL2;VARCHAR(6);Description;;6
COLUMN=COL3;VARCHAR(8);Description;;8
```

## 6.10.4 Format Parameters for File Datastore Adapters

File format parameter descriptions for File Datastore adapters.

### Global

Parameter	Description and Examples
FORCE_FILENAME_PATTERN FORCE_DIRECTORY_PATTERN	<p>You might want to execute a simple <code>select * from &lt;virtualtable&gt;</code> without a WHERE clause on a directory. In that case, every file in the root directory and subdirectories is read and parsed according to this virtual table's format definitions. That process could take a long time and produce errors. However, if the virtual table maps to files in a particular directory, directory tree, or to particular file names only, you can specify this information in the virtual table directly. For example:</p> <ul style="list-style-type: none"><li>To read all files in that directory only:<pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata</pre></li><li>To read all files in that directory and subdirectories:<pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata/%</pre></li><li>To read all files in directories that start with "plan":<pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plan%:</pre></li><li>To read files like <code>plan20120101.txt</code>:<pre>FORCE_FILENAME_PATTERN=plan%.txt</pre></li><li>To read files inside the directory and matching the provided name pattern:<pre>FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/ FileServer/plandata FORCE_FILENAME_PATTERN=plan%.txt</pre></li></ul>
FORMAT	<a href="#">CSV</a> is required for CSV files.
CODEPAGE	The character encoding with which to read the file. By default, the operating system default is used. If the file has a Byte Order Mark, this codepage is used. Valid values of the Java installation can be found by creating a virtual table for CODEPAGE and querying its contents.



Parameter	Description and Examples
ROW_DELIMITER	<p>A character sequence indicating the end of a row in the file. If these sequences are nonprintable characters, they can be provided encoded as /d65536 or /xFFFF or as Unicode notation /u+FFFF. Alternatively, the typical \r and \n are supported as well. Examples:</p> <ul style="list-style-type: none"> <li>• \n UNIX standard</li> <li>• \r\n Windows standard</li> <li>• \d13\d10 Windows standard, but characters are provided as a decimal number</li> <li>• \x0D\x0A Windows standard, but characters are provided as a hex number</li> </ul>
SKIP_HEADER_LINES	If the file has a header, enter the number of lines to skip.
ERROR_ON_COLUMNCOUNT	By default, a row with fewer columns than defined is considered acceptable. Setting this parameter to <i>true</i> indicates that all rows of the file have as many columns as defined.
LOCALE	<p>The decimal and date conversion from the strings in the file into native numbers or dates might be locale-specific. For example, if you have the date "14. Oktober 2000", and you are using a German locale, it works. However, for all other languages, it does not work.</p> <p>Valid values for the locale can be found by querying a virtual table based on the LOCALE table of the adapter.</p>
COLUMN	multiple entries consist of the <code>columnname;datatype</code> , where the <code>datatype</code> is any SAP HANA data type.
NULL_INDICATOR	Specifies a character sequence to indicate to the software that the data is NULL.
<div><b>i Note</b></div> <div>The software ignores NULL indicators specified in the file format for blob columns.</div>	
IGNORE_ROW_MARKERS	Specifies a character sequence that appears at the beginning of specific rows. When the software reads the file, or when it automatically creates metadata, and it encounters the row markers, it ignores the row and moves to the next row.
DATEFORMAT	Specifies the date format for reading and writing date values to and from the file.
TIMEFORMAT	Specifies the time format for reading and writing time values to and from the file.
SECONDDATEFORMAT	Specifies the date/time format for reading or writing date/time values to and from the file.
BOF	Specifies a string that marks the start of data in the file.
EOF	Specifies the string that marks the end of data in the file.

Parameter	Description and Examples
EXPONENTIAL	<p>Defines the exponential character used for decimal numbers.</p> <p>For example, <code>e</code> for <code>1.05097214923805e-06</code> or <code>E</code> for <code>1.05097214923805E-06</code>.</p> <p>Default: <code>E</code></p>
LENIENT	<p>Controls automatic date and time format conversion when the value exceeds the range.</p> <p>For example, when this parameter is set to <code>True</code>, the 14th month of 2016 is converted to the second month of 2017.</p>

## CSV only

Parameter	Description and Examples
COLUMN_DELIMITER	<p>The character sequence indicating the next column. If nonprintable characters are used, then any of the following encodings works: <code>\d65536</code>, <code>\xFFFF</code>, or <code>\u+FFFF</code>.</p> <ul style="list-style-type: none"> <li>• <code>;</code> A semicolon is the column separator. For example, <code>2000;IT Costs; 435.55</code></li> <li>• <code> </code> uses the pipe character as a delimiter.</li> <li>• <code>\d09</code> uses an ASCII tab character as a delimiter.</li> </ul>
TEXT_QUOTES	<p>Sometimes text data is enclosed in quotes so a column delimiter inside the text does not break the format. The line <code>2000;IT Costs; software related only;435.55</code> would appear as four columns because the text contains a semicolon as well. If the file was created with quotes such as <code>2000;"IT Costs; software related only";435.55</code>, then there is no such issue. However, the file parser must not just search for the next column delimiter, it also must check if the text is inside or outside of the text quote character.</p>
ESCAPE_CHAR	<p>Another way to deal with inline special characters is to escape them. For example, <code>2000;IT Costs\; software related only;435.55</code>. Here the <code>\</code> character is an escape character and indicates that the subsequent character is to be taken literally and not as a column delimiter.</p>

Parameter	Description and Examples
TEXT_QUOTES_ESCAPE_CHAR	You can make quotes appear inside the text. For example, <code>IT Costs; "software related" only</code> . One option the file creator might have used is to use the global escape character <code>2000;"IT Costs; \"software related\" only";435.55</code> . Another popular method is to have the quotes escaped by another quote; for example, <code>2000;"IT Costs; ""software related"" only";435.55</code> . In that case, both the <code>TEXT_QUOTE="</code> and the <code>TEXT_QUOTE_ESCAPE_CHAR="</code> are set to the <code>"</code> character.
QUOTED_TEXT_CONTAIN_ROW_DELIMITER	The default value is <i>false</i> and tells the parser regardless of any quotes or escape characters that the text inside a row never contains the row delimiter character sequence. In this case, the parser can break the file into rows much faster; it must search for the character sequence only, and only the column parsing has to consider the escape and quote characters. If set to <i>true</i> , parsing becomes slower.

## Fixed-Width only

Parameter	Description and Examples
COLUMNSSTARTENDPOSITION	<p>In a fixed-width file, the column positions must be specified for each column. Examples:</p> <ul style="list-style-type: none"> <li><code>0-3;4-11;12-37;38-53</code> defines that the first 4 characters are the first column, the next 8 contain the data for the second column, and so on. Columns must be in the proper order.</li> <li><code>0;4;12;38</code> is equivalent to the previous example, but the last column ends with the line end</li> <li><code>0;4;12;38-53</code> can be used as well. In fact, for every column you can either specify the start and end position or just the start.</li> </ul>
ROWLENGTH	<p>In fixed-width files, there does not need to be a row delimiter. Often the file has some and then they must be stripped away. The following examples assume that the last data character is at index 53 as specified the COLUMNSSTARTENDPOSITION example.</p> <ul style="list-style-type: none"> <li><code>ROWLENGTH=56 ROW_DELIMITER=</code> would work for a file that has a row delimiter. The payload text ranges from 0..53; therefore, it is 54 characters long plus two characters for <code>\r\n</code>. The last column does not contain the <code>\r\n</code> because it is instructed to end at index 53.</li> <li><code>ROWLENGTH=54 ROW_DELIMITER=\r\n</code> is equivalent to the previous example. Each row is expected to be 54 characters plus 2 characters long. The main advantage of this notation is that <code>COLUMNSSTARTENDPOSITION=0;4;12;38</code> would work and the trailing <code>\r\n</code> is stripped away. In the previous example, the last column would start at 38 and end at index 55 due to <code>rowlength=56</code> and therefore contain the <code>\r\n</code> characters in the last column.</li> </ul>

## Related Information

[Configuring Access to Your Data and Configuration Files \[page 223\]](#)

### 6.10.5 Virtual Procedures

Use the provided utility virtual procedures to alter, create, delete, or view configuration files.

First use auto-detect to identify the delimiters and metadata, then use these virtual procedures to alter a file source to your requirements.

To create a virtual procedure, in the SAP HANA Web Development Workbench: Catalog, navigate to [► Provisioning ► Remote Sources ► <remote\\_source> ► File Operations ► CFG Utilities ►](#). Right-click the utility and select [Add as Virtual Procedure](#).

## Related Information

[Virtual Procedure: Alter Configuration File Property \[page 230\]](#)

[Virtual Procedure: Alter File Field \[page 232\]](#)

[Virtual Procedure: Create Configuration File \[page 233\]](#)

[Virtual Procedure: Delete Configuration File \[page 235\]](#)

[Virtual Procedure: View Configuration File \[page 235\]](#)

#### 6.10.5.1 Virtual Procedure: Alter Configuration File Property

Use the Alter Configuration File Property virtual procedure to change values in a CFG file property.

You can alter the following values in a CFG file property:

INOUT	Parameter	Type	Description
IN	ConfigFilePath	NVARCHAR	Full path to the CFG file
IN	ParameterName	NVARCHAR	Name of the CFG file format parameter
IN	ParameterValue	NVARCHAR	Value of the CFG file format parameter
OUT	StatusTable	TABLE	Table describing the procedure call status

## Creating the virtual procedure via SQL statement

```
CREATE VIRTUAL PROCEDURE "SYSTEM"."Alter_Configuration_File_Property"(  
  IN ConfigFilePath NVARCHAR(512),  
  IN ParameterName VARCHAR(1024),  
  IN ParameterValue VARCHAR(1024),  
  OUT param_3 TABLE (Status TINYINT, Message VARCHAR(1024))) CONFIGURATION '{  
    "___DP_UNIQUE_NAME___": "FileAdapter.Procedures.ConfigUtil.ALTER_SINGLE_CONFIG",  
    "___DP_HAS_NESTED_PARAMETERS___": false,  
    "___DP_USER_DEFINED_PROPERTIES___": {  
      "dsadapter.fileadapter.procedure.ConfigProcedure$ConfigProcedureType":  
        "ALTER_SINGLE_CONFIG",  
      "isProcCallOnCFGFile": "false"  
    },  
    "___DP_INPUT_PARAMETER_PROPERTIES___": [],  
    "___DP_RETURN_PARAMETER_PROPERTIES___": [],  
    "___DP_VIRTUAL_PROCEDURE___": true,  
    "___DP_HAS_INTERNAL_OUTPUT_PARAMETER___": false,  
    "___DP_DEFAULT_OUTPUT_PARAMETER_INDEX___": 0  
  }' AT "{remote_source_name}";
```

## Example

Suppose that you have a file on C:\usr\sap\dataprovagent\workspace\sample\_data.csv where the content is in the following format. You want to point the configuration to prod\_data.csv instead of sample\_data.csv so you can test with the sample file and load the production file during execution.

```
Item ID,Item Price,Item Description,Date_Added  
101,99.99,Item1,2016-10-11
```

The CFG file:

```
#FileFormat created by virtual procedures  
COLUMN_DELIMITER=,  
ERROR_ON_COLUMNCOUNT=false  
FORCE_DIRECTORY_PATTERN=C:\usr\sap\dataprovagent\workspace  
FORCE_FILENAME_PATTERN=sample_data.csv  
FORMAT=CSV  
ROW_DELIMITER=\r\n  
SKIP_HEADER_LINES=1  
COLUMN=Item_ID;INTEGER;  
COLUMN=Item_Price;DOUBLE;  
COLUMN=Item_Description;VARCHAR(256);  
COLUMN=Date_Added;DATE;SomeDateColumn;yyyy-MM-dd;0
```

Use the procedure to update FORCE\_FILENAME\_PATTERN to use prod\_data.csv:

```
--Alter second column properties  
call "SYSTEM"."Alter_Configuration_File_Property"('C:\usr\sap\dataprovagent  
\workspace\item.cfg', 'FORCE_FILENAME_PATTERN', 'prod_data.csv', ?);  
--Check if updated correctly  
call "SYSTEM"."View_Configuration_File"('C:\usr\sap\dataprovagent\workspace  
\item.cfg', ?, ?);
```

## 6.10.5.2 Virtual Procedure: Alter File Field

Alter column metadata using a virtual procedure.

The Alter File Field virtual procedure allows you to change the column metadata for a given file field. You can alter data types, length, format, and so on.

INOUT	Parameter	Type	Description
IN	ConfigFilePath	NVARCHAR	Full path to the CFG file
IN	ColumnIndex	INTEGER	Index of the column; starts with 0
IN	ColumnName	NVARCHAR	Column name
IN	DataType		Column data type
IN	LengthOrPrecision	INTEGER	Length or precision
IN	Scale	INTEGER	Column scale
IN	Description	NVARCHAR	Column description
IN	Format	NVARCHAR	Column date/time format
IN	ColumnWidth	INTEGER	Column width for fixed-width format
OUT	StatusTable	TABLE	Table describing the procedure call status

### Creating the virtual procedure via SQL statement

```
CREATE VIRTUAL PROCEDURE "SYSTEM"."Alter_File_Field"(  
  IN ConfigFilePath NVARCHAR(512),  
  IN ColumnIndex INTEGER,  
  IN ColumnName VARCHAR(1024),  
  IN DataType VARCHAR(32),  
  IN LengthOrPrecision INTEGER,  
  IN Scale INTEGER,  
  IN Description NVARCHAR(1024),  
  IN Format VARCHAR(32),  
  IN ColumnWidth INTEGER,  
  OUT param_9 TABLE (Status TINYINT, Message VARCHAR(1024))) CONFIGURATION '{  
  "___DP_UNIQUE_NAME___": "FileAdapter.Procedures.ConfigUtil.ALTER_SINGLE_COLUMN",  
  "___DP_HAS_NESTED_PARAMETERS___": false,  
  "___DP_USER_DEFINED_PROPERTIES___": {  
    "dsadapter.fileadapter.procedure.ConfigProcedure$ConfigProcedureType":  
    "ALTER_SINGLE_COLUMN",  
    "isProcCallOnCFGFile": "false"  
  },  
  "___DP_INPUT_PARAMETER_PROPERTIES___": [],  
  "___DP_RETURN_PARAMETER_PROPERTIES___": [],  
  "___DP_VIRTUAL_PROCEDURE___": true,  
  "___DP_HAS_INTERNAL_OUTPUT_PARAMETER___": false,  
  "___DP_DEFAULT_OUTPUT_PARAMETER_INDEX___": 0  
}' AT "{remote_source_name}";
```

## Example

Suppose that you have a file in `C:\usr\sap\dataprovagant\workspace\items.csv` where the content is in the following format and you want to change the data type and column name:

```
Item_ID,Item_Price,Item_Description,Date_Added
101,99.99,Item1,2016-10-11
```

The CFG file:

```
#FileFormat created by virtual procedures
COLUMN_DELIMITER=,
ERROR_ON_COLUMNCOUNT=false
FORCE_DIRECTORY_PATTERN=C:\usr\sap\dataprovagant\workspace
FORCE_FILENAME_PATTERN=item.csv
FORMAT=CSV
ROW_DELIMITER=\r\n
SKIP_HEADER_LINES=1
COLUMN=Item_ID;INTEGER;
COLUMN=Item_Price;DOUBLE;
COLUMN=Item_Description;VARCHAR(256);
COLUMN=Date_Added;DATE;SomeDateColumn;yyyy-MM-dd;0
```

Use the virtual procedure to update the second column `Item_Price` to be `Price` and `DECIMAL(10,5)`.

```
--Alter second column properties
CALL "SYSTEM"."Alter_File_Field"('C:\usr\sap\dataprovagant\workspace\item.cfg',
1,'Price','DECIMAL',10,5,'Price Filed',null,null,?);
--Check if updated correctly
call "SYSTEM"."View_Configuration_File"('C:\usr\sap\dataprovagant\workspace
\item.cfg',?,?,?);
```

### 6.10.5.3 Virtual Procedure: Create Configuration File

Create Configuration File allows you to create a CFG file under available root folders using SAP HANA tables.

INOUT	Parameter	Type	Description
IN	ConfigFilePath	NVARCHAR	Full path to the CFG file
IN	ConfigTable	TABLE	Table describing delimiters and other file format configuration
IN	MetadataTable	TABLE	Table describing file field in metadata format
IN	VerifyConfiguration	VARCHAR	True or false to verify the CFG content
OUT	StatusTable	TABLE	Table describing the procedure call status

## Creating the virtual procedure via SQL statement

```
CREATE VIRTUAL PROCEDURE "SYSTEM"."Create_Configuration_File"(  
  IN ConfigFilePath NVARCHAR(512),  
  IN ConfigTable TABLE (ParameterName VARCHAR(1024),ParameterValue VARCHAR(1024)),  
  IN MetadataTable TABLE (ColumnName NVARCHAR(1024),DataType  
    VARCHAR(32),LengthOrPrecision INTEGER,Scale INTEGER,Description  
    NVARCHAR(1024),Format VARCHAR(32),ColumnWidth INTEGER),  
  IN VerifyConfiguration VARCHAR(4),  
  OUT StatusTable TABLE (Status TINYINT,Message VARCHAR(1024))) CONFIGURATION '{  
    "DP_UNIQUE_NAME": "FileAdapter.Procedures.ConfigUtil.CREATE_CONFIG",  
    "DP_USER_DEFINED_PROPERTIES": {  
      "dsadapter.fileadapter.procedure.ConfigProcedure$ConfigProcedureType":  
        "CREATE_CONFIG",  
      "isProcCallOnCFGFile": "false"  
    },  
    "DP_VIRTUAL_PROCEDURE": true,  
    "DP_HAS_INTERNAL_OUTPUT_PARAMETER": false  
  }' AT "{remote_source_name}";
```

## Example

Suppose that you have a file on C:\usr\sap\dataprovagent\workspace\items.csv where the content is in the following format:

```
Item ID,Item Price,Item Description,Date_Added  
101,99.99,Item1,2016-10-11
```

```
--Sample SQL to create the configuration file  
--Create the input table that you will need to provide to the procedure.  
drop table SYSTEM.filefields;  
create table SYSTEM.filefields (COLUMNNAME NVARCHAR(512), DATATYPE  
  VARCHAR(32),LENGTHORPRECISION INT, SCALE INT, DESCRIPTION NVARCHAR(512), FORMAT  
  NVARCHAR(512), COLUMNWIDTH INT);  
truncate table SYSTEM.filefields;  
insert into SYSTEM.filefields values('Item_ID','INTEGER',0,0,NULL,NULL,0);  
insert into SYSTEM.filefields values('Item_Price','DOUBLE',0,0,NULL,NULL,0);  
insert into SYSTEM.filefields values('Item_Description','VARCHAR',  
  256,0,NULL,NULL,0);  
insert into SYSTEM.filefields values('Date_Added','DATE',  
  0,0,'SomeDateColumn','yyyy-MM-dd',0);  
select * from SYSTEM.filefields;  
drop table SYSTEM.config;  
create table SYSTEM.config (parametername varchar(512), parametervalue  
  varchar(512));  
truncate table SYSTEM.config;  
insert into SYSTEM.config values('SKIP_HEADER_LINES','1');  
insert into SYSTEM.config values('ROW_DELIMITER','\r\n');  
insert into SYSTEM.config values('COLUMN_DELIMITER','');  
insert into SYSTEM.config values('FORCE_DIRECTORY_PATTERN','C:\usr\sap  
  \dataprovagent\workspace');  
insert into SYSTEM.config values('FORCE_FILENAME_PATTERN','item.csv');  
--Call the procedure to create a CFG file based on this configuration.  
call "SYSTEM"."Create_Configuration_File"('C:\usr\sap\dataprovagent\workspace  
  \item.cfg',SYSTEM.config,SYSTEM.filefields,'true',?);  
--Now you can import this cfg and read from the file.
```



## 6.10.5.4 Virtual Procedure: Delete Configuration File

Delete a configuration file.

Deletes the given configuration file using the Delete Configuration File virtual procedure.

INOUT	Parameter	Type	Description
IN	ConfigFilePath	NVARCHAR	Full path to the CFG file
OUT	StatusTable	TABLE	Table describing the procedure call status

### Creating the virtual procedure via SQL statement

```
CREATE VIRTUAL PROCEDURE "SYSTEM"."Delete_Configuration_File"(  
  IN ConfigFilePath NVARCHAR(512),  
  OUT param_1 TABLE (Status TINYINT,Message VARCHAR(1024)) CONFIGURATION '{  
    "__DP_UNIQUE_NAME__": "FileAdapter.Procedures.ConfigUtil.DELETE_CONFIG",  
    "__DP_HAS_NESTED_PARAMETERS__": false,  
    "__DP_USER_DEFINED_PROPERTIES__": {  
      "dsadapter.fileadapter.procedure.ConfigProcedure$ConfigProcedureType":  
      "DELETE_CONFIG",  
      "isProcCallOnCFGFile": "false"  
    },  
    "__DP_INPUT_PARAMETER_PROPERTIES__": [],  
    "__DP_RETURN_PARAMETER_PROPERTIES__": [],  
    "__DP_VIRTUAL_PROCEDURE__": true,  
    "__DP_HAS_INTERNAL_OUTPUT_PARAMETER__": false,  
    "__DP_DEFAULT_OUTPUT_PARAMETER_INDEX__": 0  
  }' AT "{remote_source_name}";
```

### Usage

Suppose you have a file on C:\usr\sap\dataprovagant\workspace\items.cfg :

```
--Call the procedure to delete this CFG file  
call "SYSTEM"."Delete_Configuration_File"('C:\usr\sap\dataprovagant\workspace  
\item.cfg',?);
```

## 6.10.5.5 Virtual Procedure: View Configuration File

View an existing CFG file.

The View Configuration File virtual procedure allows you to view an existing CFG file under available root folders.

INOUT	Parameter	Type	Description
IN	ConfigFilePath	NVARCHAR	Full path to the CFG file
OUT	ConfigTable	TABLE	Table describing delimiters and other file format configuration
OUT	MetadataTable	TABLE	Table describing file field in SAP HANA smart data integration metadata format

## Creating the virtual procedure via SQL statement

```
CREATE VIRTUAL PROCEDURE "SYSTEM"."View_Configuration_File"(
  IN ConfigFilePath NVARCHAR(512),
  OUT param_1 TABLE (ParameterName VARCHAR(1024),ParameterValue VARCHAR(1024)),
  OUT param_2 TABLE (ColumnName NVARCHAR(1024),DataType
    VARCHAR(32),LengthOrPrecision
    INTEGER,Scale INTEGER,Description NVARCHAR(1024),Format VARCHAR(32),ColumnWidth
    INTEGER))
CONFIGURATION '{
  "DP_UNIQUE_NAME": "FileAdapter.Procedures.ConfigUtil.VIEW_CONFIG",
  "DP_HAS_NESTED_PARAMETERS": false,
  "DP_USER_DEFINED_PROPERTIES": {
    "dsadapter.fileadapter.procedure.ConfigProcedure$ConfigProcedureType":
    "VIEW_CONFIG",
    "isProcCallOnCFGFile": "false"
  },
  "DP_INPUT_PARAMETER_PROPERTIES": [],
  "DP_RETURN_PARAMETER_PROPERTIES": [],
  "DP_VIRTUAL_PROCEDURE": true,
  "DP_HAS_INTERNAL_OUTPUT_PARAMETER": false,
  "DP_DEFAULT_OUTPUT_PARAMETER_INDEX": 0
}' AT "{remote_source_name}";
```

## Example

Suppose that you have a CFG file in C:\usr\sap\dataprovagant\workspace\items.cfg:

```
--Call the procedure to get the CFG file
call "SYSTEM"."View_Configuration_File"('C:\usr\sap\dataprovagant\workspace
\item.cfg',?,?);
```

## 6.10.6 FileAdapterDatastore

To access file sources, use the FileAdapterDatastore, one of the File Datastore adapters.

## Related Information

[FileAdapterDatastore Remote Source Configuration \[page 237\]](#)

[File \[page 187\]](#)

[SFTPAdapterDatastore \[page 240\]](#)

### 6.10.6.1 FileAdapterDatastore Remote Source Configuration

Remote source configuration parameters for the FileAdapterDatastore. Also included is a code sample for creating a remote source using the SQL console.

Category	Option	Description
File Format Configuration	Format	Specifies that the file has a delimiter character between columns. <i>Flat Files</i> and <i>Fixed Width Files</i> are supported.
	Skip Error Handling	Specifies whether to skip the error handling during processing. Default value is <i>false</i> .
Error handling	Log data conversion warnings	Specifies whether to log data conversion warnings.  Default value is <i>true</i> .
	Maximum warnings to log	Only available when <i>Skip Error Handling</i> is enabled ( <i>true</i> ). Specifies the maximum number of warnings in log files.
	Capture data conversion errors	Specifies whether to capture data conversion errors in the logs.  Default value is <i>false</i> .
	Capture row format errors	Specifies whether to capture row format errors in the logs.  Default value is <i>true</i> .
	Capture string truncation errors	Specifies whether to capture string truncation errors in the logs.  Default value is <i>false</i> .
	Maximum errors to stop processing	Only available when <i>Skip Error Handling</i> is enabled ( <i>true</i> ). Specifies the maximum number of errors allowed before stopping the process.

Category	Option	Description
	Write error rows to file	<p>Specifies whether to write error rows to an external error file in the <i>Error file root directory</i>.</p> <p>Default value is <i>false</i>.</p>
	Error file root directory	<p>Only available when <i>Write error rows to file</i> is enabled (<i>true</i>). Full path to the directory in which to store the error file.</p>
	Error file name	<p>Only available when <i>Write error rows to file</i> is enabled (<i>true</i>). Name of the error file.</p>
Additional Configuration	Auto-Detect Columns	<p>Specifies whether to detect delimiters and data types automatically.</p> <div> <p><b>Note</b></p> <p>Auto-detect might not match your data types and delimiters exactly. If this is the case, you can use the CFG file utility virtual procedures to modify the files to your specifications.</p> </div> <p>Default value is <i>true</i>.</p>
	Data type mapping match percent	<p>Used for auto-detection. Given a file with data:</p> <ol style="list-style-type: none"> <li>1. The software analyzes the probability of possible data types for each column.</li> <li>2. The software selects the data type with the highest probability, provided that the probability is greater than or equal to the specified <i>Data type mapping match percent</i>.</li> <li>3. If the calculated probability for the data type is less than the specified <i>Data type mapping match percent</i>, the software sets the data type as VARCHAR(256).</li> </ol> <p>Default value is 90.</p> <p>Range is 50 to 100.</p>

Category	Option	Description
	Allow CFG file to overwrite configuration	Whether changes made to settings in the configuration file overwrite the configuration.  Default value is <i>true</i> .
Credentials	Credentials Mode	Only <i>Technical User</i> is supported.
	AccessToken	<p>A password. An access token protects the files from access from different agents. Use this same password when creating a remote source. You can browse and manipulate the configuration and data files only if the AccessToken provided in the remote source configuration matches that set in Data Provisioning Agent Configuration Tool.</p> <p>To create an AccessToken, launch the Data Provisioning Agent Configuration Tool, which is <code>dpagentconfigtool.exe</code> in the <code>&lt;DPAgent_root&gt;/configTool</code> directory. Set the AccessToken value by navigating to <a href="#">Configure Adapters &gt; FileAdapter</a>.</p>

The following code sample illustrates how to create a remote source using the SQL console:

## Example

### Sample Code

```
CREATE REMOTE SOURCE "FileAdapterDSTest" ADAPTER "FileAdapterDatastore" AT
LOCATION agent "MyAgent"
CONFIGURATION '<?xml version="1.0" encoding="UTF-8"?>
<ConnectionProperties name="configuration">
  <PropertyGroup name="fileformatconfiguration">
    <PropertyEntry name="format">flatfiles</PropertyEntry>
    <PropertyEntry name="errorHandling">>false</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="errorHandlingConfiguration">
    <PropertyEntry name="logDataConversionWarnings">>true</PropertyEntry>
    <PropertyEntry name="maximumWarningsToLog"></PropertyEntry>
    <PropertyEntry name="captureDataConversionErrors">>false</
PropertyEntry>
    <PropertyEntry name="captureRowFormatErrors">>true</PropertyEntry>
    <PropertyEntry name="captureStringTruncationErrors">>false</
PropertyEntry>
    <PropertyEntry name="maximumErrorsToStopJob"></PropertyEntry>
```

```

        <PropertyEntry name="writeErrorRowsToFile">false</PropertyEntry>
        <PropertyEntry name="errorFileRootDirectory"></PropertyEntry>
        <PropertyEntry name="errorFileName"></PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="additionalConfiguration">
        <PropertyEntry name="autodetect">true</PropertyEntry>
        <PropertyEntry name="overwriteConfigByCFG">true</PropertyEntry>
    </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="AccessTokenEntry">
    <password><yourAccessToken></password>
</CredentialEntry>';

```

## Related Information

[Virtual Procedures \[page 230\]](#)

## 6.10.7 SFTPAdapterDatastore

To access SFTP CFG file sources, use the SFTPAdapterDatastore, one of the File Datastore adapters.

## Related Information

[SFTPAdapterDatastore Remote Source Configuration \[page 240\]](#)

[File \[page 187\]](#)

[FileAdapterDatastore \[page 236\]](#)

### 6.10.7.1 SFTPAdapterDatastore Remote Source Configuration

Remote source configuration parameters for the SFTPAdapterDatastore. Also included is a code sample for creating a remote source using the SQL console.

Category	Option	Description
File Format Configuration	Format	Specifies that the file has a delimiter character between columns. <i>Flat Files</i> and <i>Fixed Width Files</i> are supported.
	Skip Error Handling	Specifies whether to skip the error handling during processing. Default value is <i>false</i> .

Category	Option	Description
Error handling	Log data conversion warnings	Specifies whether to log data conversion warnings.  Default value is <i>true</i> .
	Maximum warning to log	Only available when <i>Skip Error Handling</i> is enabled ( <i>true</i> ). Specifies the maximum number of warnings in log files.
	Capture data conversion errors	Specifies whether to capture data conversion errors in the logs.  Default value is <i>false</i> .
	Capture row format errors	Specifies whether to capture row format errors in the logs.  Default value is <i>true</i> .
	Capture string truncation errors	Specifies whether to capture string truncation errors in the logs.  Default value is <i>false</i> .
	Maximum errors to stop processing	Only available when <i>Skip Error Handling</i> is enabled ( <i>true</i> ). Specifies the maximum number of errors allowed before stopping the process.
	Write error rows to file	Specifies whether to write error rows to an external error file in the <i>Error file root directory</i> .  Default value is <i>false</i> .
	Error file root directory	Only available when <i>Write error rows to file</i> is enabled ( <i>true</i> ). Full path to the directory in which to store the error file.
	Error file name	Only available when <i>Write error rows to file</i> is enabled ( <i>true</i> ). Name of the error file.
SFTP Configuration	Host	The host name of the SFTP server
	Port	The port number enabled for the SFTP connection
	Hostkey Fingerprint	Used to secure the SFTP connection. You can generate a hostkey fingerprint

Category	Option	Description
		<p>for a public key using ssh-keygen, for example:</p> <pre>ssh-keygen -lf /path/to/key.pub</pre>
	Authentication Type	Only <i>Password</i> is supported.
	Connection Retry Count	The maximum number of times to retry the connection
	Connection Retry Interval	The time interval for each connection retry
	Remote File Format Directory	The directory of the folder on the SFTP server to browse
	Enable Additional Logging	<p>Set to <i>True</i> to allow JSch to write its own logging to <code>framework.trc</code></p> <p>Set to <i>False</i> to not print JSch specific logs to <code>framework.trc</code></p> <p>The default value is <i>False</i>.</p>
Credentials	Credentials Mode	Only <i>Technical User</i> is supported.
	AccessToken	<p>A password. An access token protects the files from access from different agents. Use this same password when creating a remote source. You can browse and manipulate the configuration and data files only if the AccessToken provided in the remote source configuration matches that set in Data Provisioning Agent Configuration Tool.</p> <p>To create an AccessToken, launch the Data Provisioning Agent Configuration Tool, which is <code>dpagentconfigtool.exe</code> in the <code>&lt;DPAgent_root&gt;/configTool</code> directory. Set the AccessToken Value by navigating to <a href="#">Configure &gt; Adapters &gt; FileAdapter</a>.</p>
	User	The user name for the SFTP connection



Category	Option	Description
	Password	The password for the corresponding SFTP user

The following code sample illustrates how to create a remote source using the SQL console.

## Example

### Sample Code

```
CREATE REMOTE SOURCE "SFTPAdapterDSTest" ADAPTER "SFTPAdapterDatastore" AT
LOCATION agent "MyAgent"
CONFIGURATION '<?xml version="1.0" encoding="UTF-8"?>
<ConnectionProperties name="configuration">
  <PropertyGroup name="fileformatconfiguration">
    <PropertyEntry name="format">flatfiles</PropertyEntry>
    <PropertyEntry name="errorHandling">>false</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="errorHandlingConfiguration">
    <PropertyEntry name="logDataConversionWarnings">>true</PropertyEntry>
    <PropertyEntry name="maximumWarningsToLog"></PropertyEntry>
    <PropertyEntry name="captureDataConversionErrors">>false</
PropertyEntry>
    <PropertyEntry name="captureRowFormatErrors">>true</PropertyEntry>
    <PropertyEntry name="captureStringTruncationErrors">>false</
PropertyEntry>
    <PropertyEntry name="maximumErrorsToStopJob"></PropertyEntry>
    <PropertyEntry name="writeErrorRowsToFile">>false</PropertyEntry>
    <PropertyEntry name="errorFileRootDirectory"></PropertyEntry>
    <PropertyEntry name="errorFileName"></PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="sftp_location">
    <PropertyEntry name="host">mo-1a6803cc5.mo.sap.corp</PropertyEntry>
    <PropertyEntry name="port">22</PropertyEntry>
    <PropertyEntry name="hostKeyFingerprint">ba:84:07:e8:1d:23:a0:89:0e:
13:83:e0:d2:e5:77:3e</PropertyEntry>
    <PropertyEntry name="authType">password</PropertyEntry>
    <PropertyEntry name="connectionRetryCount">10</PropertyEntry>
    <PropertyEntry name="connectionRetryInterval">10</PropertyEntry>
    <PropertyEntry name="sftp_remote_directory">/usr/sap/KS1/HDB01</
PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
  '<CredentialEntry name="AccessTokenEntry">
    <password><password></password>
  </CredentialEntry>'
  '<CredentialEntry name="SFTP_CREDENTIAL">
    <user><username></user>
    <password><yourAccessToken></password>
  </CredentialEntry>';
```

## 6.11 Hive

The Hive adapter supports Hadoop via Hive.

Hive is the data warehouse that sits on top of Hadoop and includes a SQL interface. While Hive SQL does not fully support all SQL operations, most SELECT features are available. The Hive adapter service provider is created as a remote source, and requires the support of artifacts like virtual table and remote subscription for each source table to perform replication.

### i Note

Before registering the adapter with the SAP HANA system, ensure that you have downloaded and installed the correct JDBC libraries. See the SAP HANA smart data integration Product Availability Matrix (PAM) for details. Place the files in the `<DPAgent_root>/lib/hive` folder.

## Adapter Functionality

This adapter supports the following functionality:

- SELECT, INSERT, UPDATE, and DELETE
- Virtual table as a source
- Virtual table as a target using a Data Sink node in a flowgraph

### ! Restriction

Write-back operations including INSERT, UPDATE, and DELETE are supported only on Hive 2.3.3 and newer, and the source table must support ACID transactions.

When writing to a Hive virtual table, the following data type size limitations apply:

- BLOB: 65,536 bytes
- CLOB: 43,690 bytes

In addition, this adapter supports the following capabilities:

Table 39: Global Settings

Functionality	Supported?
SELECT from a virtual table	Yes
INSERT into a virtual table	Yes
Execute UPDATE statements on a virtual table	Yes
Execute DELETE statements on a virtual table	Yes
Different capabilities per table	No

Functionality	Supported?
Different capabilities per table column	No
Real-time	No

Table 40: Select Options

Functionality	Supported?
Select individual columns	Yes
Add a WHERE clause	Yes
JOIN multiple tables	Yes
Aggregate data via a GROUP BY clause	Yes
Support a DISTINCT clause in the select	Yes
Support a TOP or LIMIT clause in the select	Yes
ORDER BY	Yes
GROUP BY	Yes

## Related Information

[Understanding Hive Versions, Features, and JAR Files \[page 245\]](#)

[Hive Remote Source Configuration \[page 248\]](#)

[Kerberos Debugging \[page 253\]](#)

[Update JCE Policy Files for Stronger Encryption \[page 518\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



[Understanding Hive Versions, Features, and JAR Files \[page 245\]](#)

### 6.11.1 Understanding Hive Versions, Features, and JAR Files

Find out which Hive, Hadoop, and other product JAR files are compatible with which versions of SAP HANA smart data integration

Depending on the version of SAP HANA smart data integration and Hive you are using, there are steps you need to take to ensure you have the proper JAR files loaded.

## Upgrading to SDI 2.2.2 or Higher

Beginning with SDI 2.2.2, we no longer bundle the `hadoop-core-0.20.2.jar` file. When you upgrade from a previous version, you must manually download this file and place it in the `<DPAgent_root>/lib/hive` folder. After you restart the Data Provisioning Agent and refresh the Hive adapter in SAP HANA, your remote source will work.

## Avoiding JAR File Conflicts

There are two ways that conflicts may occur when installing JAR files in the `<DPAgent>/lib/hive` directory:

- The directory cannot contain multiple versions of Hive JAR files, which avoids class name conflicts.
- The directory cannot contain both a `hadoop-core-0.20.2.jar` and `hadoop-common-<version>.jar` file at the same time, which also avoids class name conflicts.

## JAR Files for Normal Operation

If you are not using more advanced features, the following JAR files are sufficient:

Table 41: Hive 1.2.2/Hadoop 2.7.3

Hive JAR Files	Hadoop JAR Files
Found in <code>\$HIVE_HOME/lib/</code> <ul style="list-style-type: none"><li>• <code>hive-jdbc-1.2.2-standalone.jar</code></li></ul>	Found in the Maven repository <ul style="list-style-type: none"><li>• <code>hadoop-core-0.20.2.jar</code></li></ul>

Table 42: Hive 2.3.0/Hadoop 2.8.1 (SDI 2.3.0 and above)

Hive JAR Files	Hadoop JAR Files
Found in the <a href="#">Maven repository</a> ➡ <ul style="list-style-type: none"><li>• <code>hive-jdbc-2.3.0-standalone.jar</code></li></ul>	Found in the <a href="#">Maven repository</a> ➡ <ul style="list-style-type: none"><li>• <code>hadoop-core-0.20.2.jar</code></li></ul>

Alternatively, you can use the JAR files associated with advanced Hive features listed below.

## JAR Files for Advanced Features

If you are using some advanced Hive features, for example, Zookeeper and HTTP Transport Mode, a standalone Hive JAR (`hive-jdbc-<version>-standalone.jar`) is not sufficient. If you are using any of the following

features, you need to be sure that the following files are manually installed in the `<DPAgent_root>/lib/hive` folder:

Table 43: Hive 1.2.2/Hadoop 2.7.3

Hive JAR Files	Hadoop JAR Files
Found in <code>\$HIVE_HOME/lib/</code>	Found in <code>\$HADOOP_HOME/share/hadoop/</code>
<ul style="list-style-type: none"> <li>hive-jdbc-1.2.2-standalone.jar</li> <li>commons-codec-1.4.jar</li> <li>httpclient-4.4.jar</li> </ul>	<ul style="list-style-type: none"> <li>common/hadoop-common-2.7.3.jar</li> <li>common/lib/commons-configuration-1.6.jar</li> <li>common/lib/hadoop-auth-2.7.3.jar</li> <li>common/lib/jaxb-impl-2.2.3.jar</li> <li>common/lib/slf4j-log4j12-1.7.10.jar</li> <li>hdfs/lib/xercesImpl-2.9.1.jar</li> </ul>

Table 44: Hive 2.3.0/Hadoop 2.8.1 (SDI 2.3.0 and above)

Hive JAR Files	Hadoop JAR Files
<code>\$HIVE_HOME/lib/</code>	<code>\$HADOOP_HOME/share/hadoop/</code>
<ul style="list-style-type: none"> <li>commons-codec-1.4.jar</li> <li>curator-client-2.7.1.jar</li> <li>curator-framework-2.7.1.jar</li> <li>guava-14.0.1.jar</li> <li>hive-common-2.3.0.jar</li> <li>hive-jdbc-2.3.0.jar</li> <li>hive-serde-2.3.0.jar</li> <li>hive-service-2.3.0.jar</li> <li>hive-service-rpc-2.3.0.jar</li> <li>hive-shims-0.23-2.3.0.jar</li> <li>hive-shims-2.3.0.jar</li> <li>hive-shims-common-2.3.0.jar</li> <li>httpclient-4.4.jar</li> <li>libthrift-0.9.3.jar</li> <li>zookeeper-3.4.6.jar</li> </ul>	<ul style="list-style-type: none"> <li>common/hadoop-common-2.8.1.jar</li> <li>common/lib/commons-collections-3.2.2.jar</li> <li>common/lib/commons-configuration-1.6.jar</li> <li>common/lib/commons-lang-2.6.jar</li> <li>common/lib/hadoop-auth-2.8.1.jar</li> <li>common/lib/httpcore-4.4.4.jar</li> <li>common/lib/jaxb-impl-2.2.3-1.jar</li> <li>common/lib/slf4j-log4j12-1.7.10.jar</li> <li>hdfs/lib/xercesImpl-2.9.1.jar</li> </ul>

## Related Information

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



[Hive Remote Source Configuration \[page 248\]](#)

## 6.11.2 Hive Remote Source Configuration

Configure the following options in smart data access to set up your connection to a Hive remote source. Also included is sample code for creating a remote source using the SQL console.

### **i** Note

If you change the remote source parameters after you have made a connection with Hive, you need to restart the Data Provisioning Agent.

Category	Option	Description
Connection	Use Connection URL	<p>Specify whether to use a connection URL.</p> <p>If you set this value to <i>True</i>, you need to provide the URL in the <i>Connection URL</i> parameter.</p>
	Connection URL	<p>The URL used to create the connection.</p> <p>The format for the connection URL is documented on the Apache website.</p>
	Hive Version	<p>The version of Hive. For Hive 0.12.0, set its value to 0.12.0. For Hive 0.13.0 and 0.13.1, set its value to 0.13.1, and so on.</p>
	Host	<p>The host of Hive.</p> <p>A value for this parameter is necessary only when <i>Use Connection URL</i> is set to <i>False</i>.</p> <p>If <i>Use Connection URL</i> is set to <i>True</i>, the host should be specified in the URL directly.</p>
	Port	<p>The port number of Hive.</p> <p>A value for this parameter is necessary only when <i>Use Connection URL</i> is set to <i>False</i>.</p> <p>If <i>Use Connection URL</i> is set to <i>True</i>, the port should be specified in the URL directly.</p>
	Database Name	<p>The Hive database name.</p> <p>If <i>Use Connection URL</i> is set to <i>True</i>, this parameter has no effect.</p> <p>If <i>Use Connection URL</i> is set to <i>False</i> and the database name is specified</p>

Category	Option	Description
		<p>here, you will see only the specified database in the remote source catalog. If you leave this parameter empty, you will see all Hive databases in the remote source catalog.</p>
Data Type Mapping	Map Hive STRING to	<p>If the length of a string in Hive is greater than 5000 characters, set this parameter to <i>CLOB</i>. The default value is VARCHAR(5000).</p>
	Map Hive BINARY to	<p>If the length of a BINARY in Hive is greater than 5000 characters, set this parameter to <i>BLOB</i>. The default value is VARBINARY(5000).</p>
Security	Use SSL	<p>Specifies whether to use SSL.</p> <p>The default value is <i>False</i>.</p> <p>A value for this parameter is necessary only when <i>Use Connection URL</i> is set to <i>False</i>.</p> <p>If <i>Use Connection URL</i> is set to <i>True</i>, the connection URL should be specified in the URL directly.</p> <div> <p><b>i Note</b></p> <p>The CA certificate for the remote source must be imported into the adapter truststore on the Data Provisioning Agent host.</p> </div> <p>You will also need to set up the truststore and password in the Data Provisioning Agent Configuration Tool.</p>
	Logon Mechanism	<p>Controls the authentication (+authorization) method used, and which username and password values to enter in the credentials field.</p> <ul style="list-style-type: none"> <li>• Default</li> <li>• Kerberos: If set to <i>Kerberos</i>, the <i>Realm</i>, <i>KDC</i>, and <i>Hive Service Principal</i> settings are used when making the Hive connection.</li> </ul>

Category	Option	Description
	Use Agent Stored Credential	Set to <i>True</i> to use credentials that are stored in the DP Agent secure storage.
Kerberos	Realm	<p>(Optional when using Kerberos) Authenticate using a principal from this realm instead of the systems default realm. Specify the realm for the technical user.</p> <p>The <i>Realm</i> option must be used together with <i>KDC</i>.</p>
	KDC	(Optional when using Kerberos) The address of the technical user's KDC (Key Distribution Center) to be used with the specified realm. This must be used together with the <i>Realm</i> option.
	Hive Service Principal	<p>The Hive Service principal name.</p> <div> <p><b>i Note</b></p> <p>A value for this parameter is necessary only when <i>Use Connection URL</i> is set to <i>False</i>.</p> <p>If <i>Use Connection URL</i> is set to <i>True</i>, the Hive service principal should be specified in the URL directly.</p> </div>
	Use Ticket Cache	<p>Set this to true if you want the ticket-granting ticket (TGT) to be obtained from the ticket cache. Set this option to <i>False</i> if you do not want this module to use the ticket cache. The default value is <i>False</i>.</p> <p>This module searches for the ticket cache in the following locations:</p> <ul style="list-style-type: none"> <li>On Solaris and Linux, in <code>/tmp/krb5cc_&lt;uid&gt;</code>, where the uid is a numeric user identifier.</li> <li>If the ticket cache is not available in <code>/tmp/krb5cc_&lt;uid&gt;</code>, or if you are on a Windows platform, the module looks for the cache as <code>&lt;user.home&gt;&lt;file.separa</code></li> </ul>



Category	Option	Description
		<pre>tor&gt;krb5cc_&lt;user.name&gt;.</pre> <p>You can override the ticket cache location by using the <i>Ticket Cache</i> parameter.</p> <ul style="list-style-type: none"> <li>For Windows, if a ticket cannot be retrieved from the file ticket cache, the module uses Local Security Authority (LSA) API to get the TGT.</li> </ul>
	Ticket Cache	Set this to the name of the ticket cache that contains the user's TGT. If this is set, <i>Use Ticket Cache</i> must also be set to true; otherwise, a configuration error is returned.
	Use Key Tab	<p>Set this to <i>True</i> if you want the module to get the technical user's key from the keytab. The default value is <i>False</i>.</p> <p>If <i>Key Tab</i> is not set, then the module locates the keytab from the Kerberos configuration file. If it is not specified in the Kerberos configuration file, then the module looks for the file</p> <pre>&lt;user.home&gt;&lt;file.separator&gt;krb5.keytab.</pre>
	Key Tab	Set this to the file name of the keytab to get the technical user's secret key.
	Additional Properties	<p>Additional JDBC settings that are added directly to the JDBC URL. The parameters must be specified in the following format:</p> <pre>key=value, key=value, . . .</pre> <p>A value for this parameter is necessary only when <i>Use Connection URL</i> is set to <i>False</i>.</p>
Credentials	Credentials Mode	<p><i>Technical user</i> or <i>Secondary user</i></p> <p>Select one of the choices depending on the purpose of the remote source you want to create.</p>
JDBC Credentials	Username	The technical user's user name.

Category	Option	Description
		If <a href="#">Logon Mechanism</a> is set to <a href="#">Kerberos</a> , the user should be the client principal.
	Password	The technical user's password.

The following code samples illustrate how to create a remote source using the SQL console:

## Basic

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyHiveSource" ADAPTER "HiveAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="connectionInfo" displayName="Database">
    <PropertyEntry name="HOST" displayName="Host">myhost.sap.corp</
PropertyEntry>
    <PropertyEntry name="PORT" displayName="Port Number">10000</
PropertyEntry>
    <PropertyEntry name="DB_NAME" displayName="Database Name">mydb</
PropertyEntry>
    <PropertyEntry name="VERSION" displayName="Database Version">1.2.1</
PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="security" displayName="Security">
    <PropertyEntry name="USE_SSL">false</PropertyEntry>
    <PropertyEntry name="LOGMECH">default</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>myuser</user>
  <password>mypassword</password>
</CredentialEntry>';
```

## Kerberos

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyHiveSource" ADAPTER "HiveAdapter" AT LOCATION AGENT
"MyAgent"
```

```

CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="connectionInfo" displayName="Database">
    <PropertyEntry name="HOST" displayName="Host">myhost.sap.corp</
PropertyEntry>
    <PropertyEntry name="PORT" displayName="Port Number">10000</
PropertyEntry>
    <PropertyEntry name="DB_NAME" displayName="Database Name">mydb</
PropertyEntry>
    <PropertyEntry name="VERSION" displayName="Database Version">1.2.1</
PropertyEntry>
    <PropertyEntry name="ADDITIONAL"></PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="security" displayName="Security">
    <PropertyEntry name="USE_SSL">false</PropertyEntry>
    <PropertyEntry name="LOGMECH">Kerberos</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="Kerberos" displayName="Kerberos">
    <PropertyEntry name="KERBEROS_REALM">SAPDS.CORP</PropertyEntry>
    <PropertyEntry name="KERBEROS_KDC">myhost.sap.corp</PropertyEntry>
    <PropertyEntry name="KERBEROS_PRINCIPAL">hive/
myhost.sap.corp@SAPDS.CORP</PropertyEntry>
    <PropertyEntry name="KERBEROS_REFRESH_KRB5_CONFIG">true</
PropertyEntry>
    <PropertyEntry name="KERBEROS_USE_TICKET_CACHE">false</
PropertyEntry>
    <PropertyEntry name="KERBEROS_USE_KEY_TAB">true</PropertyEntry>
    <PropertyEntry name="KERBEROS_KEY_TAB">my.keytab</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>myuser@SAPDS.CORP</user>
  <password>mypassword</password>
</CredentialEntry>';

```

## Related Information

[Apache Hive Connection URL Format](#) 📄

[Understanding Hive Versions, Features, and JAR Files \[page 245\]](#)

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

## 6.11.3 Kerberos Debugging

There are steps you need to take to enable Kerberos debugging.

Even though you may have enabled Kerberos debug messages in the remote source configuration by setting *Kerberos Debug* to *True* or by setting `sun.security.krb5.debug=true` in the `dpagentconfig.ini` file, the debug messages will not appear in the Data Provisioning Agent log `framework.trc`.

To make the Kerberos debug messages visible, start the Data Provisioning Agent directly by executing `<DPAgent_root>/dpagent`, or in Windows, `<DPAgent_root>/dpagent.exe`). Then, all logs and Kerberos

debug messages are printed in your console. In Linux, you could also save all of the output to a file by redirecting the `stdout` and `stderr`, such as `./dpagent 2>&1 1>output.txt`.

## Related Information

[Hive Remote Source Configuration \[page 248\]](#)

## 6.12 IBM DB2 Log Reader

The IBM DB2 Log Reader adapter provides real-time changed-data capture capability to replicate changed data from a database to SAP HANA in real time. You can also use this adapter for batch loading.

The Log Reader service provider is created as a remote source and requires the support of artifacts like virtual tables and remote subscriptions for each source table to perform replication.

### i Note

Before registering the adapter with the SAP HANA system, ensure you have downloaded and installed the correct JDBC libraries. See the *SAP HANA smart data integration Product Availability Matrix (PAM)* for details. Place the files in the `<DPAgent_root>/lib` folder.

## Adapter Functionality

This adapter supports the following functionality:

- Connect multiple remote sources in SAP HANA to the same source database

### i Note

Use different DB2 users to set up different replications on the same DB2 database.

- Virtual table as a source
- Real-time changed-data capture (CDC)

### ! Restriction

DB2 range partitioned tables are not supported for real-time CDC.

### i Note

Log Reader adapters do not support the truncate table operation.

- Virtual table as a target using a Data Sink node in a flowgraph
- Loading options for target tables

- DDL propagation. The supported schema changes are:
  - ADD COLUMN
  - DROP COLUMN
- Replication monitoring and statistics
- Search for tables
- LDAP Authentication
- Virtual procedures

In addition, this adapter supports the following capabilities:

Table 45: Global Settings

Functionality	Supported?
SELECT from a virtual table	Yes
INSERT into a virtual table	Yes
Execute UPDATE statements on a virtual table	Yes
Execute DELETE statements on a virtual table	Yes
Different capabilities per table	No
Different capabilities per table column	No
Realtime	Yes

Table 46: Select Options

Functionality	Supported?
Select individual columns	Yes
Add a WHERE clause	Yes
JOIN multiple tables	Yes
Aggregate data via a GROUP BY clause	Yes
Support a DISTINCT clause in the select	Yes
Support a TOP or LIMIT clause in the select	Yes
ORDER BY	Yes
GROUP BY	Yes

## Related Information

[IBM DB2 Real-time Replication \[page 256\]](#)

[DB2LogReaderAdapter Preferences \[page 268\]](#)

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Using a Schema Alias \[page 277\]](#)

[Log Reader Adapter Log Files \[page 278\]](#)

[Configure SSL for the DB2 Log Reader Adapter \[page 278\]](#)

[Creating a Whitelist to Limit Access to a Source Database \[page 281\]](#)

[Disable Adapter Write-back Functionality \[page 282\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



## 6.12.1 IBM DB2 Real-time Replication

Information about setting up your source system and adapter for real-time replication.

### Related Information

[Remote Database Setup for DB2 Real-time Replication \[page 256\]](#)

[Remote Database Clean-up for DB2 Real-time Replication \[page 266\]](#)

[Validate the IBM DB2 Log Reader Environment \[page 266\]](#)

[Generate a Log Reader Remote Source Creation Script \[page 267\]](#)

### 6.12.1.1 Remote Database Setup for DB2 Real-time Replication

The remote database must be set up properly for Log Reader adapters to function correctly when using real-time replication.

This setup process is necessary only when using real time.

Remember the following when setting up for replication:

- If you have a UDB client instance and a UDB server instance on different machines, the client and server must be of the same UDB version.
- On a Windows system, the DB2 connectivity autocommit parameter must be enabled (autocommit=1). The autocommit parameter is specified in the DB2 call level interface (CLI) configuration file for the primary database.  
If the autocommit parameter is not enabled, a deadlock problem can occur. The path to the CLI configuration file is: <%DB2DIR%> \sqllib\db2cli.ini where <%DB2DIR%> is the path to the DB2 client installation. Alternatively, to enable autocommit, open the DB2 administrative command-line console and run: `db2set DB2OPTIONS=-c`
- To initialize LogReader without error, the database must have a tablespace created with these characteristics:

- The tablespace should be a user temporary tablespace. By default, user temporary tablespaces are not created when a database is created.
- The tablespace must be a system-managed space (SMS).
- The PAGESIZE parameter must be set to 8192 (8 kilobytes) or greater.

## Upgrading the DB2 Database

Before upgrading your source DB2 database, keep the following in mind:

- Suspend any remote subscriptions before upgrading. Before suspending your subscriptions, ensure that all data has been synced to the SAP HANA target table.
- After suspending your subscriptions, ensure that there is a change to the DB2 source table.
- After your upgrade, resume your subscriptions. If you receive an error such as `code: <-2, 657>` after resuming your subscriptions, reset and then resume all of your subscriptions.

## Real-time Replication Limitations

The following limitations exist when performing real-time replication:

- Unsupported table types:
  - Table with all LOB columns
  - Table with computed columns
  - Table with LOB column and no primary key or unique index
  - Table with duplicated rows and no primary key
  - Table with user-defined identifier
  - Nested table

## Related Information

[Setting DB2 Universal Database Environment Variables \[page 258\]](#)

[Installing the Data Provisioning Agent and DB2 Server on Different Servers \[page 258\]](#)

[Primary DB2 UDB Database Configuration for Replication \[page 260\]](#)

[Required Libraries for DB2 Log Reader Adapter \[page 265\]](#)

### 6.12.1.1.1 Setting DB2 Universal Database Environment Variables

The method for setting DB2 UDB environment variables depends on the operating system.

#### i Note

The DB2 UDB environment variables should be set up regardless of whether your Data Provisioning Agent is installed on the same server as the DB2 database or not. Prior to setting up the variables, be sure that you have installed the IBM Data Server Runtime Client.

For Linux, the DB2 UDB installation provides two scripts for setting up the DB2 UDB environment variables: `db2cshrc` for C shell and `db2profile` for Bourne or Korn shell. These scripts set the library path environment variable based on the bit size of the installed server or client.

For Windows, the installation sets all necessary environment variables.

For Linux platforms, the 32-bit and 64-bit versions of the driver and API libraries are located in `<$HOME/sqlllib/lib32>/sqlllib/lib32` and `<$HOME/sqlllib/lib64>/sqlllib/lib64`, respectively, where `<$HOME>` is the home directory of the DB2 UDB instance owner.

#### i Note

If the Data Provisioning Agent is installed on Linux, the library path environment variable must point to the 64-bit libraries. For Windows, the library path environment variable must point to the 32-bit libraries.

#### i Note

We recommend that you add a line to the `<DPAgent_root>/bin/dpagent_env.sh` file to set the `db2profile` environmental variables. This ensures that when you use `dpagent_service.sh` to start and stop the DPAgent service, the DB2 UDB environment variables are sourced automatically. For example, you could add a line such as `. /home/db2inst1/sqlllib/db2profile.`

### 6.12.1.1.2 Installing the Data Provisioning Agent and DB2 Server on Different Servers

Additional steps are necessary when installing the Data Provisioning Agent and DB2 Server on different servers.

If the Data Provisioning Agent and the DB2 Server are on different machines, the IBM Data Server Runtime Client must be installed on the Data Provisioning Agent machine.

## Related Information

[DB2 Connectivity \[page 259\]](#)

[Catalog the Remote TCP/IP Node from the DB2 Client \[page 259\]](#)



## 6.12.1.1.2.1 DB2 Connectivity

The method for configuring DB2 connectivity varies by operating system.

On a Windows system, you must configure a DB2 Universal Database JDBC data source in the DB2 Administration Client, then use the database name and database alias specified for that DB2 Universal Database JDBC data source when you configure DB2 LogReader Adapter connectivity.

On a Linux system, catalog the node and the primary database in DB2. Set the DB2 LogReader Adapter `pds_datasource_name` parameter to the database alias. Also set the `pds_host_name` and `pds_host_number`.

## 6.12.1.1.2.2 Catalog the Remote TCP/IP Node from the DB2 Client

Follow these steps to catalog the remote TCP/IP node from the DB2 client.

### Procedure

1. (For Linux only) Log in as the DB2 instance owner.  
Logging in sets up your DB2 environment variables by executing the environment scripts. You can also execute these scripts manually as follows.  
In Korn shell, source the `db2profile` file: `<$HOME>/sqlllib/db2profile`.  
In C shell, source the `db2cshrc` file: `source <$HOME>/sqlllib/db2cshrc`  
`<$HOME>` is the home directory of the DB2 instance owner.
2. Start the DB2 command-line processor by typing the following DB2 command: `%>db2 db2 =>`
3. Catalog the remote TCP/IP node using this command at the DB2 prompt: `db2 => catalog TCPIP node MYNODE remote MYHOST server XXXX`, where `<MYNODE>` is the node name, `<MYHOST>` is the host name or IP address of the data server, and `<XXXX>` is the data server port number.
4. Verify the catalog entry: `db2 => list node directory`. DB2 should return something similar to: Node 1 entry: Node name = MYNODE Comment = Directory entry type = LOCAL Protocol = TCPIP Hostname = MYHOST Service name = XXXX

### 6.12.1.1.2.3 Catalog the Primary Database from the DB2 Client

Follow these steps to catalog the primary database from the DB2 client.

#### Procedure

1. Catalog the primary database using this command at the DB2 prompt:

```
db2 => catalog database MYDB as MYDB_ALIAS at node MYNODE
```

Parameter	Description
MYDB	Database name
MYDB_ALIAS	Alias for the database
MYNODE	Node name used in the catalog TCPIP node command

2. Verify the catalog entry:

```
db2 => list database directory
```

DB2 should return something similar to:

System Database Directory	
Number of entries in the directory 1	
Database 1 entry	Database alias = MYDB_ALIAS Database name = MYDB Node name = MYNODE Database release level = b.00 Comment = Directory entry type = Remote

### 6.12.1.1.3 Primary DB2 UDB Database Configuration for Replication

Configure your DB2 UDB database to work with the Log Reader adapter and replication.

For successful replication, remember the following:

- If you have a UDB client instance and a UDB server instance on different machines, the client and server must be of the same UDB version.

- On a Windows system, the DB2 connectivity autocommit parameter must be enabled (autocommit=1). The autocommit parameter is specified in the DB2 call level interface (CLI) configuration file for the primary database. If the autocommit parameter is not enabled, a deadlock problem can occur. The path to the CLI configuration file is: `<%DB2DIR%>\sqllib\db2cli.ini` where `<%DB2DIR%>` is the path to the DB2 client installation. Alternatively, to enable autocommit, open the DB2 administrative command line console and run: `db2set DB2OPTIONS=+c`
- To initialize LogReader without error, the database must have a tablespace created with these characteristics:
  - The tablespace should be a user temporary tablespace. By default, user temporary tablespaces are not created when a database is created.
  - The tablespace must be a system-managed space (SMS).
  - The PAGESIZE parameter must be set to 8192 (8 kilobytes) or greater.

## Related Information

[Add a Temporary Tablespace to the Primary Database \[page 261\]](#)

[Verify the Current Archive Setting of the Transaction Log \[page 262\]](#)

[Create a DB2 UDB User and Grant Permissions \[page 264\]](#)

### 6.12.1.1.3.1 Add a Temporary Tablespace to the Primary Database

These steps show how to add a temporary tablespace to the primary database.

#### Procedure

1. Start the DB2 UDB command-line processor:

```
%>bash
%>source /db2home/db2inst1/sqllib/db2profile
%>db2
```

2. Connect to the primary DB2 UDB database:

```
db2 => connect to pdb user db2_admin_user using db2_admin_password
```

`<db2_admin_user>` and `<db2_admin_password>` are the administrative user ID and password for the primary database.

3. Create a buffer pool:

```
db2 => create bufferpool pdb_buffer_name size 1000 pagesize
same_pagesize_as_pdb
```

<pdb\_buffer\_name> is the buffer name and <same\_pagesize\_as\_pdb> is the page size at the primary database.

4. Create a temporary tablespace:

```
db2=>create user temporary tablespace pdb_temp_space_name
pagesize same_pagesize_as_pdb managed by automatic storage
bufferpool pdb_buffer_name
```

<pdb\_temp\_space\_name> is the tablespace name, <same\_pagesize\_as\_pdb> is the page size at the primary database, and <pdb\_buffer\_name> is the buffer name.

### **i Note**

Determine the DB2 UDB page size using the LIST TABLESPACES SHOW DETAIL command. For example, to create a temporary tablespace named deep13 with a 16-KB page size and buffer pool named tom\_servo, enter:

```
db2 => create user temporary tablespace deep13 pagesize 16K managed by
automatic storage bufferpool tom_servo
```

## **6.12.1.1.3.2 Verify the Current Archive Setting of the Transaction Log**

Set the primary DB2 UDB database transaction logging to archive logging instead of circular logging for DB2 LogReader Adapter.

### **Procedure**

1. Determine the LOGARCHMETH1 setting.
  - a. Connect to the database by entering this command at the CLP prompt:

```
db2 => CONNECT TO dbalias USER db2_user USING db2_user_ps
```

where <dbalias> is the cataloged alias of the primary database, <db2\_user> is the primary database user, and <db2\_user\_ps> is the password.

- b. Determine the LOGARCHMETH1 setting:

```
db2 => GET DB CFG FOR dbalias
```

2. If the results do not show that LOGARCHMETH1 is set to LOGRETAIN or to the path name of the directory to which logs are archived or TSM server, set it:
  - o To use the default archive location:

```
db2 => UPDATE DATABASE CONFIGURATION USING logarchmeth1 LOGRETAIN
```

- o To use a specific archive location:

```
db2 => UPDATE DATABASE CONFIGURATION USING logarchmeth1 DISK:path
```

- To use TSM server:

```
db2 => UPDATE DATABASE CONFIGURATION USING logarchmeth1 TSM
```

where `<path>` is the full path name of the directory where the archive logs are to be stored. If you change the setting of the DB2 UDB `logarchmeth1` parameter, DB2 UDB requires you to back up the database. Use your normal backup procedure or see the IBM documentation for information on the `BACKUP DATABASE` command.

### 3. Reactivate and backup the DB2 UDB database to make the configuration change take effect:

- Deactivate the database `db2 => DEACTIVATE DATABASE dbalias USER db2_user USING db2_user_ps`, where `<dbalias>` is the cataloged alias of the primary database, `<db2_user>` is the primary database user, and `<db2_user_ps>` is the password.

- Back up the database:

- `LOGARCHMETH1=LOGRETAIN`

```
db2 => BACKUP DATABASE dbalias USER db2_user USING db2_user_ps
```

- `LOGARCHMETH1=DISK: path`

```
db2 => BACKUP DATABASE dbalias TO path USER db2_user USING db2_user_ps
```

where `<dbalias>` is the cataloged alias of the primary database, `<path>` is the log archive path you specified, `<db2_user>` is the primary database user, and `<db2_user_ps>` is the password.

- Activate the database again `db2 => ACTIVATE DATABASE dbalias USER db2_user USING db2_user_ps`, where `<dbalias>` is the cataloged alias of the primary database, `<db2_user>` is the primary database user, and `<db2_user_ps>` is the password.

### 4. Verify the configuration change:

- `db2=> CONNECT TO dbalias USER db2_user USING db2_user_ps`

where `<dbalias>` is the cataloged alias of the primary database, `<db2_user>` is the primary database user, and `<db2_user_ps>` is the password.

- `db2=> CALL SYSPROC.GET_DB_CONFIG()`

- `db2=> SELECT DBCONFIG_TYPE, LOGARCHMETH1 FROM SESSION.DB_CONFIG`

The last `SELECT` statement returns two rows: one for the on-disk (`DBCONFIG_TYPE=0`) value and another for the in-memory (`DBCONFIG_TYPE=1`) value. Make sure that both of the values are changed to `LOGRETAIN` or `DISK`.

### 6.12.1.1.3.3 Create a DB2 UDB User and Grant Permissions

These steps show how to create a DB2 UDB user and grant permissions.

#### Context

DB2 LogReader Adapter requires a DB2 UDB login that has permission to access data and create new objects in the primary database. The DB2 UDB login must have SYSADM or DBADM authority to access the primary database transaction log.

#### Procedure

1. Create a new operating system user named `ra_user` using commands appropriate for your operating system. For example, to create a user named `ra_user` on a Linux operating system, use: `%>useradd -gusers -Gmgmt -s/bin/shell -psybase -d/home/ra_user -m ra_user`, where `<psybase>` is the password corresponding to the `ra_user` user name.
2. Start the DB2 UDB command-line processor:

```
%>bash
%>source /db2home/db2inst1/sqlllib/db2profile
%>db2
```

3. Connect to the primary DB2 UDB database: `db2=>connect to pdb user db2_admin_user using db2_admin_password`, where `<db2_admin_user>` and `<db2_admin_password>` are the administrative user ID and password for the primary database.
4. Grant all necessary authorities to `ra_user`:

```
GRANT DBADM ON DATABASE TO USER <user>
GRANT CREATETAB ON DATABASE TO USER <user>
GRANT BINDADD ON DATABASE TO USER <user>
GRANT CONNECT ON DATABASE TO USER <user>
GRANT CREATE_NOT_FENCED_ROUTINE ON DATABASE TO USER <user>
GRANT IMPLICIT_SCHEMA ON DATABASE TO USER <user>
GRANT LOAD ON DATABASE TO USER <user>
GRANT CREATE_EXTERNAL_ROUTINE ON DATABASE TO USER <user>
GRANT QUIESCE_CONNECT ON DATABASE TO USER <user>
```

## 6.12.1.1.4 Required Libraries for DB2 Log Reader Adapter

The following table contains a list of the required libraries for setting up the DB2 Log Reader Adapter.

Library	Notes						
DB2 UDB JDBC driver	<p>Include the DB2 JDBC driver library in the Data Provisioning Agent <code>CLASSPATH</code> environment variable. Use the corresponding version of the JDBC driver listed in the IBM documentation.</p> <p>For information about required JDBC libraries, see the <i>SAP HANA smart data integration Product Availability Matrix (PAM)</i>. This JAR file (<code>db2jcc4.jar</code>) must be copied to the following directory:</p> <p><code>&lt;DPAgent_root&gt;/lib</code></p>						
Log Reader native interface	<p>The DB2 Log Reader Adapter calls a C-based native interface to access the DB2 Log Reader API to read its log record. Include the native interface library in the <code>DPAgent PATH</code> (for Windows) or <code>LD_LIBRARY_PATH</code> (for Linux) environment variable or <code>JVM -Djava.library.path</code> variable if you start up the Data Provisioning Agent from Eclipse.</p> <table><tr><th>Platform</th><th>Notes</th></tr><tr><td>Windows (64-bit)</td><td><p><code>sybrauni.dll</code> to support DB2 v9.5</p><p><code>sybrauni97.dll</code> to support DB2 v9.7</p><p><code>sybrauni98.dll</code> to support DB2 v10.1, v10.5</p></td></tr><tr><td>Linux (64-bit)</td><td><p><code>libsybrauni.so</code> to support DB2 v9.5</p><p><code>libsybrauni97.so</code> to support DB2 v9.7</p><p><code>libsybrauni98.so</code> to support DB2 v9.8, v10.1, v10.5</p></td></tr></table> <div><p><b>Note</b></p><p>The native interface libraries are packaged into the Data Provisioning Agent installer.</p></div>	Platform	Notes	Windows (64-bit)	<p><code>sybrauni.dll</code> to support DB2 v9.5</p> <p><code>sybrauni97.dll</code> to support DB2 v9.7</p> <p><code>sybrauni98.dll</code> to support DB2 v10.1, v10.5</p>	Linux (64-bit)	<p><code>libsybrauni.so</code> to support DB2 v9.5</p> <p><code>libsybrauni97.so</code> to support DB2 v9.7</p> <p><code>libsybrauni98.so</code> to support DB2 v9.8, v10.1, v10.5</p>
Platform	Notes						
Windows (64-bit)	<p><code>sybrauni.dll</code> to support DB2 v9.5</p> <p><code>sybrauni97.dll</code> to support DB2 v9.7</p> <p><code>sybrauni98.dll</code> to support DB2 v10.1, v10.5</p>						
Linux (64-bit)	<p><code>libsybrauni.so</code> to support DB2 v9.5</p> <p><code>libsybrauni97.so</code> to support DB2 v9.7</p> <p><code>libsybrauni98.so</code> to support DB2 v9.8, v10.1, v10.5</p>						
DB2 Log Reader Adapter internal libraries	<ul style="list-style-type: none"><li><code>sybrautunc.jar</code></li><li><code>sybraudb2flsn.jar</code></li></ul> <p>These libraries are installed into the DB2 database during replication initialization for specific procedure calls. Include them in the Data Provisioning Agent <code>CLASSPATH</code> environment variable. These libraries are packaged into the Data Provisioning Agent installer.</p>						

## Related Information

[IBM driver documentation](#) 



## 6.12.1.2 Remote Database Clean-up for DB2 Real-time Replication

Run SQL scripts to clean objects manually from the DB2 source database.

Clean-up scripts are used to drop database-level objects. Usually you do not need to execute a clean-up script after an adapter is dropped, because the adapter drops database-level objects automatically. However, in some cases, if any errors occur before or while automatically dropping these objects, the objects may not be dropped. At that point, you may want to execute the clean-up script to drop the objects.

You can find the DB2 clean-up script file at `<DPAgent_root>\LogReader\scripts\db2_logreader_cleanup.sql`.

## 6.12.1.3 Validate the IBM DB2 Log Reader Environment

You can use the Data Provisioning Agent command-line configuration tool to validate the configuration of the IBM DB2 log reader environment before creating remote sources that use the IBM DB2 Log Reader adapter.

### Prerequisites

Before validating the log reader environment, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

Also, before starting these steps, place your files in `<DPAgent_root>/lib`, and manually create the `/lib` folder.

### Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`
3. Choose [DB2 Replication Setup](#).
4. Choose [Config DB2 Connection Info](#) to configure the connection used for other validation tasks.  
Specify the following information required to connect the configuration tool to the database:



- The hostname, port number, database name, and database source name for the DB2 database
- Whether to use SSL
- The DB2 username and password for connecting to the database

The configuration tool connects to the database with the specified parameters when performing other validation tasks.

5. Perform validation and configuration tasks for the IBM DB2 log reader environment.

For each task, provide any additional parameters required by the task. To test whether the DB2 environment is ready for replication, choose [DB2 Replication Precheck](#).

## Next Steps

After you have validated the configuration of the IBM DB2 log reader environment, you can create remote sources with the IBM DB2 Log Reader adapter. You can manually create remote sources or generate a creation script with the command-line configuration tool.

## Related Information

[Generate a Log Reader Remote Source Creation Script \[page 267\]](#)

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

### 6.12.1.4 Generate a Log Reader Remote Source Creation Script

Use the Data Provisioning Agent command-line configuration tool to validate parameters and generate a usable script to create a remote source for log reader adapters.

## Prerequisites

Before generating a remote source creation script for your source, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

Before performing these steps, place your files in `<DPAgent_root>/lib`. Note that you must manually create the `/lib` folder.

## Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`
3. Choose the appropriate replication setup option for your remote source type.
4. Choose the appropriate log reader setup option for your remote source type.
5. Provide the configuration details for your remote source as prompted.

Specify the name of the agent to use and the name of the remote source to create, as well as any connection and configuration information specific to your remote source.

For more information each configuration parameter, refer to the remote source configuration section for your source type.

## Results

The configuration tool validates the configuration details for your remote source and generates a script that can be used to create the remote source. You can view the validation results in the Data Provisioning Agent log.

By default, the configuration tool generates the remote source creation script in the user temporary directory. For example, on Windows: `C:\Users\<username>\AppData\Local\Temp\remoteSource-<remote_source_name>.txt`.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

## 6.12.2 DB2LogReaderAdapter Preferences

Configuration parameters for the DB2 Log Reader adapter.

### Note

Log Reader adapter preferences are no longer set in the Data Provisioning Agent Configuration Tool with the exception of *Number of wrapped log files*, *Enable verbose trace*, and *Maximum log file size*. They are now in the remote source configuration options in SAP HANA. If you have upgraded from a previous version, the settings you find in the Agent Configuration Tool are the previous settings and are displayed for your reference.

You can adjust DB2 Log Reader adapter settings in the Data Provisioning Agent Configuration Tool.  
(`<DPAgent_root>/configTool/dpagentconfigtool.exe`)

Parameter	Description	Default value
Maximum operation queue size	The maximum number of operations permitted in the log reader operation queue during replication.	1000
Maximum scan queue size	The maximum number of log records permitted in the log reader log scan queue during replication.	1000
Ignore log record processing errors	Determines whether to ignore log record processing errors.	false
Replicate LOB columns	Determines whether the agent applies each LOB change.	true
Database connection pool size	Maximum number of connections allowed in the connection pool on a secondary node.	15
Number of times to retry to connect if a connections fails	Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt, as long as the server is not found, for the specified number of times.	5
Timeout in seconds to retry connecting	The number of seconds the agent waits between retry attempts to connect to the primary database.	10
Number of wrapped log files	The maximum size in 1-K blocks of the LogReader system log file before wrapping.	3
Enable verbose trace	Enables or disables extra diagnostic information in the agent system log files.	false
Maximum log file size	Limits the size of the message log to conserve disk space.	1000
Turn on asynchronous logging mode	Specifies whether or not Log Reader should turn on asynchronized logging mode. (TRUE, FALSE)	TRUE
Maximum size of work queue for asynchronous logging	The Maximum size of the work queue for asynchronous logging file handler to collect the log records. The range is 1 to 2147483647.	1000

Parameter	Description	Default value
Discard policy for asynchronous logging file handler	<p>Specifies the discard policy for the asynchronous logging file handler when the work queue is saturated.</p> <ul style="list-style-type: none"> <li>BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>DISCARD: The log records that cannot be offered into queue are dropped.</li> <li>DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried, which can fail again, causing this process to be repeated.</li> </ul>	BLOCKING

### 6.12.3 DB2 Log Reader Remote Source Configuration

Configure your connection to a DB2 remote source.

When setting up a remote source and you use a remote source name longer than 30 characters, the generated log reader folder name under `<DPAgent_root>/LogReader/` is converted to `AGENT<xxxx>`.

The log file is located at `<DPAgent_root>/log/Framework.trc` and reads: The instance name `<original_name>` exceeds 30 characters and it is converted to `<converted_name>`.

Category	Option	Description
Generic	Always Map Character Types to Unicode	<p>Determines whether a CHAR/ CHARACTER/VARCHAR/ LONGVARCHAR/CLOB column in the source database is mapped to a Unicode column type in SAP HANA when the source database character set is non-ASCII. The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p> <p>Set this parameter to <i>True</i> only when the remote database is multibyte character sets such as UTF-8, GBK, and JA16SJIS.</p>

Category	Option	Description
	Load and Replicate LOB columns	<p>When this parameter is set to <i>False</i>, the LOB columns are filtered out when doing an initial load and real-time replication.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p> <div> <b>i Note</b>            This option is not available for an ECC adapter.         </div>
Database	Host	<p>The host name or IP address on which the DB2 Server is running.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Port Number	<p>The port number of the DB2 Server. See <a href="#">Setting the DB2 Port Number [page 277]</a> for more information.</p>
	Database Name	The name of the database
	Database Source Name	<p>Set the Source Name parameter to <i>&lt;MYDB_ALIAS&gt;</i> when creating a remote source, where <i>&lt;MYDB_ALIAS&gt;</i> is the database alias that was used when cataloging the primary database.</p>
	Whitelist Table in Remote Database	Enter the name of the table that contains the whitelist in the remote database.
	Include Table/Columns Remarks	<ul style="list-style-type: none"> <li><i>True</i>: Returns a description of the table/column. If you have many tables, setting this parameter to <i>True</i> can impede performance.</li> <li><i>False</i> (Default): Turns off the return of descriptions</li> </ul> <p>If the parameter <i>Include Table/Columns Remarks</i> is set to <i>True</i>, the descriptions of tables/views are returned when GET_REMOTE_SOURCE_OBJECTS_LIST is called. The descriptions of tables/views and columns are returned when</p>

Category	Option	Description
		<p>GET_REMOTE_SOURCE_TABLE_DEFINITIONS is called.</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
	Additional Connection Properties	<p>Use this parameter to attach additional custom connection properties. For example, you can use this new parameter to set JDBC driver connection properties.</p> <p>Use the following format:</p> <pre>key1=value1[;key2=value2] . . .</pre> <p>For example,</p> <pre>securityMechanism=9;encryptionAlgorithm=2</pre>
LDAP Authentication	Use LDAP Authentication	<p>Set to <i>True</i> to enable LDAP authentication for the DB2 database. The default is <i>False</i>.</p> <div> <b>i Note</b>  The IBM DB2 log reader adapter does not support the following LDAP scenarios: <ul style="list-style-type: none"> <li>• LDAP + SSL authentication</li> <li>• LDAP + Kerberos authentication</li> <li>• LDAP failover mode</li> </ul> </div>
Schema Alias Replacements	Schema Alias	<p>Schema name to be replaced with the schema given in Schema Alias Replacement. If given, accessing tables under it is considered to be accessing tables under the schema given in Schema Alias Replacement.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>

Category	Option	Description
	Schema Alias Replacement	<p>Schema name to be used to replace the schema given in Schema Alias.</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
Security	Use SSL	<p>Specifies whether you are using SSL.</p> <p>The default value is <i>False</i>.</p>
	Use Agent Stored Credential	<p>Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage.</p> <p>The default value is <i>False</i>.</p> <div> <b>i Note</b>  When you use credentials stored in the agent's secure storage, you must still specify the user name in <b>Credentials &gt; User Name</b>. Additionally, the <i>Credential Mode</i> must not be <i>none</i> or empty. </div>
CDC Properties > Log Reader	Maximum operation queue size	<p>The maximum number of operations permitted in the log reader operation queue during replication. The value range is 25 to 2147483647.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Maximum scan queue size	<p>The maximum number of log records permitted in the log reader log scan queue during replication. The value range is 25 to 2147483647.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Ignore log record processing errors	<p>Specifies whether to ignore log record processing errors. If set to <i>True</i>, the replication does not stop if log record processing errors occur. The default value is <i>False</i>.</p>

Category	Option	Description
		The value of this parameter can be changed when the remote source is suspended.
	Ignore log record decluster errors	<div> <b>Note</b>  This parameter is available only when you are using the DB2 Log Reader ECC adapter. </div> <p>Specifies whether to ignore log record declustering errors. If set to <i>True</i>, the replication does not stop if log record declustering errors occur. The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Database connection pool size	<p>Maximum number of connections allowed in the connection pool on a secondary node. The value range is 1 to 64.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Number of times to retry to connect if a connection fails	<p>Instructs a client library, such as DBLIB, ODBC, and ADO, to keep trying the connection attempt when the server is not found for the specified number of times. The value range is 0 to 2147483647.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Timeout in seconds to retry connecting	<p>The number of seconds the agent waits between retry attempts to connect to the primary database. The value range is 0 to 3600.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	LogReader Character Set	Represents the charset of the source DB2 database. There is no default



Category	Option	Description
		<p>value, which means no character set conversion occurs during the replication from DB2 to SAP HANA. To view the accepted character set name, refer to <a href="http://www.iana.org/assignments/character-sets">http://www.iana.org/assignments/character-sets</a> .</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	LogReader read buffer size	<p>Allows you to adjust the size of the DB2 log read. If the size is too small, you may encounter an <code>errorsqrcode -2650 reason 8</code>.</p> <p>The default value is 65536. The value range is 1000 to 2147483647.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
Credentials	Credentials Mode	<ul style="list-style-type: none"> <li>• <b>Technical User</b> Remote sources support two types of credential modes to access a: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li>• <b>Secondary User</b>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
Credential	User Name	<p>The name of the DB2 database user that DB2 LogReader Adapter uses to access the DB2 database. Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p>
	Password	<p>The password of the DB2 database user that DB2 LogReader Adapter uses to access the DB2 database.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>

## SQL Example

```
CREATE REMOTE SOURCE "db2rs" ADAPTER "DB2LogReaderAdapter" AT LOCATION AGENT
"MyAgent" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="database" displayName="Database">
    <PropertyEntry name="pds_host_name" displayName="Host"
isRequired="true">mo-xxxxxxx.mo.sap.corp</PropertyEntry>
    <PropertyEntry name="pds_port_number" displayName="Port Number"
isRequired="true">60060</PropertyEntry>
    <PropertyEntry name="pds_database_name" displayName="Database Name"
isRequired="true">testdb</PropertyEntry>
    <PropertyEntry name="pds_datasource_name" displayName="Database
SourceName" isRequired="true">testdb</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="security" displayName="Security">
    <PropertyEntry name="pds_use_agent_stored_credential">false</
PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>xxxx</user>
  <password>xxxxxxxx</password>
</CredentialEntry>
<CredentialEntry name="credential_user_only">
  <password>xxxxxx</password>
</CredentialEntry>';
```

## Related Information

[Setting the DB2 Port Number \[page 277\]](#)

[Create Credentials for a Secondary User](#)

[Using a Schema Alias \[page 277\]](#)

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

[Security Aspects of SAP HANA Smart Data Access \(SAP HANA Security Guide\)](#)

[Creating a Whitelist to Limit Access to a Source Database \[page 281\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 82\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Command Line\] \[page 68\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Setting the DB2 Port Number \[page 277\]](#)

[Using a Schema Alias \[page 277\]](#)

## 6.12.3.1 Setting the DB2 Port Number

Make sure that the DB2 port number is within a valid range.

If the DB2 port number is set to 0 or larger than 65535, DB2 converts it to a port number that is less than 65535. The following translation rules apply:

- If the port number is 0 or 65536, DB2 will set a random port number after you restart DB2, each time.
- If the port number is larger than 65536, the real port number that DB2 set is the port number, minus 65536. For example,  $70000 - 65536 = 4464$ . In this case, 4464 is the real port number that DB2 sets.

To identify the real port number:

- On Windows, open Task Manager. Find the PID of DB2\_XX service, then open a cmd prompt and type `netstat -aon | findstr PID`.
- On Linux, use the `ps -aux | grep db2sysc` command.

## 6.12.4 Using a Schema Alias

Using a schema alias can help you manage multiple schema, remote sources, and tables more easily.

The *Schema Alias* and *Schema Alias Replacement* options, available in the remote source configuration parameters for some Data Provisioning adapters, allow you to switch easily between schema, remote sources, and tables. The *Schema Alias* is the name of the schema in the original system. The *Schema Alias Replacement* is the name of the schema in the current system that replaces the *Schema Alias* name.

A common use case is to create a remote source pointing to a development database (for example, DB\_dev), and then create virtual tables under that remote source. Afterward, you may switch to the production database (for example, DB\_prod) without needing to create new virtual tables; the same tables exist in both DB\_dev and DB\_prod, but under different schema and databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB\_dev, for example. Note that OWNER1.MYTABLE is the unique name of the source table, and it is a property of the virtual table. With it, the adapter knows which table in the source database it is expected to access. However, when you switch to the production database (DB\_prod), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name information of the virtual table cannot be changed once created.

You can resolve this problem using the Schema Alias options. In this case, we want to tell the adapter to replace OWNER1 with OWNER2. For example, when we access OWNER1.MYTABLE, the adapter should access OWNER2.MYTABLE. So here, OWNER1 is *Schema Alias* from the perspective of DB\_prod, while OWNER2 is *Schema Alias Replacement*.

To use this functionality, you must populate both of these options.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

## 6.12.5 Log Reader Adapter Log Files

You can review processing information in the Log Reader log files.

The following files are available:

Log file name and location	Description
<DPAgent_root>/LogReader/admin_logs/admin<instance_name>.log	Log Reader administration log
<DPAgent_root>/log/<instance_name>.log	Log Reader instance log

### Note

By default, the adapter instance name is the same as the remote source name when the remote source is created from the SAP HANA Web-based Development Workbench.

## 6.12.6 Configure SSL for the DB2 Log Reader Adapter

Set up secure SSL communication between DB2 and the Data Provisioning Agent.

### Context

If you want to use SSL communication between your DB2 source and the Data Provisioning Agent, you must prepare and import certificates and configure the source database.

### Procedure

1. Prepare the DB2 database server for SSL connections.
  - a. Create an SSL directory and use the gskit tool to generate the SSL key file.

For example, on Windows:

```
cd C:\SSL
"C:\Program Files\ibm\gsk8\bin\gsk8capicmd_64.exe" -keydb -create -db
"key.kdb" -pw "ibm123456" -stash
"C:\Program Files\ibm\gsk8\bin\gsk8capicmd_64.exe" -cert -create -db
"key.kdb" -pw "ibm123456" -label "SSLLabel" -dn
"CN=XXXX.XX.XX.XXXX,O=IBM,OU=IDL,L=Bangalore,ST=KA,C=INDIA"
```

```
"C:\Program Files\ibm\gsk8\bin\gsk8capicmd_64.exe" -cert -extract -db
"key.kdb" -pw "ibm123456" -label "SSLLabel" -target "key.arm" -format
ascii -fips
```

On Linux:

```
cd /home/db2inst1/SSL
/home/db2inst1/sqlllib/gskit/bin/gsk8capicmd_64 -keydb -create -db
"key.kdb" -pw "ibm123456" -stash
/home/db2inst1/sqlllib/gskit/bin/gsk8capicmd_64 -cert -create -db "key.kdb"
-pw "ibm123456" -label "SSLLabel" -dn
"CN=XXXX.XX.XX.XXXX,O=IBM,OU=IDL,L=Bangalore,ST=KA,C=INDIA"
/home/db2inst1/sqlllib/gskit/bin/gsk8capicmd_64 -cert -extract -db
"key.kdb" -pw "ibm123456" -label "SSLLabel" -target "key.arm" -format
ascii -fips
```

- b. Connect to the DB2 database using the instance user, and use the command-line interface to update SSL-relevant configuration parameters.

Specify the server SSL key location, label, and port, and set the communication protocol to include SSL.

For example, to use a key stored in `H:\cert\SSL` with the label "SSLLabel" and port 56110:

```
db2 update dbm cfg using SSL_SVR_KEYDB H:\cert\SSL\key.kdb
db2 update dbm cfg using SSL_SVR_STASH H:\cert\SSL\key.sth
db2 update dbm cfg using SSL_SVR_LABEL SSLLabel
db2 update dbm cfg using SSL_SVCENAME 56110
db2set DB2COMM=SSL,TCPIP
db2 update dbm cfg using DIAGLEVEL 4
db2 force application all
db2 stop
db2 restart
```

- c. Verify the SSL configuration.

In the DB2 diagnostic log `db2diag.log`, check for the following message:

```
MESSAGE : DIA3000I "SSL" protocol support was successfully started.
```

Additionally, verify that the `/etc/services` file contains the specified SSL port.

2. Prepare the DB2 client for SSL connections.

- a. Copy the SSL key from the DB2 database server to the DB2 client location.

Create an SSL directory on the DB2 client, and copy `key.arm` from the DB2 server into this directory.

- b. Add the DB2 server SSL key to the DB2 client.

From the SSL directory on the DB2 client, use the `gskit` tool to import the server SSL key.

For example:

```
/build/db2/gskit/bin/gsk8capicmd_64 -keydb -create -db "keyclient.kdb" -pw
"ibm123456" -stash
/build/db2/gskit/bin/gsk8capicmd_64 -cert -add -db "keyclient.kdb" -pw
"ibm123456" -label "SSLLabelClt" -file key.arm -format ascii -fips
```

- c. Update the DB2 client configuration.

Specify the SSL keydb and stash, and restart the instance.

For example:

```
db2 update dbm cfg using SSL_CLNT_KEYDB /build/home/db2inst2/SSL/
keyclient.kdb
db2 update dbm cfg using SSL_CLNT_STASH /build/home/db2inst2/SSL/
keyclient.sth
db2 force application all
db2stop
db2start
```

- d. Catalog the DB2 database with the SSL protocol.

For example:

```
db2 catalog tcpip node SSLNODE remote <hostname> server 56110 security ssl
db2 catalog database mydb as sslmydb at node SSLNODE
```

- e. Verify the SSL connection to the DB2 server.

For example:

```
db2 connect to sslmydb user db2inst1 using db2inst1
```

3. Prepare the Data Provisioning Agent for SSL connections.

- a. Copy the SSL key from the DB2 database server to the Data Provisioning Agent installation.

Copy `key.arm` from the DB2 server into `<DPAgent_root>/ssl/`.

- b. Import the DB2 server SSL key to the agent cacerts file.

Use the Java `keytool` to import the SSL key. By default, `keytool` is located in `$JAVA_HOME/bin`.

For example:

```
keytool -import -keystore <DPAgent_root>/ssl/cacerts -storepass changeit -
file <DPAgent_root>/ssl/key.arm -noprompt -alias <alias_name>
```

- c. Configure the SSL password with the Data Provisioning Agent configuration tool.

Specify the same password used when importing the SSL key, and then restart the Data Provisioning Agent.

## Next Steps

When you create a DB2 remote source, ensure that the following parameters are set appropriately:

- *Use SSL: True*
- *Port Number*: SSL port for the DB2 database. For example, 56110.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

## 6.12.7 Creating a Whitelist to Limit Access to a Source Database

There are times when you may want to limit access to all of the tables in a source database. For data provisioning log reader adapters, as well as SAP HANA and SAP ECC adapters, an efficient way to limit access is to create a whitelist.

Restricting access to only those tables that are to be replicated is done by creating a whitelist of source database objects in a separate table.

### i Note

The whitelist impacts only the virtual table created and the replications created after the whitelist was created.

You can use SQL to create the whitelist table.

### i Note

- The whitelist table, which can have any name, must have two columns named REMOTE\_SOURCE\_NAME and WHITELIST.
- The whitelist items are separated by a comma.
- You can use an asterisk (\*) to represent any character or empty string. However, the asterisk must be placed at the end of a whitelist item. Otherwise, it is treated as a normal character.
- You can add multiple rows of whitelisted tables for a single remote source.

## Microsoft SQL Server Example

```
create table whitelist(REMOTE_SOURCE_NAME varchar(128), WHITELIST varchar(4000));
```

To add a whitelist for the remote source called "localmssqldb", insert a row into the whitelist table:

```
insert into whitelist values('localmssqldb', 'object.A, object.B*');  
insert into whitelist values('localmssqldb', 'object.C, object.D*');
```

object.A, object.B\*, and so on, means that the table (or procedure) object.A and the table (or procedure) starting with object.B are filtered for the remote source "localmssqldb".

## SAP HANA Example

```
create schema SAP_RESTRICTIONS;  
create table WHITE_LIST(REMOTE_SOURCE_NAME varchar(128) primary key, WHITELIST  
varchar(4000));
```

To add a whitelist for the remote source called "localhadp", insert a row into the whitelist table:

```
insert into WHITE_LIST values('localhadp', 'APP_USER.MERCHANT,APP_PRODUCT.B*');
```

APP\_USER.MERCHANT,APP\_PRODUCT.B\* means that the table (or procedure) APP\_USER.MERCHANT and the table (or procedure) starting with APP\_PRODUCT.B are filtered for remote source "localhadp".

## 6.12.8 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. Navigate to the Agent Adapter Framework Preferences.
  - In graphical mode, choose **Config** > **Preferences**, and then select **Adapter Framework**.
  - In command-line interactive mode, choose **Set Agent Preferences** in the **Agent Preferences** menu.
3. For the **Read-only Adapters** property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:
```



```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start and Connect the Configuration Tool \[page 84\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

## 6.13 IBM DB2 Mainframe

The DB2 Mainframe adapter supports IBM DB2 for z/OS and IBM DB2 iSeries, which is formerly known as AS/400.

The DB2 Mainframe adapter is a data provisioning adapter that provides DB2 client access to the database deployed on IBM DB2 for z/OS and iSeries systems. DB2 database resources are exposed as remote objects of the remote source. These remote objects can be added as data provisioning virtual tables. The collection of DB2 data entries are represented as rows of the virtual table.

## Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source for both z/OS and iSeries
- SELECT, WHERE, JOIN, GROUP BY, ORDER BY, TOP, LIMIT, DISTINCT

## Related Information

[Setting DB2 Universal Database Environment Variables \[page 284\]](#)

[IBM DB2 Mainframe Permissions \[page 284\]](#)

[Bind the DB2 SYSHL Package \[page 285\]](#)

[Preparing JDBC JAR Files \[page 285\]](#)

[IBM DB2 Mainframe Remote Source Configuration \[page 286\]](#)

## 6.13.1 Setting DB2 Universal Database Environment Variables

The method for setting DB2 UDB environment variables depends on the operating system.

### i Note

The DB2 UDB environment variables should be set up regardless of whether your Data Provisioning Agent is installed on the same server as the DB2 database or not. Prior to setting up the variables, be sure that you have installed the IBM Data Server Runtime Client.

For Linux, the DB2 UDB installation provides two scripts for setting up the DB2 UDB environment variables: `db2cshrc` for C shell and `db2profile` for Bourne or Korn shell. These scripts set the library path environment variable based on the bit size of the installed server or client.

For Windows, the installation sets all necessary environment variables.

For Linux platforms, the 32-bit and 64-bit versions of the driver and API libraries are located in `<$HOME/sqlllib/lib32>/sqlllib/lib32` and `<$HOME/sqlllib/lib64>/sqlllib/lib64`, respectively, where `<$HOME>` is the home directory of the DB2 UDB instance owner.

### i Note

If the Data Provisioning Agent is installed on Linux, the library path environment variable must point to the 64-bit libraries. For Windows, the library path environment variable must point to the 32-bit libraries.

### i Note

We recommend that you add a line to the `<DPAgent_root>/bin/dpagent_env.sh` file to set the `db2profile` environmental variables. This ensures that when you use `dpagent_service.sh` to start and stop the DPAgent service, the DB2 UDB environment variables are sourced automatically. For example, you could add a line such as `. /home/db2inst1/sqlllib/db2profile`.

## 6.13.2 IBM DB2 Mainframe Permissions

DB2 mainframe database users must have certain permissions granted to them.

The IBM DB2 Mainframe adapter requires a user with read privileges to the `SYSIBM.SYSCOLUMNS` system table.

## 6.13.3 Bind the DB2 SYSHL Package

Instructions for binding the DB2 SYSHL package.

### Context

If you receive the following error from the adapter, follow these steps to bind the DB2 SYSHL package:

```
DB2 SQL Error: SQLCODE=-805, SQLSTATE=51002, SQLERRMC=DB1SLOC.NULLID.SYSLH
```



### Procedure

1. Install and open the IBM DB2 Configuration Assistant.
2. In the source window, connect to the DB2 database deployed on the mainframe system.
3. Test the connection.
4. Bind the DB2 SYSHL package through the Configuration Assistant.
5. Select `ddcsmvs.lst` as the bind file location, enter the connection username and password, and then click [Bind](#).

## 6.13.4 Preparing JDBC JAR Files

Prepare the IBM DB2 JDBC JAR files to use one of the DB2 Mainframe adapters.

To use one of the DB2 Mainframe adapters, you are required to copy the following IBM DB2 JDBC JAR files to the `/lib` folder of the Data Provisioning Agent installation directory (`<DPAgent_root>\lib`).

- `db2jcc4.jar` (Required)  
You can download this file here: <http://www-01.ibm.com/support/docview.wss?uid=swg21363866> .  
Download the JDBC JAR file according to your DB2 database version.
- `db2jcc_license_cisuz.jar` (Required)  
You can find information about this file here: <http://www-01.ibm.com/support/docview.wss?uid=swg21191319> .

You can find these JAR files in the following ways:

- These JAR files are available in the installation directory after you installed the IBM DB2 client. For example, on a Windows system, the JAR files are located in `C:\Program Files\IBM\SQLLIB\java`.
- Download them from the IBM Support and Download Center.

#### Note

If the source z/OS DB2 system contains a non-English CCSID table space, you are required to update the JVM to an internationalized version. At a minimum, the `charsets.jar` file within the current JVM should

contain the required `CharToByteCP<XXX>.class`, where `<XXX>` corresponds to the source system's language locale.

## 6.13.5 IBM DB2 Mainframe Remote Source Configuration

Options for connecting to the remote mainframe data server. Also included is sample code for creating a remote source using the SQL console.

Category	Option	Description
Generic	Always Map Character types to Unicode	Determines whether a CHAR/CHARACTER/VARCHAR/LONGVARCHAR/CLOB column in the source database is mapped to a Unicode column type in SAP HANA when the source database character set is non-ASCII. The default value is <code>False</code> .
		The value of this parameter can be changed when the remote source is suspended.
		Set this parameter to <code>True</code> only when the remote database is multibyte character sets such as UTF-8, GBK, JA16SJIS, and soon.
Database	Host	Host name or IP address on which the remote DB2 data server is running.
	Port Number	The DB2 data server port number.
	Database Name	The DB2 database name.
	Database Source Name	The DB2 instance name.
Security	Use SSL	Specifies whether you are using SSL. The default value is <code>False</code> .
	Use Agent Stored Credential	Set to <code>True</code> to use credentials that are stored in the DP Agent secure storage. The default value is <code>False</code> .

Category	Option	Description
z/OS DB2 Additional Info	Bind Packages	<p>When this option is set to <a href="#">Yes</a>, the DB2 mainframe adapter automatically checks and binds all of the required missing JAR files.</p> <p>We recommend that you set this option to <a href="#">Yes</a> the first time you attempt to establish a connection, then set this option to <a href="#">No</a> for subsequent attempts.</p> <div> <p><b>i Note</b></p> <p>If any necessary packages are missing, an error occurs.</p> </div> <p>Setting this option for subsequent attempts helps improve performance by eliminating the need for redundant checks for the necessary JDBC packages.</p>
	Source System is AS/400 (IBM I)	<p>Set this parameter to <a href="#">Yes</a> if your source system is AS/400.</p> <p>The default value is <a href="#">No</a>.</p>
Credential Properties	Credentials Mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li>• <a href="#">Technical User</a>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li>• <a href="#">Secondary User</a>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
	User Name	The DB2 user with access to the tables that are added as virtual tables in SAP HANA.
	Password	DB2 database user password.

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyDB2MainframeSource" ADAPTER "DB2MainframeAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" displayName="Database">
  <PropertyEntry name="pds_host_name" displayName="Host">myhost.sap.corp</
PropertyEntry>
  <PropertyEntry name="pds_port_number" displayName="Port Number">5950</
PropertyEntry>
  <PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
```

```
<PropertyEntry name="pds_datasource_name" displayName="Database
SourceName">mydb</PropertyEntry>
<PropertyEntry name="bind_packages" displayName="Bind Packages">No</
PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>myuser</user>
  <password>mypassword</password>
</CredentialEntry>';
```

## Related Information

[Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 82\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Command Line\] \[page 68\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

## 6.14 Microsoft Excel

This adapter lets SAP HANA users access Microsoft Excel files.

### Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Search for tables
- SharePoint as a source
- SharePoint on Office365
- SELECT from a virtual table

## Related Information

[Microsoft Excel Authorizations \[page 289\]](#)

[Microsoft Excel Adapter Preferences \[page 289\]](#)

[Microsoft Excel Remote Source Configuration \[page 289\]](#)

[Access SharePoint Using HTTPS/SSL \[page 295\]](#)

[Accessing Microsoft Excel Data Files in a Shared Network Directory \[page 296\]](#)

[Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365 \[page 297\]](#)

[Configure Your Microsoft Azure Application \[page 298\]](#)

## 6.14.1 Microsoft Excel Authorizations

Authorization requirements for Microsoft Excel file remote sources.

Keep the following in mind when accessing files:

- Password-protected Microsoft Excel files are not supported.
- Ensure the user account under which the Data Provisioning Agent is running has access to the Microsoft Excel files on the local computer, a shared directory, or a SharePoint site.
- If the Microsoft Excel files are located on the same computer as the Data Provisioning Agent, the files must be located in the same directory or a subdirectory of the Data Provisioning Agent root directory.

## 6.14.2 Microsoft Excel Adapter Preferences

Options for controlling the Microsoft Excel adapter.

Option	Description
Access Token	A password. An access token protects the Microsoft Excel files from being accessed from a different remote source. Use this same password when creating a remote source.

## 6.14.3 Microsoft Excel Remote Source Configuration

Options for connecting to the remote Microsoft Excel data. Also included is sample code for creating a remote source using the SQL console.

### **i** Note

If you want to use a Data Provisioning Agent installed on Linux to connect to the SharePoint site, enable Basic Authentication on the SharePoint server.

Category	Parameter	Description
File Source	File Source Type	<ul style="list-style-type: none"> <li><a href="#">File System</a>: Specifies that the Microsoft Excel source is located in a file system.</li> <li><a href="#">SharePoint</a>: Specifies that the Microsoft Excel source is located on a SharePoint server.</li> <li><a href="#">SharePoint on Office365</a>: Specifies that the Microsoft Excel source is on an Office365 server.</li> </ul>
File System	Folder	<p>The directory of Microsoft Excel files. Use a relative path.</p> <p>If you leave this parameter blank, it is set to <code>&lt;DPAgent_root&gt;/excel</code>.</p> <p>If you set the value to a relative folder name, it becomes a subfolder of <code>&lt;DPAgent_root&gt;/excel</code>.</p> <p>For example, if you set the <a href="#">Folder</a> parameter to <code>download/test</code>, the Microsoft Excel file's folder is <code>&lt;DPAgent_root&gt;/excel/download/test</code>.</p> <p>If you are using a shared network directory, enter the path as follows:</p> <pre>\\&lt;host_name&gt;\&lt;directory&gt;</pre> <div> <p><b>Note</b></p> <p>Password-protected Microsoft Excel files are not supported.</p> </div>
HANA	HANA Server	The SAP HANA server name
	HANA Port	The port used to connect to the SAP HANA server
	HANA Schema	The SAP HANA schema
SharePoint	Server URL	<p>Enter the URL for the server where the SharePoint source is located.</p> <p>If you create a SharePoint site on the server, be sure to include the name of the site at the end of the URL. For example, if your server name is <code>http://&lt;server_name&gt;/</code> and your new site name is <code>site1</code>, your URL would be <code>http://&lt;server_name&gt;/site1</code>.</p>
	Local Folder Path	The path to the folder that you want to access on the local file system where the Data Provisioning Agent is deployed.



Category	Parameter	Description
Table	First Row as Header	<p>Determines whether the first row of the sheet is considered the header. If set to <i>True</i>, each column's content is used as the column name of the virtual table in SAP HANA.</p> <p>Values:</p> <ul style="list-style-type: none"> <li><i>True</i> (Default): The columns in the first row are used as the column names of the virtual table in SAP HANA.</li> <li><i>False</i>: The column names of the virtual table in SAP HANA are defined as COL1, COL2, COL3, and so on.</li> </ul>
	Start Row of Data	<p>Determines which row of the sheet is the first data row the Microsoft Excel adapter loads into the virtual table.</p> <p>The value must be no greater than the maximum row number of the sheet.</p> <p>If <i>First Row as Header</i> is set to <i>True</i>, its default value is <i>2</i>.</p> <p>If <i>First Row as Header</i> is set to <i>False</i>, its default value is <i>1</i>.</p>
	End Row of Data	<p>Determines which row of the sheet is the last data row the adapter loads into the virtual table.</p> <p>The value must be no greater than the maximum row number of the sheet.</p> <p>By default, all rows of the sheet are loaded.</p>
	Show Hidden Column and Rows	<p>Determines whether to process the columns that are hidden from the sheet.</p> <p>Values:</p> <ul style="list-style-type: none"> <li><i>True</i>: The hidden columns are processed as normal columns.</li> <li><i>False</i> (Default): The hidden columns are ignored.</li> </ul>

Category	Parameter	Description
	Column Filter	<p>The list of columns that are processed. Any column that does not exist in the list is ignored.</p> <p>Enter a list of column names separated by a semicolon.</p> <div> <p><b>Note</b></p> <p>If the Column Filter option is empty, all columns are processed. If the Column Filter option is not empty, only the listed columns are processed.</p> <p>For example, if you set the option to COL1;COL2;COL3, all columns other than COL1, COL2, and COL3 are ignored.</p> </div> <p>Default: All columns are processed.</p>
SharePoint on Office365	Authentication Mode	<p>Choose the type of credentials needed to access SharePoint on Office365</p> <ul style="list-style-type: none"> <li>Client Credential (default)</li> <li>Username Password:</li> </ul>
	Site URL	Enter the site URL, in the form of https://<company>.sharepoint.com/sites/<siteName>
	Application ID	Enter the application ID, as defined in the Microsoft Azure Portal.
	Tenant ID	Enter the tenant ID, as defined in the Microsoft Azure Portal.
	Local Folder Path	The path to the folder that you want to access on the local file system where the Data Provisioning Agent is deployed.
Credentials	Credentials mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><b>Technical User:</b> A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><b>Secondary User:</b> A unique access credential on the remote source assigned to a specific user.</li> </ul>
User Token	User Token for Excel Folder Access	The same password as the adapter <a href="#">Access Token</a> preference. If this parameter is left blank or is different from the <a href="#">Access Token</a> , the remote source is not allowed to read the Microsoft Excel files. <a href="#">Microsoft Excel Adapter Preferences [page 289]</a>
HANA Credential		The SAP HANA user name.

Category	Parameter	Description
	HANA Password	The SAP HANA password.
SharePoint Credential	SharePoint logon (Domain\User-Name)	The domain and user name for the SharePoint account.
	SharePoint Password	The password for the SharePoint account.
SharePoint on Office365 Credential	Client Credential	Enter the client secret you created on the Microsoft Azure Portal.
SharePoint on Office365 Username Password	Username	Enter the username for the Microsoft account
	Password	Enter the password for the Microsoft account.

The following code samples illustrate how to create a remote source using the SQL console.

## Local file system

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyExcelSource" ADAPTER "ExcelAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyEntry name="FileSourceType">File System</PropertyEntry>
  <PropertyGroup name="File System" displayName="File System">
    <PropertyEntry name="folder" displayName="Folder">myfolder</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="Table" displayName="Table">
    <PropertyEntry name="firstRowAsHeader" displayName="First Row as
Header">true</PropertyEntry>
    <PropertyEntry name="rowMin" displayName="rowMin">2</PropertyEntry>
    <PropertyEntry name="showHiddenColRow" displayName="Show Hidden Column
and Rows">false</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="usertoken">
<password>mytoken</password>
</CredentialEntry>';
```

## SharePoint location

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyExcelSource" ADAPTER "ExcelAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyEntry name="FileSourceType" type="STRING">SharePoint</PropertyEntry>
<PropertyGroup name="SharePoint">
    <PropertyEntry isRequired="false" name="ServerUrl" type="STRING">http://
myhost.sap.corp/mysharepointsite</PropertyEntry>
    <PropertyEntry isRequired="false" name="LocalFolder"
type="STRING">mySubFolder</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="Table" displayName="Table">
    <PropertyEntry name="firstRowAsHeader" displayName="First Row as
Header">true</PropertyEntry>
    <PropertyEntry name="rowMin" displayName="rowMin">2</PropertyEntry>
    <PropertyEntry name="showHiddenColRow" displayName="Show Hidden Column
and Rows">false</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="usertoken">
<password>mytoken</password>
</CredentialEntry>
<CredentialEntry name="sharePointCredential">
<user>mydomain\mysharepointuser</user>
<password>mypassword</password>
</CredentialEntry>';
```

### Example: Microsoft SharePoint on Office365

```
CREATE REMOTE SOURCE "MyExcelSource" ADAPTER "ExcelAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
    <PropertyEntry isRequired="false" name="FileSourceType"
type="STRING">SharePointOnOffice365</PropertyEntry>
<PropertyGroup name="SharePointOnOffice365">
    <PropertyEntry name="AuthenticationMode">ClientCredential</PropertyEntry>
    <PropertyEntry name="SiteUrl">https://mycompany.sharepoint.com/sites/
mysharepointsite</PropertyEntry>
    <PropertyEntry name="ApplicationId">myApplicationID</PropertyEntry>
    <PropertyEntry name="TenantId">myTenantId</PropertyEntry>
    <PropertyEntry name="LocalFolder">mySubFolder</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="Table" displayName="Table">
    <PropertyEntry name="firstRowAsHeader" displayName="First Row as
Header">true</PropertyEntry>
    <PropertyEntry name="rowMin" displayName="rowMin">2</PropertyEntry>
    <PropertyEntry name="rowMax" displayName="rowMax"></PropertyEntry>
```

```

    <PropertyEntry name="showHiddenColRow">false</PropertyEntry>
    <PropertyEntry name="columnVisibility"></PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
  ' WITH CREDENTIAL TYPE 'PASSWORD' USING
  '<CredentialEntry name="usertoken"><password>mytoken</password>
</CredentialEntry>
<CredentialEntry name="sharePoint365Credential">
<password>myClientSecret</password>
</CredentialEntry>';

```

## Related Information

[Accessing Microsoft Excel Data Files in a Shared Network Directory \[page 296\]](#)

## 6.14.4 Access SharePoint Using HTTPS/SSL

Information about how to access SharePoint using HTTPS/SSL.

### Context

You can access the SharePoint server using HTTPS or SSL. You first must download the SharePoint certificate (CER) and configure your system.

### Procedure

1. Navigate to `<DPAgent_root>/ssl` folder.
2. Run the command to change the default keystore password `changeit`.

```

c:\<user>\dpagent\ssl>keytool -storepasswd -keystore cacerts
Enter keystore password:changeit
New keystore password:
Re-enter new keystore password:

```

#### Note

Keytool is in the `jre/bin` folder. Add it to the `$PATH` environment. For example, `C:\Program Files\Java\jre7\bin\keytool.exe`

3. Import the certificate that you exported.

```

c:\<user>\dpagent\ssl>keytool.exe -importcert -keystore c:\user\dpagent\ssl
\cacerts
-storepass <New Key Store Password> -file C:\<user>\dpagent\ssl
\SharePointSSL.cer

```

```

Owner: CN=RQA16CWIN2.sjc.sap.corp
Issuer: CN=RQA16CWIN2.sjc.sap.corp
Serial number: 34973632d6cb31934fdfbe04352cc5dc
Valid from: Thu Jan 05 01:29:45 PST 2017 until: Thu Jan 04 16:00:00 PST 2018
Certificate fingerprints:
    MD5: 0C:7E:CA:38:1B:1E:2A:2A:47:21:78:86:50:1C:85:CE
    SHA1: 25:CE:CF:F8:9A:2C:70:0A:66:CD:39:D5:C5:EC:10:4D:57:42:28:0B
    SHA256: 40:80:A0:E1:56:1A:9A:F4:9F:63:20:37:F3:41:B0:27:B6:1F:9C:
33:3C:
0A:E8:79:0B:91:7E:E6:6B:E8:08:3A
    Signature algorithm name: SHA1withRSA
    Version: 3
Extensions:
#1: ObjectId: 2.5.29.37 Criticality=false
ExtendedKeyUsages [
    serverAuth
]
#2: ObjectId: 2.5.29.15 Criticality=false
KeyUsage [
    Key_Encipherment
    Data_Encipherment
]
Trust this certificate? [no]: yes
Certificate was added to keystore

```

4. Open the dpagentconfig tool in `<DPAgent>_root/configTool/dpagentconfigtool.exe`. Click [Configure SSL](#) and input the keystore file path and password that you used in the previous step.
5. If you are not using the TCP SSL connection between SAP HANA and the DP Agent, clear the [Use SSL to communicate with HANA on Cloud](#) and [Enable SSL for Agent to HANA communication on TCP](#) parameters.
6. Open `<DPAgent_root>/dpagent.ini`, and add the following configuration:

```
-Djavax.net.ssl.trustStore=<keystore file path>
```

For example: `-Djavax.net.ssl.trustStore=C:\<user>\dpagent\ssl\cacerts`

7. Restart the DP Agent.

## 6.14.5 Accessing Microsoft Excel Data Files in a Shared Network Directory

Information about how to use a shared network directory for data files with the Microsoft Excel adapter.

You can access Microsoft Excel data files in a shared directory, however you must follow a few rules:

### Windows

When using Windows, make sure that you first manually access the network folder using a user name and password before trying to connect via creating a remote source.

## Linux

To access a Linux network folder, mount the folder under the Data Provisioning Agent root installation directory.

## Excel Adapter Remote Source Parameters

Observe the instructions for the [Folder](#) parameter when creating your Microsoft Excel remote source.

## Related Information

[Microsoft Excel Remote Source Configuration \[page 289\]](#)

## 6.14.6 Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365

You must register an application on Microsoft Azure Portal as a precondition for using the Microsoft Graph API, which is what allows you to access SharePoint on Office365 using the File or Microsoft Excel adapters.

## Procedure

1. Go to <https://portal.azure.com> and sign in with your Microsoft account.
2. Navigate to [Azure Active Directory](#), and click [App registrations](#).
3. Click [New registration](#).
4. Choose a name for your Data Provisioning Agent--for example, sdi-dpagent--to use as the name for your application.
5. Choose the proper [Supported account types](#): either [Account in this organizational directory only](#) or [Accounts in any organizational directory](#).
6. Leave [Redirect URL](#) empty, and click [Register](#).

## Next Steps

After registration, note the application (client) ID and Directory (tenant) ID, which you use during remote source configuration.

## Related Information

[File Adapter Remote Source Configuration \[page 190\]](#)

[Configure Your Microsoft Azure Application \[page 221\]](#)

## 6.14.7 Configure Your Microsoft Azure Application

Configure your Azure application to set up your credentials and Microsoft Graph API.

### Context

Further configuration of your Azure application is necessary to create credentials for when you create a remote source. You must also grant permissions for using the Microsoft Graph API.

### Procedure

1. Click [Authentication](#) to configure the client type.

If you want to authenticate using the username and password mode, set the [Default client type](#) to [Yes](#).

If you want to authenticate the Client Credential mode, set the [Default client type](#) to [No](#).

- a. If you chose to authenticate using Client Credential mode, create a credential by clicking [Certificates & secrets](#). If you chose to authenticate using the username and password mode, skip to step 2.
  - b. Click [New client secret](#), give it a name and an expiration time, and click [Add](#).
  - c. Note the secret password for use during remote source creation.
2. Add permissions by clicking [API permissions](#) on the application page, and then clicking [Add a permission](#).
  3. Click [Microsoft Graph](#).
  4. If you use the Client Credential mode, click [Application Permission](#). If you use the Username and password mode, click [Delegated permission](#).
  5. Add the following permissions:
    - Directory.Read.All
    - Files.Read.All
    - Group.Read.All
    - Sites.Read.All
    - User.Read.All
  6. Grant consent for these permissions.

If you have an administrator role, click [Grant consent](#).

If you do not have an administrator role, ask your administrator to grant permission for you.



### **i Note**

If permissions are not granted, you will not be able to access SharePoint Office365.

Every time a permission is changed, you should redo the grant operations.

## **Next Steps**

You can now create your remote source, using the information created while setting up your Microsoft Azure Portal application.

## **Related Information**

[File Adapter Remote Source Configuration \[page 190\]](#)

[Register an Application on Microsoft Azure Portal to Enable Access to SharePoint on Microsoft Office365 \[page 220\]](#)

## **6.15 Microsoft Outlook**

Access Microsoft Outlook data by using the Outlook adapter.

You can access Microsoft Outlook data stored in a PST file using the Outlook adapter.

This adapter supports the following functionality:

- Virtual table as a source

## **Related Information**

[Microsoft Outlook Adapter Preferences \[page 299\]](#)

[Microsoft Outlook Remote Source Configuration \[page 300\]](#)

### **6.15.1 Microsoft Outlook Adapter Preferences**

Configuration parameters for the Microsoft Outlook adapter.

You can adjust Microsoft Outlook adapter settings in the Data Provisioning Agent Configuration Tool by running `<DPAgent_root>/configTool/dpagentconfigtool.exe`.

Parameter	Description
Access Token	A password to access Microsoft Outlook PST files. This exact value must be used when setting up a Microsoft Outlook remote source.

## 6.15.2 Microsoft Outlook Remote Source Configuration

Configuration settings for accessing a Microsoft Outlook source. Also included is sample code for creating a remote source using the SQL console.

Configure the following options in smart data access to configure your connection to a Microsoft Outlook PST file.

Option	Description
PST File Location	Specifies the path and file name to the PST file from which the adapter will read. The user of the Data Provisioning Agent must have permission to access this PST file.
Ignore Extra Folder	Select <i>True</i> to not show any irrelevant folders when browsing metadata.
Credentials Mode	Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials. <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
PST File Access Token	Specifies the access token. This value must be the same as the Access Token value in the Outlook adapter preferences set in the Data Provisioning agent configuration tool.

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyOutlookSource" ADAPTER "OutlookAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations" displayName="Configurations">
<PropertyGroup name="PSTFileInformation" displayName="PST File Information">
<PropertyEntry name="PSTLocation" displayName="PST File Location"
>mymail.pst</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="PstAccessToken">
<password>mytoken</password>
```

```
</CredentialEntry>';
```

## 6.16 Microsoft SQL Server Log Reader

Use the Microsoft SQL Server Log Reader adapter to batch load to SAP HANA or to replicate changed data in real time from a database to SAP HANA.

### i Note

Before registering the adapter with the SAP HANA system, ensure you have downloaded and installed the correct JDBC libraries. See the *SAP HANA smart data integration Product Availability Matrix (PAM)* for details. Place the files in the `<DPAgent_root>/lib` folder.

### i Note

The user configured during the installation of the Data Provisioning Agent must have read access to the transaction log, which is the `.ldf` file.

### i Note

If you are using Microsoft SQL Server on Amazon RDS or Microsoft Azure, observe the following limitations:

- To avoid remote access issues in Amazon RDS, ensure the database instance setting [Publicly Accessible](#) has been enabled.
- Real-time replication is not supported.

## Adapter Functionality

This adapter supports the following functionality:

Feature	SQL Server (on premise)
Virtual table as a source	Yes

Feature	SQL Server (on premise)
Realtime change data capture (CDC)	<p>Yes. Both log reader and trigger-based realtime replication are supported</p> <div> <p><b>i Note</b></p> <ul style="list-style-type: none"> <li>Log Reader adapters do not support the truncate table operation.</li> <li>The Microsoft SQL Server Log Reader adapter does not support WRITETEXT and UPDATETEXT.</li> <li>For CDC replication, data imported into Microsoft SQL Server using the bcp tool is not supported because the tool bypasses writing to the Microsoft SQL Server transaction logs.</li> </ul> </div>
Virtual table as a target using a Data Sink node in a flow-graph	Yes
Connect multiple remote sources in HANA to the same source database	Yes
Loading options for target tables	Yes
DDL propagation	<p>Yes</p> <p>The supported schema changes are:</p> <ul style="list-style-type: none"> <li>ADD COLUMN</li> <li>DROP COLUMN</li> <li>RENAME TABLE</li> <li>RENAME COLUMN</li> <li>ALTER COLUMN DATATYPE</li> </ul> <div> <p><b>i Note</b></p> <p>For trigger-based CDC, the supported schema changes are:</p> <ul style="list-style-type: none"> <li>ADD COLUMN</li> <li>DROP COLUMN</li> <li>ALTER COLUMN DATA TYPE</li> </ul> </div>
Replication monitoring and statistics	Yes
Search for tables	Yes
Virtual procedures	Yes

In addition, this adapter supports the following capabilities:

- Global: SELECT, INSERT, UPDATE, DELETE

- [Select: WHERE, JOIN, GROUP BY, DISTINCT, TOP or LIMIT, ORDER BY](#)

## Related Information

[Microsoft SQL Server Real-time Replication \[page 303\]](#)

[MssqlLogReaderAdapter Preferences \[page 322\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Using a Schema Alias \[page 337\]](#)

[Log Reader Adapter Log Files \[page 338\]](#)

[Configure SSL for the Microsoft SQL Server Log Reader Adapter \[page 338\]](#)

[Configuring Windows Authentication \[page 340\]](#)

[Creating a Whitelist to Limit Access to a Source Database \[page 341\]](#)

[Disable Adapter Write-back Functionality \[page 342\]](#)

[Configure Microsoft Windows Authentication \[page 343\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



[Amazon Virtual Private Cloud \(VPCs\) and Amazon RDS](#)

## 6.16.1 Microsoft SQL Server Real-time Replication

Information about setting up your source system and adapter for real-time replication.

### Note

Real-time replication is not supported with Microsoft SQL Server on Amazon RDS or Microsoft Azure.

## Related Information

[Remote Database Setup for Microsoft SQL Server Real-time Replication \[page 304\]](#)

[Installing Data Provisioning Agent and Microsoft SQL Server on Different Servers \[page 314\]](#)

[Connecting Multiple Remote Sources to the Same SQL Server Source Database \[page 316\]](#)

[Remote Database Cleanup for Microsoft SQL Server Real-time Replication \[page 316\]](#)

[Validate the Microsoft SQL Server Log Reader Environment \[page 317\]](#)

[Generate a Log Reader Remote Source Creation Script \[page 318\]](#)

[Microsoft SQL Server Trigger-Based Replication \[page 319\]](#)

## 6.16.1.1 Remote Database Setup for Microsoft SQL Server Real-time Replication

The remote database must be set up properly for Log Reader adapters to function correctly when using real-time replication.

This setup process is necessary only when using real-time replication.

### Real-time Replication Limitations

The following limitations exist when performing real-time replication:

- Unsupported table types:
  - Table with all LOB columns
  - Table with non-persisted computed columns as part of primary keys.

#### i Note

If the non-persisted computed columns are not part of primary keys, values for these columns will be propagated to the target table during initial load. However, because changes in values for these columns are not recorded in transaction logs, the changed values for these columns cannot be replicated during realtime (CDC), and they will be set to NULL for the changed rows.

- Table with LOB column and no primary key or unique index
- Table with duplicated rows and no primary key
- Table with user-defined identifier
- Nested table
- Table with REF constraint
- Table with a clustered column store index
- WRITETEXT and UPDATETEXT
- Update LOB data types using a LIKE statement
- Big size TEXT data using BCP

#### i Note

The Microsoft SQL Server Log Reader relies on database logs to perform data movement. Logs must be available until the data is successfully read and replicated to the target SAP HANA database. To ensure that the data is replicated to SAP HANA, configure Microsoft SQL Server in Full Recovery Mode.

#### ! Restriction

Microsoft SQL Server with Transparent Data Encryption (TDE) is not supported.

Real-time replication for Microsoft SQL Server relies on the ability of the adapter to read transactions from physical log files. Because these files are encrypted by Microsoft SQL Server, the adapter cannot read the transactions, so consequently real-time capability is not available.

## Related Information

[Create Users and Grant Privileges \[page 305\]](#)

[Enable Remote Dedicated Administrator Connection \(DAC\) \[page 305\]](#)

[Enable TCP/IP \[page 307\]](#)

[Configure the Primary Data Server for the First Time \[page 308\]](#)

[Run a Microsoft SQL Server Log Reader Adapter on Linux \[page 309\]](#)

[Configure a Microsoft SQL Server Log Reader Adapter with Always On Support \[page 311\]](#)

[Configure a Microsoft SQL Server Log Reader Adapter with Failover Cluster Support \[page 313\]](#)

### 6.16.1.1.1 Create Users and Grant Privileges

Follow these steps to create users and grant privileges.

#### Procedure

1. Create a Microsoft SQL Server user, for example DP\_USER, for the remote source.
2. Grant the required privileges as follows:

```
use master
go
create login DP_USER with password = 'MyPW'
go
use <primary database>
go
create user DP_USER for login DP_USER
go
EXEC sp_addsrvrolemember 'DP_USER', 'sysadmin'
go
```

### 6.16.1.1.2 Enable Remote Dedicated Administrator Connection (DAC)

Follow these steps to enable DAC to allow remote connections.

#### Procedure

1. Log on to Microsoft SQL Server using the newly created user, and change the Microsoft SQL Server remote admin connections configuration option to enable DAC to allow remote connections:

```
sp_configure 'remote admin connections', 1
```

```
go
```

2. Update the remote administrator connection setting:

```
reconfigure  
go
```

3. Verify the remote admin connections string:

```
sp_configure 'remote admin connections'  
go
```

## Related Information

[Make Log Files Readable \[page 306\]](#)

### 6.16.1.1.2.1 Make Log Files Readable

Install and set up the sybfilter driver so that the Log Reader can read the primary transaction log files.

## Prerequisites

On Windows Server 2008 R2, Windows Security Update KB3033929 must already be installed on the host system.

## Procedure

1. In Windows Explorer, navigate to the sybfilter driver installation directory. This directory is located at `<DPAgent_root>\LogReader\sybfilter\system\<platform>`, where `<DPAgent_root>` is the root directory or Data Provisioning Agent installation and `<platform>` is either `winx86` or `winx64`.
  - `winx86` is for 32-bit Windows Server 2008, Windows Server 2008 R2, and Windows 7
  - `winx64` is for 64-bit Windows Server 2008, Windows Server 2008 R2, and Windows 7
2. Right-click `sybfilter.inf`, and click *Install* to install the sybfilter driver.
3. Under any directory, create a configuration file to save all log file paths for primary databases. The configuration file must have a `.cfg` suffix. For example, under `<DPAgent_root>\LogReader\sybfilter\system\<platform>`, create a file named `LogPath.cfg`.
4. Add a system environment variable named `<RACFGFilePath>`, then set its value to the path and file name of the configuration file.



5. In Windows Explorer, navigate to `<DPAgent_root>\LogReader\sybfilter\bin\`, right-click the `sybfiltermgr.exe` file, then select *Run as administrator* to access the sybfilter driver management console.
  6. To start the sybfilter driver, enter **start** at the management console.
  7. Add the log file path to the sybfilter driver with the user manager or by modifying the configuration file directly:
    - User manager: Use the `add` command in the management console. The syntax for this command is `add serverName dbName logFilePath`. For example, to add the log file named `pdb1_log.ldf` for the database `pdb1` on the data server `PVGD50857069A\MSSQLSERVER`, use the following: `add PVGD50857069A\MSSQLSERVER pdb1 C:\Mssql2012\MSSQL11.MSSQLSERVER\MSSQL\DATA\pdb1_log.ldf`
    - Add the following into the `LogPath.cfg` file directly:
- ```
[PVGD50857069A\MSSQLSERVER, pdb1]
```
- ```
log_file_path=C:\Mssql2012\MSSQL11.MSSQLSERVER\MSSQL\DATA\pdb1_log.ldf
```
8. Refresh the configuration with the newly-added path.  
In the sybfilter management console, enter **refresh** and press Enter.
  9. If Microsoft SQL Server was running while the log paths were added, restart it to make the log files readable.
  10. Verify whether the log files are readable.  
In the sybfilter management console, enter **check** and press Enter.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

### 6.16.1.1.3 Enable TCP/IP

Follow these steps to enable TCP/IP for the Microsoft SQL Server adapter.

## Procedure

1. Go to *SQL Server Configuration Tool*, and choose **SQL Server Configuration Manager** **SQL Server Network Configuration** **Protocols for <SQLInstanceName>**, where `<SQLInstanceName>` is your Microsoft SQL Server instance.
2. Right-click *TCP/IP*, and choose *Enable*.

## 6.16.1.1.4 Configure the Primary Data Server for the First Time

Configure the primary data server.

### Context

Before you can begin using the SQL Server Log Reader adapter, you must configure the primary data server.

#### i Note

If the *Database Data Capture Mode* parameter is set to *MSSQL CDC Mode* when you create a remote source, this step is not necessary.

#### i Note

If you are using Microsoft SQL Server installed on Windows 2012 and later, you must restart Microsoft SQL Server in single-user mode from the command line opened with the *Run as Administrator* parameter enabled.

### Procedure

1. Stop the Microsoft SQL Server service.
  - a. In **Control Panel** > **Administrative Tools** > **Services**, find the service named *MicrosoftSQLServer (<SERVER>)*, where *<SERVER>* is the name of your Microsoft SQL Server data server. For example, *Microsoft SQL Server (TEAMSTER)*.
  - b. Right-click your Microsoft SQL Server instance and choose *Properties*.
  - c. In the *General* tab, click *Stop*.

#### → Tip

You can also stop Microsoft SQL Server in single-user mode from the command line using Administrator privileges.

For example, if you started the instance using a command prompt, enter **Ctrl+C** in the window and enter **y** to stop it.

2. Restart Microsoft SQL Server in single-user mode.
  - a. Click **Start** > **Control Panel** > **Administrative Tools** > **Services**.
  - b. Right-click your Microsoft SQL Server instance, and choose *Properties*.
  - c. In the *General* tab, click *Stop*.
  - d. Under *Start parameters*, enter **-m**.
  - e. Switch to the *Log On* tab, make note of the account, then change to a user who has Administrator privileges.

- f. Click [Start](#).

#### → Tip

Restart Microsoft SQL Server in single-user mode from the command line using Administrator privileges.

For example, Run `> C:\Program Files\Microsoft SQL Server\MSSQL12.MSSQLSERVER\MSSQL\Binn>> .\sqlservr.exe -sMSSQLSERVER -m`

3. Connect to Microsoft SQL Server using dedicated administrator connection (DAC).
  - a. In Microsoft SQL Server Management Studio, with no other DACs open, click [Database Engine Query](#) on the toolbar.
  - b. In the [Connect to Database Engine](#) dialog box, in the [Server](#) name box, type **ADMIN:**, followed by the name of the server instance. For example, to connect to a server instance named ACCT\PAYABLE, type **ADMIN:ACCT\PAYABLE**.
  - c. Complete the [Authentication](#) section, providing credentials for a member of the sysadmin group, and then click [Connect](#).

The connection is made. If the DAC is already in use, the connection fails with an error indicating it cannot connect.

4. To initialize the server, execute script `<DPAgent_root>\LogReader\scripts\mssql_server_init.sql`. Script `<DPAgent_root>\LogReader\scripts\mssql_server_deinit.sql` can be used to de-initialize the server if necessary.
5. Open the Microsoft SQL Server service properties window: by clicking **Start** **Control Panel** **Administrative Tools** **Services**, then right-click your Microsoft SQL Server instance, and choose [Properties](#). Then, recover the user account to the previous value in the [Log On](#) tab.
6. Stop and restart the Microsoft SQL Server service back to normal mode.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

### 6.16.1.1.5 Run a Microsoft SQL Server Log Reader Adapter on Linux

Learn how to set up your environment to run your Microsoft SQL Server database on one computer and run the Data Provisioning Agent on a separate Linux computer.

## Context

The following is an example of how to set up an environment with a SQL Server database named “mypdb” installed on Windows computer A and a Data Provisioning Agent installed on Linux computer B.

## Procedure

1. Install the Data Provisioning Agent on computer B (Linux).
2. Configure Sybfilter on computer A (Windows computer where the Microsoft SQL Server database is installed). You can copy Sybfilter from the Data Provisioning Agent installation directory on computer B. For example, `<DPAgent_root>/LogReader/Sybfilter`.
3. Run the following SQL query to get the exact location of the log files:

```
SELECT physical_name FROM sys.database_files WHERE type=1;
```

For example, you might get a return of the following paths:

- C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA\mypdb\_log.ldf
- C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA\mypdb\_log\_2.ldf
- C:\MSSQL\_LOG\mypdb\mypdb\_log\_3.ldf

4. Share the SQL Server transaction log directory and mount to the Linux computer.

For example, in step 2, the Microsoft SQL log files are stored in two directories:

- C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA
- C:\MSSQL\_LOG\mypdb

Share the two directories on computer A, and then mount the two directories on computer B.

- a. Create a directory on computer B where you want to mount the MSSQL log file folder. For example, create directories on computer B named `/MSSQL_share_folder1` and `/MSSQL_share_folder2`.
- b. On computer B execute the following command:

For SLES SP 11:

```
sudo mount -v -t cifs -o  
username=<computer_A_login_name>,password=<computer_A_login_password>,domain=  
<computer_A_login_name_domain>,ro,cache=none,directio  
<computer_A_share_directory> <computer_B_mounted_directory>
```

For SLES SP 12 and above:

```
sudo mount -v -t cifs -o  
username=<computer_A_login_name>,password=<computer_A_login_password>,domain=  
<computer_A_login_name_domain>,ro,cache=none <computer_A_share_directory>  
><computer_B_mounted_directory>
```

- c. Assuming that the username/password for computer A is ABC/123456, the logon domain is localhost, and the share name of the MSSQL log file folder on computer A is `//10.172.162.145/DATA` and `//10.172.162.145/mypdb`, you can execute the following command to mount the MSSQL log file folder on computer B:

```
sudo mount -v -t cifs -o  
username=ABC,password=123456,domain=localhost,ro,cache=none //  
10.172.162.145/DATA /MSSQL_share_folder1
```

and

```
sudo mount -v -t cifs -o  
username=ABC,password=123456,domain=localhost,ro,cache=none //  
10.172.162.145/mypdb /MSSQL_share_folder2
```

5. Configure the `mssql_log_path_mapping.props` file on computer B.

Open the file `<DPAgent_root/Logreader/config/mssql_log_path_mapping.props>` and add the following information into the `mssql_log_path_mapping.props` file, assuming the database name you use is R01: [R01] C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA=/MSSQL\_share\_folder1 C:\MSSQL\_LOG\mypdb=/MSSQL\_share\_folder2.

6. Open SAP HANA Web IDE and log in.
7. Create a Microsoft SQL Server remote source, and open the remote source configuration page. In the remote source configuration page, expand the *Configurations* category and expand the *Database* option.
8. Make sure that the *Use Remote Database* option is set to *True*.

## Related Information

[Install the Data Provisioning Agent \[page 42\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

### 6.16.1.1.6 Configure a Microsoft SQL Server Log Reader Adapter with Always On Support

More steps are necessary when configuring a Microsoft SQL Server Log Reader Adapter to connect to a Microsoft SQL Server host that uses Always On Availability Groups.

## Prerequisites

Before you can configure the log reader adapter with Always On support, Microsoft SQL Server must be configured with an Availability Group Listener. For more information, see the Microsoft SQL Server documentation.

## Context

The following is an example that shows you how to set up an environment with a Microsoft SQL Server database named "mypdb". The database is also configured with an Always On Availability Group with a secondary database, in addition to the primary database.

## Procedure

1. Install and configure Sybfilter on each host in the Microsoft SQL Server Always On Availability Group, including the primary and secondary databases.

You can copy Sybfilter from the agent installation directory on the Data Provisioning Agent host. For example, `C:\usr\sap\dataprovagent\LogReader\sybfilter`.

2. Run a SQL query to get the exact location of the log files.

```
SELECT physical_name FROM sys.database_files WHERE type=1;
```

For example, you might get a return of the following path:

```
C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA  
\mypdb_log.ldf
```

3. Share the folders that contain “mypdb” database log files on each host computer in the Always On Availability Group.

### i Note

Grant READ permissions for the shared folders to the DPAGENT user on each host in the Always On Availability Group. If you haven't done so already, make sure that your log files are readable by following the instructions in [Make Log Files Readable \[page 306\]](#).

For example, share the folder `C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA`.

4. Edit and include the mapping relationship into the `mssql_log_path_mapping.props` file as shown in the following example. Also, provide the database name as shown in the following example.
  - Because the mapping is based on a parent directory and not on the log file itself, only one entry is sufficient for both `mypdb_log.ldf` and `mypdb_log_2.ldf`.
  - Put the original path on the left side of the equal sign and the UNC pathname of each share folder on the right side, separated by semicolons.

For example, suppose that you are connecting to the database “mypdb”, with the primary database on computer A and one secondary database on computer B.

```
[myrs:mypdb]  
C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA=  
\<host_name_A>\mssql_data;\<host_name_B>\mssql_data
```

5. When you create the remote source, set the value of the *SQL Server Always On* parameter to *True* and specify the *Availability Group Listener Host* and *Availability Group Listener Port*.

### → Tip

We recommend that you also set *Database Data Capture Mode* to *MS SQL CDC Mode*. If you do not use the Microsoft CDC data capture mode, you need to execute server-level initialization scripts on each host in the Always On Availability Group.

## 6.16.1.1.7 Configure a Microsoft SQL Server Log Reader Adapter with Failover Cluster Support

More steps are necessary when configuring a Microsoft SQL Server Log Reader Adapter to connect to a Microsoft SQL Server host that is part of a failover cluster.

### Context

The following procedure is an example, which shows you how to set up an environment with a Microsoft SQL Server database named “mypdb” that is configured as part of a failover cluster.

### Procedure

1. Install and configure Sybfilter on each host in the failover cluster, including the primary and secondary databases.

You can copy Sybfilter from the agent installation directory on the Data Provisioning Agent host. For example, `C:\usr\sap\dataprovagent\LogReader\sybfilter`.

2. Run a SQL query to get the exact location of the log files.

```
SELECT physical_name FROM sys.database_files WHERE type=1;
```

For example, you might get a return of the following path:

```
C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA  
\mypdb_log.ldf
```

3. Share the folders that contain mypbd database log files on the active node of the failover cluster.

#### i Note

Grant READ permissions for the shared folder to the DPAGENT user. If you haven't done so already, make sure that your log files are readable by following the instructions in [Make Log Files Readable \[page 306\]](#).

For example, share the folder `C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA`.

4. Edit and include the mapping relationship into the `mssql_log_path_mapping.props` file as shown in the following example. Also, provide the database name as shown in the following example.
  - Because the mapping is based on a parent directory and not on the log file itself, only one entry is sufficient for both `\mypdb_log.ldf` and `\mypdb_log_2.ldf`.
  - Put the original path on the left side of the equal sign and the UNC pathname of the share folder on the right side.

```
[myrs:mypdb]  
C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA=  
\<host_name>\mssql_data
```

5. When you create the remote source, set the value of the *Use Remote Database* parameter to *True*.

## Results

By default, during a failover event, the agent tries to reopen an inaccessible log file three times at intervals of 5 seconds. If the agent is unable to open the log file after these attempts, the task fails.

You can modify the number of attempts and the retry interval by changing the `lr_reopen_device_times` and `lr_reopen_device_interval` parameters in `<DPAgent_root>\LogReader\config\mssql.cfg`.

### 6.16.1.2 Installing Data Provisioning Agent and Microsoft SQL Server on Different Servers

More steps are necessary when installing the Data Provisioning Agent and Microsoft SQL server on different computers.

## Context

The following example shows you how to set up an environment with a Microsoft SQL Server database named “mypdb” on computer A and a Data Provisioning Agent installed on another computer B.

## Procedure

1. Install and configure Sybfilter on computer A (`<host_name>`).

Sybfilter can be copied from the Data Provisioning Agent installation directory on computer B. For example, `C:\usr\sap\dataprovagent\LogReader\sybfilter`.

2. Run a SQL query to get the exact location of the log files.

```
SELECT physical_name FROM sys.database_files WHERE type=1;
```

For example, you might get a return of the following paths:

- `C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA\mypdb_log.ldf`
- `C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA\mypdb_log_2.ldf`
- `C:\MSSQL_LOG\mypdb\mypdb_log_3.ldf`

3. Share the folders that contain mypbd database log files on computer A.



## i Note

Grant READ permissions for the shared folders to the DPAGENT user on computer B. If you haven't done so already, make sure that your log files are readable by following the instructions in [Make Log Files Readable \[page 306\]](#).

For example, share the folders:

- C:\MSSQL\_LOG\mypdb
- C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA

4. Edit and include the mapping relationship into the `mssql_log_path_mapping.props` file as shown in the following example. Also, provide the database name, as shown in the following example.

- Because the mapping is based on a parent directory and not on the log file itself, only one entry is sufficient for both `mypdb_log.ldf` and `mypdb_log_2.ldf`
- Put the original path on the left side of the equal symbol and the UNC path name of the share folder on the right side.
- C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA=\<host\_name>\mssql\_data
- C:\MSSQL\_LOG\mypdb=\\<host\_name>\mssql\_log\mypdb
- You can also include multiple databases in the same file.

5. If you are using remote databases, you should edit the `mssql_log_path_mapping.props` file to differentiate database names and instances.

For example, suppose that you have the following scenario:

- User1 creates remote source RS1 connecting to DB1
- User2 creates remote source RS2 connecting to DB2

In this case, you would add the following to the `mssql_log_path_mapping.props` file:

If DB1 and DB2 have different names:

```
[DB1]
D:\Program Files\Microsoft SQL Server\MSSQL10_50.MSSQLSERVER\MSSQL\DATA=\
\computer1\mssql_data
[DB2]
D:\Program Files\Microsoft SQL Server\MSSQL10_50.MSSQLSERVER\MSSQL\DATA=\
\computer2\mssql_data
```

If DB1 and DB2 have the same name, add a remote source name to differentiate:

```
[RS1:DB1]
D:\Program Files\Microsoft SQL Server\MSSQL10_50.MSSQLSERVER\MSSQL\DATA=\
\computer1\mssql_data
[RS2:DB1]
D:\Program Files\Microsoft SQL Server\MSSQL10_50.MSSQLSERVER\MSSQL\DATA=\
\computer2\mssql_data
```

6. When you create the remote source, set the value of the *Use Remote Database* parameter to *True*.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

### 6.16.1.3 Connecting Multiple Remote Sources to the Same SQL Server Source Database

You can connect multiple remote sources to the same remote database, providing that you meet the following conditions:

- Each remote source uses a unique schema, specified in the *LogReader Objects Schema in Remote Database* remote source configuration parameter.
- Each remote source uses a unique name, in case the remote sources are created on different SAP HANA instances.

### 6.16.1.4 Remote Database Cleanup for Microsoft SQL Server Real-time Replication

Run SQL scripts to disable replication and clean up objects manually from the Microsoft SQL Server source database.

Cleanup scripts disable replication of a source database and drop database-level objects. Usually, you do not need to execute a cleanup script after an adapter is dropped, because replication is disabled and the adapter automatically drops database-level objects. However, in some cases, if any errors occur during or before automatically disabling replication and dropping these objects, the replication may still be enabled and objects may not be dropped. At that point, you may need to execute the cleanup script to drop the objects.

You can find the Microsoft SQL Server cleanup script files at `<DPAgent_root>\LogReader\scripts`.

The script to be executed depends on which *Database Data Capture Mode* you select in your remote source configuration. If you select *MSSQL CDC Mode*, execute `mssql_logreader_mscdc_cleanup.sql`. If you select *Native Mode*, execute `mssql_logreader_native_cleanup.sql`.

You can find Trigger-based cleanup scripts at `<DPAgent_root>\Trigger`.

## 6.16.1.5 Validate the Microsoft SQL Server Log Reader Environment

You can use the Data Provisioning Agent command-line configuration tool to validate the configuration of the Microsoft SQL Server log reader environment, before creating remote sources that use the SQL Server Log Reader adapter.

### Prerequisites

Before validating the log reader environment, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA Smart Data Integration Product Availability Matrix (PAM)*.

Before performing these steps, place your files in `<DPAgent_root>/lib` and manually create the `/lib` folder.

### Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`
3. Choose [Microsoft SQL Server Replication Setup](#).
4. Choose [Config Mssql Connection Info](#) to configure the connection used for other validation tasks.

Specify the information required for the configuration tool to connect to the database:

- The data server, port number, and database name for the Microsoft SQL Server database
- Whether to use SSL
- The username and password to use to connect to the database

The configuration tool connects to the database with the specified parameters when performing other validation tasks.

5. Perform validation tasks for the Microsoft SQL Server log reader environment.
  - To test whether the Microsoft SQL Server environment is ready for replication, choose [Mssql Replication Precheck](#).
  - To create a new Microsoft SQL Server user with the permissions required for replication, choose [Create A Mssql User With All Permissions Granted](#).

For each task, provide any additional parameters required by the task. For example, to test whether the Microsoft SQL Server environment is ready for replication, you must specify the name of the Microsoft SQL Server user and whether CDC is being used.

## Next Steps

After you have validated the configuration of the Microsoft SQL Server log reader environment, you can create remote sources with the Microsoft SQL Server Log Reader adapter. You can manually create remote sources or generate a creation script with the command-line configuration tool.

## Related Information

[Generate a Log Reader Remote Source Creation Script \[page 318\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

### 6.16.1.6 Generate a Log Reader Remote Source Creation Script

Use the Data Provisioning Agent command-line configuration tool to validate parameters and generate a usable script to create a remote source for log reader adapters.

## Prerequisites

Before generating a remote source creation script for your source, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

Before performing these steps, place your files in `<DPAgent_root>/lib`. Note that you must manually create the `/lib` folder.

## Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`
3. Choose the appropriate replication setup option for your remote source type.
4. Choose the appropriate log reader setup option for your remote source type.
5. Provide the configuration details for your remote source as prompted.

Specify the name of the agent to use and the name of the remote source to create, as well as any connection and configuration information specific to your remote source.

For more information each configuration parameter, refer to the remote source configuration section for your source type.

## Results

The configuration tool validates the configuration details for your remote source and generates a script that can be used to create the remote source. You can view the validation results in the Data Provisioning Agent log.

By default, the configuration tool generates the remote source creation script in the user temporary directory. For example, on Windows: `C:\Users\<username>\AppData\Local\Temp\remoteSource-<remote_source_name>.txt`.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

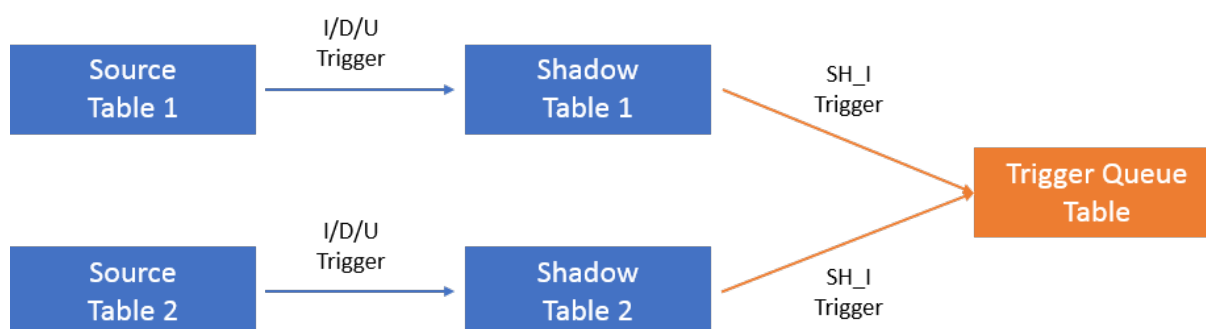
[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

### 6.16.1.7 Microsoft SQL Server Trigger-Based Replication

Unlike like log reader functionality, which reads a remote database log to get changed data, trigger-based replication is based on triggers capturing changed data, and then the adapter continuously queries the source database to get the changed data. When a table is subscribed to replicate, the adapter creates three triggers (INSERT, UPDATE, and DELETE) on the table for capturing data. The supported operations are:

- Add a column
- Delete a column
- Alter a column datatype
- Rename a column

The adapter also creates a shadow table for the subscribed table. Except for a few extra columns for supporting replication, the shadow table has the same columns as its replicated table. Triggers record changed data in shadow tables. For each adapter instance (remote source), the adapter creates a Trigger Queue table to mimic a queue. Each row in shadow tables has a corresponding element (or placeholder) in the queue. The adapter continuously scans the queue elements and corresponding shadow table rows to get changed data and replicate them to the target SAP HANA database.



## Related Information

[Required Permissions for SQL Server Trigger-Based Replication \[page 320\]](#)

[System Objects Created in Microsoft SQL Server \[page 321\]](#)

### 6.16.1.7.1 Required Permissions for SQL Server Trigger-Based Replication

Grant permissions and privileges to use MS SQL Server trigger-based replication.

Creating a DML trigger requires ALTER permission on the table or view on which the trigger is being created.

Creating a DDL trigger with database scopes (ON DATABASE) requires ALTER ANY DATABASE DDL TRIGGER permission in the current database.

GRANT CREATE PROCEDURE TO [pds\_user].

GRANT SELECT, INSERT, UPDATE, DELETE, ALTER, EXECUTE, VIEW DEFINITION ON SCHEMA::[schema of the target subscribed table] TO [pds\_user].

GRANT VIEW SERVER STATE permission to view data processing state, such as transaction ID. This must be granted on the master database.

#### **i** Note

“GRANT VIEW SERVER STATE TO SDI\_USER” isn’t permitted for SQL Server on Azure. On SQL Database Premium Tiers, the VIEW DATABASE STATE permission is required in the database. On SQL Database Standard and Basic Tiers, the Server admin or an Azure Active Directory admin account is required.

## Related Information

[sys.dm\\_tran\\_current\\_transaction \(Transact-SQL\) 📖](#)

## 6.16.1.7.2 System Objects Created in Microsoft SQL Server

When you create a remote source to use trigger-based replication, a few system objects—such as tables, triggers, or procedures—are created on the SQL Server source.

### Remote Source Level

All of the system objects are created under `<pds_user>`. The “SDI\_” prefix is an example, and it is set in the remote source configuration parameters.

(table) Trigger queue table: "`<pds_user>`".`SDI_TRIGGER_QUEUE`"

(table) Marker table: "`<pds_user>`".`SDI_MARKERS`"

(trigger) Insert trigger on marker table: "`<pds_user>`".`SDI_MARKERS_I_SDI_TRIG`"

(trigger) Delete trigger on marker table: "`<pds_user>`".`SDI_MARKERS_D_SDI_TRIG`"

(trigger) Update trigger on marker table: "`<pds_user>`".`SDI_MARKERS_U_SDI_TRIG`"

(table) Shadow table of Marker table: "`<pds_user>`".`SDI_SHADOW_SDI_MARKERS`"

(trigger) Insert trigger on shadow table of marker table: "`<pds_user>`".`SDI_MARKERS_SH_I_SDI_TRIG`"

(table) DDL table: "`pds_user`".`SDI_DDL_CHANGE`"

(trigger) Insert trigger on DDL table: "`<pds_user>`".`SDI_DDL_CHANGE_I_SDI_TRIG`"

(trigger) Delete trigger on DDL table: "`<pds_user>`".`SDI_DDL_CHANGE_D_SDI_TRIG`"

(trigger) Update trigger on DDL table: "`<pds_user>`".`SDI_DDL_CHANGE_U_SDI_TRIG`"

(table) Shadow table of DDL table: "`<pds_user>`".`SDI_SHADOW_SDI_DDL_CHANGE`"

(trigger) Insert trigger on shadow table of DDL table: "`<pds_user>`".`SDI_DDL_CHANGE_SH_I_SDI_TRIG`"

(procedure) Mark procedure: "`<pds_user>`".`SDI_PROC_V1`"

(sequence) Scan sequence: "`<pds_user>`".`SDI_SCAN_SEQ`"

(sequence) Trans sequence: "`<pds_user>`".`SDI_TRIGGER_SEQ`"

(table) Table to show the table name and its corresponding shadow table: "`<pds_user>`".`SDI_SRC_TO_ST`"

(table) Subscribed table metadata table: "`<pds_user>`".`SDI_COLUMNS_METADATA`"

### Source Table Level

(table) Shadow table of source table: "`<table_owner>`".`SDI_SHADOW_<table_name>`"

(trigger) Insert trigger on shadow table of source table: "<table\_owner>."<table\_name>\_SH\_I\_SDI\_TRIG"

(trigger) Insert trigger on source table: "<table\_owner>."<table\_name>\_I\_SDI\_TRIG"

(trigger) Delete trigger on source table: "<table\_owner>."<table\_name>\_D\_SDI\_TRIG"

(trigger) Update trigger on source table: "<table\_owner>."<table\_name>\_U\_SDI\_TRIG"

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

### 6.16.2 MssqlLogReaderAdapter Preferences

Configuration parameters for the Microsoft SQL Server Log Reader adapter.

#### i Note

Log Reader adapter preferences are no longer set in the Data Provisioning Agent Configuration Tool with the exception of *Number of wrapped log files*, *Enable verbose trace*, and *Maximum log file size*. They are now in the remote source configuration options in SAP HANA. If you have upgraded from a previous version, the settings you find in the Agent Configuration Tool are the previous settings and are displayed for your reference.

You can adjust Microsoft SQL Server Log Reader adapter preferences in the Data Provisioning Agent Configuration Tool (<DPAgent\_root>/configTool/dpagentconfigtool.exe).

Parameter	Description	Default value
Maximum operation queue size	The maximum number of operations permitted in the log reader operation queue during replication.	1000
Maximum scan queue size	The maximum number of log records permitted in the log reader log scan queue during replication.	1000



Parameter	Description	Default value
Maximum wait interval between log scans	The maximum wait interval between Log Reader transaction log scans.	2

**Note**

- The value of the parameter is the maximum number of seconds that can elapse before the Log Reader component scans the transaction log for a transaction to be replicated, after a previous scan yields no such transaction.
- For reduced replication latency in an infrequently updated database, we recommend lower number settings for the parameter.
- If the primary database is continuously updated, the value of the parameter is not significant to performance.

Parameter	Description	Default value
Seconds to add to each log scan wait interval	<p>The number of seconds to add to each wait interval before scanning the transaction log, after a previous scan yields no transaction to be replicated.</p> <div> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>The value of the parameter is the number of seconds added to each wait interval before the Log Reader component scans the log for a transaction to be replicated, after a previous scan yields no such transaction.</li> <li>The number of seconds specified by the parameter is added to each wait interval, until the wait interval reaches the value specified by the <i>Maximum wait interval between log scans</i> parameter.</li> <li>For optimal performance, the value of the parameter should be balanced with the average number of operations in the primary database over a period of time. In general, better performance results from reading more operations from the transaction log during each Log Reader scan.</li> <li>With a primary database that is less frequently updated, increasing the value of the parameter may improve overall performance.</li> <li>If the database is continuously updated, the value of the parameter may not be significant to performance.</li> </ul> </div>	0
Replicate LOB columns	Determines whether the agent applies each LOB change.	True
Database connection pool size	Maximum number of connections allowed in the connection pool on a secondary node.	15
Number of times to retry to connect if a connection fails	Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt, as long as the server is not found, for the specified number of times.	5

Parameter	Description	Default value
Timeout in seconds to retry connecting	The number of seconds the agent waits between retry attempts to connect to the primary database.	10
Number of wrapped log files	The maximum size in 1-K blocks of the agent system log file before wrapping.	3
Enable verbose trace	Enables or disables extra diagnostic information in the agent system log files.	False
Maximum log file size	Limits the size of the message log to conserve disk space.	1000
Turn on asynchronous logging mode	Specifies whether or not Log Reader should turn on asynchronized logging mode. (True, False)	True
Maximum size of work queue for asynchronous logging	The maximum size of the work queue for the asynchronous logging file handler to collect the log records. The range is 1 to 2147483647.	1000
Discard policy for asynchronous logging file handler	<p>Specifies the discard policy for the asynchronous logging file handler when the work queue is saturated.</p> <ul style="list-style-type: none"> <li>• BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>• DISCARD: The log records that cannot be offered into the queue are dropped.</li> </ul> <p>DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried, which can fail again, causing this process to be repeated.</p>	BLOCKING

### 6.16.3 Microsoft SQL Server Log Reader Remote Source Configuration

Configure the following options for a connection to a Microsoft SQL Server remote source. Also included is sample code for creating a remote source using the SQL console.

#### i Note

When setting up a remote source and you use a remote source name longer than 30 characters, the generated log reader folder name under `<DPAgent_root>/LogReader/` is converted to `AGENT<xxxx>`.

The log file is located at `<DPAgent_root>/log/framework.trc` and reads: The instance name `<original_name>` exceeds 30 characters and it is converted to `<converted_name>`.

Category	Option	Description
Data Type Conversion	Always Map Character Types to Unicode	<p>Determines whether a CHAR/VARCHAR/TEXT column in the source database is mapped to a Unicode column type in SAP HANA when the source database character set is non-ASCII. The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p> <p>Set this parameter to <i>True</i> only when the remote database is non-ASCII, such as UTF-8, GBK, and JA16SJIS.</p>
	Map SQL Server Data Type Time to Timestamp	<p>The value is <i>False</i> by default, which means TIME is mapped to TIME. However, setting this parameter to <i>False</i> can lead to the loss of precision. When setting its value to <i>True</i>, TIME maps to TIMESTAMP.</p>
Generic	Load and Replicate LOB columns	<p>When this parameter is set to <i>False</i>, the LOB columns are filtered out when doing an initial load and real-time replication. The value of this parameter can be changed when the remote source is suspended.</p> <div> <p><b>i Note</b></p> <p>This option isn't available for an ECC adapter.</p> </div>
Database	Data Server (serverName \instanceName)	<p>The Microsoft SQL Data Server name</p> <p>If your Microsoft SQL Server instance is enabled with dynamic ports, you must provide the Instance Name of the Microsoft SQL Server instance instead of the port number. Provide the data server name and the instance name in the format <i>&lt;serverName&gt; \&lt;instanceName&gt;</i>.</p> <p>If the instance name isn't provided, the default instance name (MSSQLSERVER) is used.</p>
	Port Number	<p>The Microsoft SQL Data Server port number. The value range is 1–65535.</p>

Category	Option	Description
		If you're using the instance name in the <a href="#">Data Server</a> parameter, you don't need to provide the port number.
	Database Name	The Microsoft SQL Server database name
	Use Remote Database	<p>Set to <a href="#">True</a> if you're running the Data Provisioning Agent on a different computer than you source Microsoft SQL Server database.</p> <p>The default value is <a href="#">False</a>.</p>
	Include Table/Columns Remarks	<ul style="list-style-type: none"> <li>• <a href="#">True</a>: Returns a description of the table/column. If you have many tables, setting this parameter to <a href="#">True</a> can impede performance.</li> <li>• <a href="#">False</a> (Default): Turns off the return of descriptions</li> </ul> <p>You can add SQL Server Extended Properties for objects (Table/View/Column) to define a description of a Microsoft SQL Server object. To create a description of an object, you must add a property called "MS_Description", and then add a description of the object as the value.</p> <p>If the parameter <a href="#">Include Table/Columns Remarks</a> is set to <a href="#">True</a>, the descriptions of tables/views are returned when GET_REMOTE_SOURCE_OBJECTS_LIST is called. The descriptions of tables/views and columns are returned when GET_REMOTE_SOURCE_TABLE_DEFINITIONS is called.</p> <div> <p><b>i Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
	Whitelist Table in Remote Database	Enter the name of table that contains the whitelist in the remote database.

Category	Option	Description
	SQL Server Always On	Specifies whether Microsoft SQL Server is configured for Always On availability group support.
	Availability Group Listener Host	The host name of the listener for the Always On availability group
	Availability Group Listener Port	The port used by the listener for the Always On availability group
Schema Alias Replacements	Schema Alias	<p>Schema name to be replaced with the schema given in <a href="#">Schema Alias Replacement</a>. If given, accessing tables under this alias is considered to be accessing tables under the schema given in <a href="#">Schema Alias Replacement</a>.</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
	Schema Alias Replacement	<p>Schema name to use to replace the schema given in <a href="#">Schema Alias</a></p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
Security	Use SSL	<p>Specify whether you're using SSL.</p> <p>The default value is <a href="#">False</a>.</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
	Host Name in Certificate	<p>Enter the host name that is in the SSL certificate.</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
	Use Windows Authentication	Specifies whether Windows credentials on local machine are allowed to use for connecting to a source database.

Category	Option	Description
		<p>The default value is <i>False</i>.</p> <div> <p><b>i Note</b></p> <p>The value of this parameter may not be changed when the remote source is suspended.</p> </div> <div> <p><b>i Note</b></p> <p>If set to <i>True</i>, the <i>Credentials Mode</i> parameter must be set to <i>Technical user</i>.</p> </div>
	Use Agent Stored Credential	<p>Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage.</p> <p>The default value is <i>False</i>.</p>
CDC Properties	Capture mode	<ul style="list-style-type: none"> <li>• <i>LogReader</i>: Choose <i>Log Reader</i> to enable log-based change data capture.</li> <li>• <i>Trigger</i>: Choose <i>Trigger</i> to enable trigger-based change data capture.</li> </ul>
	Table Subscribing Mode	<ul style="list-style-type: none"> <li>• <i>Native Mode</i> (default). SAP HANA smart data integration installs some procedures into the Microsoft SQL Server mssqlsystemresource database. These procedures are called every time you mark a table for replication.</li> <li>• <i>Microsoft SQL CDC Mode</i>: The adapter uses the Microsoft SQL CDC API to mark a table for replication, so that the first time you use it, server-level initialization isn't required. When the <i>Database Data Capture Mode</i> option is set to <i>Microsoft SQL CDC Mode</i>, the adapter doesn't support replicating the TRUNCATE TABLE operation.</li> </ul> <p>To switch to another mode, you must reset all of your subscriptions and then alter this mode.</p>

Category	Option	Description
		<div>i Note</div> <p>You don't need to enable Microsoft SQL Server CDC.</p> <div>→ Tip</div> <p>Both of these database data capture modes require the SYSADMIN role to execute.</p>
	LogReader objects schema in remote database (Case Sensitive)	<p>Optional. The schema name to use when creating log reader objects in the remote database. This schema name uniquely identifies the objects belonging to a specific remote source, and enables replication for multiple remote sources on a single source database.</p> <div>i Note</div> <p>When replicating using multiple remote sources and a single source database, each schema name and each remote source name must be unique.</p>
	Maintenance User Filter (Case Sensitive)	<p>Optional. Enter a source database user name. Source database transactions (INSERT, UPDATE, DELETE, and DDL changes such as ALTER TABLE) conducted by this user are filtered out (ignored) and not propagated to the SAP HANA target. For example, if you log in to the source database with this maintenance user and delete a row from a source table that is subscribed for replication, this row isn't deleted from the SAP HANA target table.</p> <p>Don't use the same name as the <i>User Name</i> credential.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>



Category	Option	Description
		<p><b>i Note</b></p> <p>If the S-ID of this user is changed using ALTER USER DDL, the <i>Maintenance User Filter</i> doesn't work.</p>
	Interval of transaction log truncation	<p>The interval to truncate the transaction log in minutes. Set to 0 to disable the truncation.</p> <p>The default value is 10 minutes.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Ignore log record processing errors	<p>Specifies whether the Log Reader ignores the errors that occur during log record processing. If set to <i>True</i>, the replication doesn't stop if log record processing errors occur. The default value is <i>False</i>.</p> <p><b>i Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Ignore log record decluster errors	<p><b>i Note</b></p> <p>This parameter is available only when you're using the Microsoft SQL Server Log Reader ECC adapter.</p> <p>Specifies whether to ignore log record declustering errors. If set to <i>True</i>, the replication doesn't stop if log record declustering errors occur. The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Maximum operation queue size	<p>The maximum number of operations permitted in the log reader operation queue during replication</p> <p>The default value is 1000. The value range is 25–2147483647 .</p>

Category	Option	Description
		<b>i Note</b> The value of this parameter can be changed when the remote source is suspended.
	Maximum scan queue size	<p>The maximum number of log records permitted in the log reader log scan queue during replication.</p> <p>The default value is 1000. The value range is 25–2147483647.</p> <b>i Note</b> The value of this parameter can be changed when the remote source is suspended.
	Maximum wait interval between log scans	<p>The default value is 2 seconds. The value range is 1–3600.</p> <b>i Note</b> The value of this parameter can be changed when the remote source is suspended.
	Seconds to add to each log scan wait interval	<p>The default value is 0. The value range is 0–3600.</p> <b>i Note</b> The value of this parameter can be changed when the remote source is suspended.
	Database connection pool size	<p>Maximum number of connections allowed in the connection pool on a secondary node.</p> <p>The default value is 15. The value range is 1–64.</p> <b>i Note</b> The value of this parameter can be changed when the remote source is suspended.

Category	Option	Description
	Number of times to retry to connect if a connection fails	<p>Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt as long as the server isn't found for the specified number of times.</p> <p>The default value is 5. The value range is 0–2147483647.</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
	Timeout in seconds to retry connecting	<p>The number of seconds the agent waits between retry attempts to connect to the primary database.</p> <p>The default value is 10. The value range is 0–3600.</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
	Trigger-based: System object prefix	<p>(Case Insensitive) The prefix of the names of the SQL Server adapter system objects created in the source SQL Server database by the adapter. We recommend keeping the default value of "SDI_".</p>
	Trigger-based: Connection pool size	<p>Maximum number of connections allowed in the connection pool. The default value is 4.</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
	Trigger-based: Minimum scan interval in seconds	<p>The minimum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value is 0 (seconds), which means there's no waiting time before the next scan.</p>

Category	Option	Description
		<b>i Note</b> The value of this parameter can be changed when the remote source is suspended.
	Trigger-based: Maximum scan interval in seconds	The maximum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value is 10 (seconds). If the adapter scans the queue and finds that the queue is empty, it will gradually increase the scan interval from the minimum scan interval to the maximum scan interval.  <b>i Note</b> The value of this parameter can be changed when the remote source is suspended.
	Trigger-based: Maximum batch size	The maximum number of consecutive change data on the same table that is batched to process and send to Data Provisioning Server together. The default value is 128.  <b>i Note</b> The value of this parameter can be changed when the remote source is suspended.
	Trigger-based: Batch queue size	The internal batch queue size. The batch queue size determines the maximum number of batches of change data that are queued in memory. The default value is 64.  <b>i Note</b> The value of this parameter can be changed when the remote source is suspended.
	Trigger-based: Maximum transaction count in scan	The maximum number of transactions being processed in a scan of the remote source database.
	Trigger-based: Maximum scan size	The maximum number of rows being fetched from the trigger queue table in one scan and assigned to batch jobs for further processing.

Category	Option	Description
	Trigger-based: Triggers record PK only	<p>Set to <i>True</i> to have the triggers record only primary keys of delta data during CDC processing. This action may improve the DML performance in the source database.</p> <p>The default value is <i>False</i>.</p> <div> <b>i Note</b> <p>When this parameter is set to <i>True</i>, only support DML (INSERT &amp; DELETE) is supported; no DDL is supported.</p> </div>
Credentials	Credentials Mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
	User Name	Microsoft SQL Server user name
	Password	Microsoft SQL Server user password
		<div> <b>i Note</b> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>

The following examples illustrate how to create a remote source using the SQL console.

## Basic

### Example

```
CREATE REMOTE SOURCE "MySQLServerSource" ADAPTER "MssqlLogReaderAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="data_type_conversion" displayName="Data Type Conversion">
```

```

    <PropertyEntry name="map_char_types_to_unicode" displayName="Always Map
Character Types to Unicode">false</PropertyEntry>
    <PropertyEntry name="map_time_to_timestamp" displayName="Map SQL Server Data
Type Time to Timestamp">true</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="database" displayName="Database">
    <PropertyEntry name="pds_server_name" displayName="Host">myserver.sap.corp</
PropertyEntry>
    <PropertyEntry name="pds_port_number" displayName="Port Number">1433</
PropertyEntry>
    <PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
</PropertyGroup>
<PropertyGroup name="cdc" displayName="CDC Properties">
    <PropertyEntry name="pds_dcmode" displayName="Database Data Capture
Mode">MSCDC</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="logreader" displayName="LogReader">
    <PropertyEntry name="skip_lr_errors" displayName="Ignore log record
processing errors">false</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
'WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
    <user>myuser</user>
    <password>mypassword</password>
</CredentialEntry>'

```

## Microsoft SQL Server AlwaysOn

### Example

#### Sample Code

```

CREATE REMOTE SOURCE "MySQLServerSource" ADAPTER "MssqlLogReaderAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" displayName="Database">
    <PropertyEntry name="pds_always_on" displayName="SQL Server Always
On">true</PropertyEntry>
    <PropertyEntry name="pds_aglistener_host" displayName="Availability Group
Listener Host">myhost.sap.corp</PropertyEntry>
    <PropertyEntry name="pds_aglistener_port" displayName="Availability Group
Listener Port">1433</PropertyEntry>
    <PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>'

```

## Related Information

[CREATE REMOTE SUBSCRIPTION Statement \[Smart Data Integration\] \[page 543\]](#)  
[Create Credentials for a Secondary User](#)  
[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)  
[Security Aspects of SAP HANA Smart Data Access \(SAP HANA Security Guide\)](#)  
[MssqlECCAdapter Preferences \[page 429\]](#)  
[Configuring Windows Authentication \[page 340\]](#)  
[Creating a Whitelist to Limit Access to a Source Database \[page 341\]](#)  
[Using a Schema Alias \[page 337\]](#)  
[Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 82\]](#)  
[Store Source Database Credentials in Data Provisioning Agent \[Command Line\] \[page 68\]](#)  
[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

### 6.16.4 Using a Schema Alias

Using a schema alias can help you manage multiple schema, remote sources, and tables more easily.

The *Schema Alias* and *Schema Alias Replacement* options, available in the remote source configuration parameters for some Data Provisioning adapters, allow you to switch easily between schema, remote sources, and tables. The *Schema Alias* is the name of the schema in the original system. The *Schema Alias Replacement* is the name of the schema in the current system that replaces the *Schema Alias* name.

A common use case is to create a remote source pointing to a development database (for example, DB\_dev), and then create virtual tables under that remote source. Afterward, you may switch to the production database (for example, DB\_prod) without needing to create new virtual tables; the same tables exist in both DB\_dev and DB\_prod, but under different schema and databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB\_dev, for example. Note that OWNER1.MYTABLE is the unique name of the source table, and it is a property of the virtual table. With it, the adapter knows which table in the source database it is expected to access. However, when you switch to the production database (DB\_prod), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name information of the virtual table cannot be changed once created.

You can resolve this problem using the Schema Alias options. In this case, we want to tell the adapter to replace OWNER1 with OWNER2. For example, when we access OWNER1.MYTABLE, the adapter should access OWNER2.MYTABLE. So here, OWNER1 is *Schema Alias* from the perspective of DB\_prod, while OWNER2 is *Schema Alias Replacement*.

To use this functionality, you must populate both of these options.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)  
[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

[SAP HANA Remote Source Configuration \[page 444\]](#)

[SDI DB2 Mainframe \[page 460\]](#)

## 6.16.5 Log Reader Adapter Log Files

You can review processing information in the Log Reader log files.

The following files are available:

Log file name and location	Description
<code>&lt;DPAgent_root&gt;/LogReader/admin_logs/admin&lt;instance_name&gt;.log</code>	Log Reader administration log
<code>&lt;DPAgent_root&gt;/log/&lt;instance_name&gt;.log</code>	Log Reader instance log

### Note

By default, the adapter instance name is the same as the remote source name when the remote source is created from the SAP HANA Web-based Development Workbench.

## 6.16.6 Configure SSL for the Microsoft SQL Server Log Reader Adapter

Set up secure SSL communication between Microsoft SQL Server and the Data Provisioning Agent.

### Context

If you want to use SSL communication between your Microsoft SQL Server source and the Data Provisioning Agent, you must create and import certificates and configure the source database.

### Procedure

1. On the Microsoft SQL Server host, create a certificate authority (CA) certificate using the sha1 algorithm. You can also create a certificate using the `makecert.exe` utility included in the Windows SDK.

For example:

```
makecert -r -pe -n "CN=<hostname>" -b 01/01/2017 -e 01/01/2023 -eku  
1.3.6.1.5.5.7.3.1 -ss my -sr localmachine -sky exchange -sp "Microsoft RSA  
SChannel Cryptographic Provider" -sy 21 -a sha1
```



2. Import the new certificate on the Microsoft SQL Server host.

You can use the [Certificates](#) snap-in for the Microsoft Management Console (MMC) to import the certificate.

- a. In the Microsoft Management Console, choose [File](#) [Add/Remove Snap-in](#) and add the [Certificates](#) snap-in to the MMC.  
In the wizard, specify the account and local computer.
- b. In [Certificates \(Local Computer\)](#), right-click on the CA certificate that you created and choose [All Tasks](#) [Manage Private Keys](#).

#### Note

If the CA certificate does not appear, first choose [All Tasks](#) [Import](#) to import the certificate.

- c. In [Group or user names](#), click [Add](#) and specify the name of the account used by the Microsoft SQL Server service.
  - d. Copy the certificate and paste it under [Certificates \(Local Computer\)](#) [Trusted Root Certification Authorities](#) [Certificates](#).
3. Specify the certificate for the Microsoft SQL Server instance.

Use the SQL Server Configuration Manager (SSCM) to specify the certificate.

- a. Expand [SQL Server Network Configuration](#), and choose [Protocols for <SQL Server instance>](#) [Properties](#).
- b. In the [Certificate](#) tab, select the certificate that you imported and click [OK](#).

#### Tip

If the certificate does not appear, verify that the hostname in the certificate is correct, and that the Microsoft SQL Server service user has been added to the certificate.

4. Restart Microsoft SQL Server to ensure that the new certificate is picked up.

In the SQL Server error log, a message such as the following should appear:

```
The certificate [Cert Hash(sha1) "<hash>"] was successfully loaded for encryption.
```

5. Export the certificate from the Microsoft SQL Server host.

- a. In the [Certificates](#) snap-in for the Microsoft Management Console, navigate to [Personal](#) [Certificates](#).
- b. Right-click on the certificate and choose [All Tasks](#) [Export](#).

Export the certificate in the DER encoded binary X.509 (.CER) format. You do not need to export the private key with the certificate.

6. Prepare the Data Provisioning Agent for SSL connections.

- a. Copy the certificate from the Microsoft SQL Server host to the Data Provisioning Agent installation.
- b. Import the certificate into the Data Provisioning Agent keystore.

Use the Java keytool to import the certificate. By default, `keytool` is located in `<DPAgent_root>/sapjvm/bin`.

For example:

```
keytool -importcert -alias mssql -keystore <DPAgent_root>\ssl\cacerts -  
storepass <password> -file <path_to_exported_certificate> -noprompt
```

- c. Configure the SSL password with the Data Provisioning Agent configuration tool.

Specify the same password used when importing the certificate, and then restart the Data Provisioning Agent.

## Next Steps

When you create a Microsoft SQL Server remote source, ensure that the following parameters are set appropriately:

- [Use SSL: True](#)
- [Host Name in Certificate](#): The host name specified when creating the certificate on the Microsoft SQL Server host.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

## 6.16.7 Configuring Windows Authentication

To configure Windows authentication, copy an installed DLL file to your Windows system.

To use integrated authentication, the `sqljdbc_auth.dll` file must be copied to a directory in the Windows system path on the computer where the JAVA installation is located.

The `sqljdbc_auth.dll` file can be copied from the following location:

```
<JDBC driver installation directory>\sqljdbc_<version>\<language>\auth\
```

Copy the `sqljdbc_auth.dll` file to the following default location:

```
<JAVA installation directory>\jdk_<version>\bin
```

### Note

When you run a 32-bit Java Virtual Machine (JVM), use the `sqljdbc_auth.dll` in the `x86` folder, even if the operating system is the x64 operation. When you run a 64-bit JVM on a x64 processor, use the `sqljdbc_auth.dll` file in the `x64` folder.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[SAP HANA Smart Data Integration: Potential issues when connecting to SQL Server using the MssqlLogReader Adapter and Windows Authentication](#) ➡

### 6.16.8 Creating a Whitelist to Limit Access to a Source Database

There are times when you may want to limit access to all of the tables in a source database. For data provisioning log reader adapters, as well as SAP HANA and SAP ECC adapters, an efficient way to limit access is to create a whitelist.

Restricting access to only those tables that are to be replicated is done by creating a whitelist of source database objects in a separate table.

#### i Note

The whitelist impacts only the virtual table created and the replications created after the whitelist was created.

You can use SQL to create the whitelist table.

#### i Note

- The whitelist table, which can have any name, must have two columns named REMOTE\_SOURCE\_NAME and WHITELIST.
- The whitelist items are separated by a comma.
- You can use an asterisk (\*) to represent any character or empty string. However, the asterisk must be placed at the end of a whitelist item. Otherwise, it is treated as a normal character.
- You can add multiple rows of whitelisted tables for a single remote source.

### Microsoft SQL Server Example

```
create table whitelist(REMOTE_SOURCE_NAME varchar(128), WHITELIST varchar(4000));
```

To add a whitelist for the remote source called "localmssqldb", insert a row into the whitelist table:

```
insert into whitelist values('localmssqldb', 'object.A, object.B*');  
insert into whitelist values('localmssqldb', 'object.C, object.D*');
```

object.A, object.B\*, and so on, means that the table (or procedure) object.A and the table (or procedure) starting with object.B are filtered for the remote source "localmssqldb".

## SAP HANA Example

```
create schema SAP_RESTRICTIONS;  
create table WHITE_LIST(REMOTE_SOURCE_NAME varchar(128) primary key, WHITELIST  
varchar(4000));
```

To add a whitelist for the remote source called “localhadp”, insert a row into the whitelist table:

```
insert into WHITE_LIST values('localhadp', 'APP_USER.MERCHANT,APP_PRODUCT.B*');
```

APP\_USER.MERCHANT,APP\_PRODUCT.B\* means that the table (or procedure) APP\_USER.MERCHANT and the table (or procedure) starting with APP\_PRODUCT.B are filtered for remote source “localhadp”.

### 6.16.9 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

#### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. Navigate to the Agent Adapter Framework Preferences.
  - In graphical mode, choose **Config > Preferences**, and then select *Adapter Framework*.
  - In command-line interactive mode, choose *Set Agent Preferences* in the *Agent Preferences* menu.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start and Connect the Configuration Tool \[page 84\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

## 6.16.10 Configure Microsoft Windows Authentication

Install a JDBC driver and configure your remote source to enable Windows authentication.

### Context

### Procedure

1. Download and install the Windows JDBC driver to a location of your choice.

You will find the `sqljdbc_auth.dll` file in the `/x64` directory at the installation location. For example,  
`<JDBC installation directory>\sqljdbc_<version>\<language>\auth  
\x64\sqljdbc_auth.dll`

2. Set the system environment `Path` variable to the location of the `sqljdbc_auth.dll` file.
3. Start the Data Provisioning Agent.

## Related Information

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

## 6.17 OData

Set up access to the OData service provider and its data and metadata.

Open Data Protocol (OData) is a standardized protocol for exposing and accessing information from various sources, based on core protocols including HTTP, AtomPub (Atom Publishing Protocol), XML, and JSON (Java Script Object Notation). OData provides a standard API on service data and metadata presentation, and data operations.

The SAP OData adapter provides OData client access to the OData service provider and its data and metadata. The OData service provider is created as a remote source. OData resources are exposed as metadata tables of the remote source. These metadata tables can be added as virtual tables. An SAP HANA SQL query can then access the OData data. Collections of OData data entries are represented as rows of the virtual table.

The OData adapter supports the following functionality:

- Virtual table as a source
- Virtual table as a target using a Data Sink in a flowgraph

The data of the main navigation entities can be accessed via SQL with the following restrictions:

- Without a join, selected projection columns appear in the OData system query “\$select”.
- With a join, columns of the joined table, which is the associated OData entity, can occur in the projection. Selected projection columns appear in the OData system query “\$select”. All joined tables appear in the OData system query “\$expand”.
- Due to a restriction of the OData system queries “\$select” and “\$orderby”, no expressions can occur in the Projection and the Order By clause.
- The Where clause supports logical, arithmetic, and ISNULL operators, string functions, and date functions. The expression is translated into the OData system query “\$filter”.

Refer to OData documentation for the OData URI conventions.

### Related Information

[Installation and Deployment \[page 345\]](#)

[Consume HTTPS OData Services \[page 348\]](#)

[URI Conventions !\[\]\(104fbf564e2e5a8fbd84f31656d114c7\_img.jpg\)](#)

## 6.17.1 Installation and Deployment

You must configure the SAP HANA server and provide the appropriate settings when you create a remote source to connect to the service provider.

Unlike other adapters, the OData adapter is not installed with the Data Provisioning Agent.

### Related Information

[Set up the SAP HANA Server \[page 345\]](#)

[Create an OData Remote Source \[page 345\]](#)

[OData Remote Source Configuration \[page 346\]](#)

### 6.17.1.1 Set up the SAP HANA Server

Follow these steps to set up the SAP HANA server before using the OData adapter.

#### Procedure

1. Ensure that the Data Provisioning server is enabled.
2. If the OData service provider site supports only HTTPS connection, use the SAP HANA cryptography tool SAGENPSE to create a personal security environment (PSE) file and to import the public certificate provided by the server.  
Make sure that you place the PSE file into the SECUDIR (<HDB\_INSTANCE>/<HOST\_NAME>/sec) folder.
3. If the OData service provider requires HTTP basic authentication, set up a user and password.

### 6.17.1.2 Create an OData Remote Source

Follow these steps to create an OData remote source.

#### Procedure

1. Register the OData adapter to the ADAPTERS table.

```
CREATE ADAPTER "ODataAdapter" PROPERTIES 'display_name=OData
Adapter;description=OData Adapter' AT LOCATION DP$SERVER;
```

You can verify whether an entry for the OData adapter exists in the ADAPTERS table:

```
SELECT * FROM ADAPTERS
```

2. Create an ODataAdapter-type remote source and enter the configuration information.
3. Expand the new OData adapter remote source to browse for table metadata information and add tables from that remote source as virtual tables.
4. Expand [Catalog/<SCHEMA>/Tables](#) to find the added virtual tables and to view the table definition or to preview table data.

## Related Information

[OData Remote Source Configuration \[page 346\]](#)

[Create Credentials for a Secondary User](#)

### 6.17.1.3 OData Remote Source Configuration

Configuration settings for accessing an OData source. Also included is sample code for creating a remote source using the SQL console.

Configure the following options in smart data access.

Option	Description
URL	OData service provider URL.
Proxy Server	Proxy host if URL is outside the firewall.
Proxy Port	Proxy port if URL is outside the firewall.
Trust Store	The trust store that contains the OData client public certificate, either a file in SECUDIR or a database trust store.
Is File Trust Store	Select <a href="#">True</a> if the trust store is a file in SECUDIR, or <a href="#">False</a> if the trust store resides in the SAP HANA database. The default value is <a href="#">True</a> .
Support Format Query	If set to <a href="#">True</a> , <code>\$format=json</code> is appended to get OData entities in JSON format. If set to <a href="#">False</a> , no format query is appended. The default value is <a href="#">True</a> .
Require CSRF Header	Enter <a href="#">True</a> if OData Service requires CSRF Header. The default value is <a href="#">True</a> .
CSRF Header Name	Enter the name used for CSRF Header. The default value is <a href="#">X-CSRF-Token</a> .



Option	Description
CSRF Header Fetch Value	Enter the value used for CSRF Header Fetch. The default value is <i>Fetch</i> .
Support Date Functions	Select <i>False</i> if the OData service site does not support the date functions hour, minute, month, or year. The default value is <i>True</i> .
Show Navigation Properties	<p>Select <i>True</i> or <i>False</i> for the OData Service to return Navigation Properties. The default value is <i>False</i>.</p> <p>If <i>Show Navigation Properties</i> is <i>False</i>, the <code>select *</code> SQL query returns only the regular properties.</p> <p>If <i>Show Navigation Properties</i> is <i>True</i>, the <code>select *</code> SQL query also returns the navigation properties.</p> <div> <p><b>i Note</b></p> <p>Due to an HTTP request maximum length restriction, avoid using the <code>select *</code> query if the total lengths for all Property and Navigation Property names exceed the restriction.</p> </div>
Support accept-encoding:gzip	<p>Select <i>True</i> if the OData Service supports accept-encoding:gzip. The default value is <i>False</i>.</p> <p>If <i>Support accept-encoding:gzip</i> is <i>True</i>, the OData HTTP request adds the header <code>accept-encoding:gzip</code>. If the OData Service HTTP response contains the header <code>Content-Encoding: gzip</code>, the response body is unzipped.</p>
Follow Redirects	Select <i>True</i> for the OData adapter to follow redirected URLs. The default value is <i>False</i> .
Extra Connection Parameters	Enter extra connection parameters or leave blank.
Verify Server Certificate	Select <i>True</i> to have the OData adapter verify the server certificate. The default value is <i>False</i> .
Extra Header Parameters	Enter extra header parameters or leave blank.
Convert to Local Timezone	Select <i>True</i> or <i>False</i> for the OData adapter to convert the timestamp value to a local timezone. The default value is <i>True</i>
Credentials Mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> </ul>

Option	Description
	<ul style="list-style-type: none"> <li><a href="#">Secondary User</a>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
User Name	User name for HTTP Basic Authentication in <code>&lt;username@companyId&gt;</code> format.
Password	Password for HTTP Basic Authentication.

## Example

```
CREATE REMOTE SOURCE "MyODataSource" ADAPTER "ODataAdapter" AT LOCATION DPSEVER
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
  <ConnectionProperties name="connection_properties">
    <PropertyEntry name="URL" displayName="URL">http://host:port/path1/
path2/pathN/MyODataService.svc</PropertyEntry>
    <PropertyEntry name="proxyserver" displayName="Proxy
Server">myproxyserver</PropertyEntry>
    <PropertyEntry name="proxyport" displayName="Proxy Port">8080</
PropertyEntry>
    <PropertyEntry name="supportformatquery" displayName="Support
Format Query">true</PropertyEntry>
    <PropertyEntry name="extraHeaderparameters">APIKey:
pX7dvtDvXLUjVCVAWsTAud0ilyluH8aC</PropertyEntry>
  </ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="password">
  <user>myuser</user>
  <password>mypassword</password>
</CredentialEntry>';
```

## 6.17.2 Consume HTTPS OData Services

Steps to configure the consumption of HTTPS OData services.

### Context

If you want to consume HTTPS-based OData Services, as opposed to non-secured HTTP-based OData Services, you must import the SSL certificate from the OData Services provider into the trust store on your SAP HANA platform.

Set up the Trust Manager to consume the OData Services.

## Procedure

1. Obtain the SSL certificate from the OData Services provider.

You can use your browser to navigate to the OData URL and export the certificate from the browser.

2. Import the SSL certificate using the SAP HANA XS Admin Trust Manager.
  - For file trust stores, import the certificate to the Trust Manager SAML trust store. This action imports the certificate to the `sapsrv.pse` file in SECUDIR.
  - For database trust stores, create a database trust store and import the certificate to that new trust store.

See the *SAP HANA Administration Guide* for more information about the Trust Manager and trust relationships.

3. Create the remote source:
  - For file trust stores, set *Trust Store* to the `sapsrv.pse` file.
  - For database trust stores, set *Trust Store* to the new database trust store and *Is File Trust Store* to *False*.

For file trust stores, add the certificate to the file trust store using the following steps:

- a. In the browser for the source site click **Padlock** **DetailsDetails** **Copy to File** **Next** **DER encoded binary** **Next** **Next** **Finish**, and select a location to download.
- b. Copy the certificate to the HANA machine, and use `sapgenpse` to import the server, logged in as the `<SID>adm` user (for example `a71adm`).

```
sapgenpse maintain_pk -p <path to your Hana sec dir>/sapcli.pse -a <full path to your downloaded certificate>
```

Path to HANA sec directory example: `/usr/sap/XXX/HDBXX/<hostname>/sec`

4. Use SAP HANA studio or Web Workbench to browse the remote source and to create virtual tables.

## Related Information

### 6.18 Oracle Log Reader

Use the Oracle Log Reader adapter to connect to an Oracle source.

The Oracle Log Reader adapter provides real-time changed-data capture capability to replicate changed data from a database to SAP HANA. You can also use it for batch loading.

The Log Reader service provider is created as a remote source, and it requires the support of artifacts like virtual tables and remote subscriptions for each source table to perform replication.

With this adapter, you can add multiple remote sources using the same Data Provisioning Agent.

### **i Note**

Before registering the adapter with the SAP HANA system, ensure you have downloaded and installed the correct JDBC libraries. See the *SAP HANA smart data integration Product Availability Matrix (PAM)* for details. Place the files in the `<DPAgent_root>/lib` folder.

## **Adapter Functionality**

This adapter supports the following functionality:

- Oracle 12c multitenant database support
- Virtual table as a source
- Real-time change data capture (CDC) including support for database or table-level (default) supplemental logging.

### **i Note**

Log Reader adapters do not support the truncate table operation.

- Trigger-based real-time CDC
- Virtual table as a target using a Data Sink node in a flowgraph
- Loading options for target tables
- DDL propagation. The supported schema changes are:
  - ADD COLUMN
  - DROP COLUMN
  - RENAME TABLE
  - RENAME COLUMN
  - ALTER COLUMN DATA TYPE

### **i Note**

For trigger-based CDC, the supported schema changes are:

- ADD COLUMN
  - DROP COLUMN
  - ALTER COLUMN DATA TYPE
- Replication monitoring and statistics
  - Search for tables
  - Connect multiple remote sources in HANA to the same source database
  - LDAP Authentication
  - Virtual procedures

In addition, this adapter supports the following capabilities:

Table 47: Global Settings

Functionality	Supported?
SELECT from a virtual table	Yes
INSERT into a virtual table	Yes
Execute UPDATE statements on a virtual table	Yes
Execute DELETE statements on a virtual table	Yes
Different capabilities per table	No
Different capabilities per table column	No
Real-time	Yes

Table 48: Select Options

Functionality	Supported?
Select individual columns	Yes
Add a WHERE clause	Yes
JOIN multiple tables	Yes
Aggregate data via a GROUP BY clause	Yes
Support a DISTINCT clause in the select	Yes
Support a TOP or LIMIT clause in the select	Yes
ORDER BY	Yes
GROUP BY	Yes

## Related Information

[Oracle Database Permissions \[page 352\]](#)  
[Oracle Real-time Replication \[page 358\]](#)  
[OracleLogReaderAdapter Preferences \[page 367\]](#)  
[Oracle Log Reader Remote Source Configuration \[page 370\]](#)  
[Using a Schema Alias \[page 386\]](#)  
[Oracle RAC Configuration \[page 387\]](#)  
[Amazon Web Services Configuration \[page 389\]](#)  
[Log Reader Adapter Log Files \[page 390\]](#)  
[Synchronize the Oracle and Data Provisioning Agent Timestamp \[page 390\]](#)  
[Configure SSL for the Oracle Log Reader Adapter \[page 391\]](#)

[Creating a Whitelist to Limit Access to a Source Database \[page 394\]](#)

[Disable Adapter Write-back Functionality \[page 395\]](#)

[Connecting Multiple Remote Sources to the Same Oracle Source Database \[page 364\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



## 6.18.1 Oracle Database Permissions

Oracle database users must have certain permissions granted to them in order to carry out real-time change data capture or batch or initial load transactions.

You can run a script to assign all necessary permissions, or choose which ones suit users best. The following scripts can be found in the `oracle_init_example.sql` file, which is located in the `Scripts` folder of the Data Provisioning Agent installation at `<DPAgent_root>\LogReader\scripts`.

### i Note

Be aware that the `oracle_init_example.sql` file is a template script. You may need to alter the following:

- Change `LR_USER` to the configured database user name in the remote source options, if it is not `LR_USER`.
- Change `<replace_with_password>` to the password of the database user.

For on-premise deployment, grant select access to the log reader user by issuing the following statement. In these examples – taken from the `oracle_init_example.sql` file – the user is named `LR_USER`. Change this user name to whatever you need.

```
GRANT SELECT ON <table_to_be_replicated> TO LR_USER;
```

For convenience, you can also grant `SELECT ANY TABLE`.

However, for cloud deployment such as when accessing a database instance on Amazon Web Services (AWS) as a Relational Database Service (RDS), some privileges require granting using the AWS `rdsadmin` package. The following example shows how to `GRANT SELECT` on `SYS.INDCOMPART$` to the `LR_USER` using the `rdsadmin` package. The privileges that require this method are noted in the `oracle_init_example.sql` file.

```
begin
  rdsadmin.rdsadmin_util.grant_sys_object(
    p_obj_name => 'INDCOMPART$',
    p_grantee  => 'LR_USER',
    p_privilege => 'SELECT',
    p_grant_option => true);
end;
/
```

### i Note

- As of 2.0 SP 03 Patch 53, the list of Oracle users can be accessed through the `RA_ALL_USERS_VIEW` instead of directly accessing `SYS.USERS$`.

Create this view manually following the example in `oracle_init_example.sql`. Note that the default view is based on ALL\_USERS. Although this view requires lesser permission privileges, it may not include all Oracle users and may affect the replication process.

For additional information, see SAP Note [2757950](#).

- We have removed the following permissions, as of SPS 11:
  - CREATE PUBLIC SYNONYM
  - DROP PUBLIC SYNONYM
  - ALTER SYSTEM
  - EXECUTE on DBMS\_FLASHBACK
- If you are using Oracle 12c, the permission LOGMINING is required. Additionally, the permission SELECT ANY TRANSACTION is not required.
- The GRANT SELECT ON SYS.DEFERRED\_STG\$ TO LR\_USER permission is not required for versions of Oracle below 11gR2.

Permission	Reason	Required For CDC/Non-CDC
GRANT CREATE SESSION TO LR_USER;	Required to connect to Oracle	CDC and Non-CDC
GRANT CREATE TRIGGER TO LR_USER;	Required to administer the DDL trigger used for Schema change (DDL) replication.	CDC
GRANT CREATE SEQUENCE TO LR_USER;	Required to create a sequence that SDI needs	CDC
GRANT CREATE TABLE TO LR_USER;	Required to create tables in the primary database that SDI needs.	CDC
GRANT CREATE PROCEDURE TO LR_USER;	Required to create rs_marker and rs_dump stored procedures.	CDC
GRANT ALTER ANY TABLE TO LR_USER;	Temporary permission to turn on table level supplemental logging when a table is marked for replication in the source system. Needed only for the mark. However, if you turn on DDL replication and you expect to create tables, it must be left on so that tables can be altered by having supplemental logging turned on.	CDC
GRANT EXECUTE_CATALOG_ROLE TO LR_USER;	Required to use Oracle LogMiner.	CDC
GRANT LOGMINING TO LR_USER;	Required to use LogMiner for Oracle 12c.	CDC

Permission	Reason	Required For CDC/Non-CDC
GRANT SELECT ANY TRANSACTION TO LR_USER;	Required to use Oracle LogMiner.	CDC
GRANT SELECT ON SYS.ATTRIBUTE\$ TO LR_USER;	Required to process Oracle types.	CDC
GRANT SELECT ON SYS.CCOL\$ TO LR_USER;	Required to support table replication (column constraint information).	CDC
GRANT SELECT ON SYS.CDEF\$ TO LR_USER;	Required to support table replication (constraint information).	CDC
GRANT SELECT ON SYS.COL\$ TO LR_USER;	Required to support table replication (column information).	CDC
GRANT SELECT ON SYS.COLLECTION\$ TO LR_USER;	Required to support table replication. (column information)	CDC
GRANT SELECT ON SYS.CON\$ TO LR_USER;	Required to support table replication (constraint information).	CDC
GRANT SELECT ON SYS.DEFERRED_STG\$ TO LR_USER;	Required to suppress replication of compressed tables in versions of Oracle, on which LogMiner does not support compressed tables, such as Oracle 11g Release 2.	CDC
GRANT SELECT ON SYS.ICOL\$ TO LR_USER;	Required to support the use of a unique index on columns as the primary key of the replication definition when there is no primary key defined for that table.	CDC
GRANT SELECT ON SYS.IND\$ TO LR_USER;	Required when marking tables and to identify indexes.	CDC
GRANT SELECT ON SYS.INDCOMPART\$ TO LR_USER;	Required when marking tables and to identify indexes.	CDC
GRANT SELECT ON SYS.INDPART\$ TO LR_USER;	Required when marking tables and to identify indexes.	CDC
GRANT SELECT ON SYS.INDSUBPART\$ TO LR_USER;	Required when marking tables and to identify indexes.	CDC
GRANT SELECT ON SYS.LOB\$ TO LR_USER;	Required for LOB replication.	CDC
GRANT SELECT ON SYS.LOBCOMPART\$ TO LR_USER;	Required to support partitioned LOB replication.	CDC



Permission	Reason	Required For CDC/Non-CDC
GRANT SELECT ON SYS.LOBFRAG\$ TO LR_USER;	Required to support partitioned LOB replication.	CDC
GRANT SELECT ON SYS.MLOG\$ TO LR_USER;	Required to filter materialized view log tables.	CDC
GRANT SELECT ON SYS.NTAB\$ TO LR_USER;	Required to support table replication.	CDC
GRANT SELECT ON SYS.OBJ\$ TO LR_USER;	Required for processing procedure DDL commands in the repository.	CDC
GRANT SELECT ON SYS.OPQTYPE\$ TO LR_USER;	Required for DDL replication and XMLTYPE data replication. XMLTYPE is not supported in SDI yet.	CDC
GRANT SELECT ON SYS.PARTOBJ\$ TO LR_USER;	Required to support partitioned table replication.	CDC
GRANT SELECT ON SYS.SEG\$ TO LR_USER;	Required to suppress replication of compressed tables in versions of Oracle, on which LogMiner does not support compressed tables, such as Oracle 11g Release 2.	CDC
GRANT SELECT ON SYS.SEQ\$ TO LR_USER;	Required to support sequence replication. Replication of sequences is not supported in SDI yet.	CDC
GRANT SELECT ON SYS.SNAP\$ TO LR_USER;	Required to filter out materialized view tables.	CDC
GRANT SELECT ON SYS.TAB\$ TO LR_USER;	Required to support table replication.	CDC
GRANT SELECT ON SYS.TABCOMPART\$ TO LR_USER;	Required when marking partitioned tables.	CDC
GRANT SELECT ON SYS.TABPART\$ TO LR_USER;	Required when marking partitioned tables.	CDC
GRANT SELECT ON SYS.TABSUBPART\$ TO LR_USER;	Required when marking partitioned tables.	CDC
GRANT SELECT ON SYS.TS\$ TO LR_USER;	Required to identify tablespace encryption in Oracle 11g.	CDC
GRANT SELECT ON SYS.TYPE\$ TO LR_USER;	Required to process Oracle predefined and user-defined types.	CDC

Permission	Reason	Required For CDC/Non-CDC
GRANT SELECT ON SYS.USER\$ TO LR_USER;	Required for Oracle user identification. Required during Schema change (DDL) replication and when marking tables.	CDC
<div> <div>i Note</div> <div>Required only if your RA_ALL_USERS_VIEW is based on SYS.USER\$.</div> </div>		
GRANT SELECT ON V_\$DATABASE TO LR_USER;	Required to identify current SCN (for example, end of log) and information about supplemental logging.	CDC
GRANT SELECT ON V_\$LOGMNR_CONTENTS TO LR_USER;	Required to use Oracle LogMiner.	CDC
GRANT SELECT ON V_\$LOGMNR_LOGS TO LR_USER;	Required to use Oracle LogMiner.	CDC
GRANT SELECT_CATALOG_ROLE TO LR_USER;	Required to use Oracle LogMiner.	CDC

Granting the EXECUTE CATALOG ROLE or the SELECT CATALOG ROLE is not necessary. Instead, you can grant the following specific permissions that are part of those roles:

Role	Permissions
EXECUTE CATALOG ROLE	<ul style="list-style-type: none"> <li>GRANT EXECUTE ON SYS.DBMS_LOGMNR TO LR_USER;</li> <li>GRANT EXECUTE ON SYS.DBMS_LOGMNR_D TO LR_USER;</li> </ul>

Role	Permissions
SELECT CATALOG ROLE	<ul style="list-style-type: none"> <li>• GRANT SELECT ON SYS.DBA_ERRORS TO LR_USER;</li> <li>• GRANT SELECT ON SYS.DBA_LIBRARIES TO LR_USER;</li> <li>• GRANT SELECT ON SYS.DBA_LOG_GROUPS TO LR_USER;</li> <li>• GRANT SELECT ON SYS.DBA_OBJECTS TO LR_USER;</li> <li>• GRANT SELECT ON SYS.DBA_SYNONYMS TO LR_USER;</li> <li>• GRANT SELECT ON SYS.DBA_TABLES TO LR_USER;</li> <li>• GRANT SELECT ON SYS.DBA_TRIGGERS TO LR_USER;</li> <li>• GRANT SELECT ON SYS.GV_\$INSTANCE TO LR_USER;</li> <li>• GRANT SELECT ON SYS.GV_\$SESSION TO LR_USER;</li> <li>• GRANT SELECT ON SYS.V_\$ARCHIVE_DEST TO LR_USER;</li> <li>• GRANT SELECT ON SYS.V_\$ARCHIVED_LOG TO LR_USER;</li> <li>• GRANT SELECT ON SYS.V_\$DATABASE TO LR_USER;</li> <li>• GRANT SELECT ON SYS.V_\$DATABASE_INCARNATION TO LR_USER;</li> <li>• GRANT SELECT ON SYS.V_\$INSTANCE TO LR_USER;</li> <li>• GRANT SELECT ON SYS.V_\$LOG TO LR_USER;</li> <li>• GRANT SELECT ON SYS.V_\$LOGFILE TO LR_USER;</li> <li>• GRANT SELECT ON SYS.V_\$LOGMNR_CONTENTS TO LR_USER;</li> <li>• GRANT SELECT ON SYS.V_\$LOGMNR_LOGS TO LR_USER;</li> <li>• GRANT SELECT ON SYS.V_\$PARAMETER TO LR_USER;</li> <li>• GRANT SELECT ON SYS.V_\$TRANSACTION TO LR_USER;</li> </ul>

## Multitenant Database Permissions

To set permissions for a multitenant database, run the scripts in the following files. They are also located in `<DPAgent_root>\LogReader\Scripts`. The same rules concerning `<LR_USER>` apply to this script, and so on.

### Note

The `<C##LR_USER>` in the container database must be the “common user” and the `<LR_USER>` user in the pluggable database is the “local user”.

- `oracle_multitenant_init_example_for_container_database.sql`
- `oracle_multitenant_init_example_for_pluggable_database.sql`

## Permissions for Processing Pool or Cluster Tables

If you want to process pool or cluster tables, you must uncomment the following lines from the `oracle_init_example.sql` file:

```
--grant select on SAPSR3.DM41S to LR_USER;
```

```
--grant select on SAPSR3.DM26L to LR_USER;
--grant select on SAPSR3.DD02VV to LR_USER;
--grant select on SAPSR3.DM40T to LR_USER;
--grant select on SAPSR3.DD02L to LR_USER;
--grant select on SAPSR3.DD16S to LR_USER;
--grant select on SAPSR3.DD03L to LR_USER;
--grant select on SAPSR3.DD02T to LR_USER;
--grant select on SAPSR3.DD03T to LR_USER;
--grant select on SAPSR3.DD04T to LR_USER;
--grant select on SAPSR3.DDNTT to LR_USER;
--grant select on SAPSR3.DDNTF to LR_USER;
```

For cluster and pool tables, multiple ECC tables are stored in a single physical Oracle table. Grant permission to access the physical Oracle table associated with the ECC table that you want to access. For example, to access the ECC BSEG table, you must grant access to the RFBLG Oracle physical. The `oracle_init_example.sql` file contains many examples of these tables, such as:

```
--grant select on SAPSR3.T000 to LR_USER;
--grant select on SAPSR3.KNA1 to LR_USER;
--grant select on SAPSR3.RFBLG to LR_USER;
--grant select on SAPSR3.VBAK to LR_USER;
--grant select on SAPSR3.VBAP to LR_USER;
```

You may need to add your own tables to this script.

## Related Information

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

## 6.18.2 Oracle Real-time Replication

Information about setting up your source system and adapter for real-time replication.

### i Note

We have found that the Oracle Log Miner maximum throughput is approximately 1 TB/day. With anything more than that, Oracle Log Miner begins to lag behind.

Therefore, no matter the amount of overage, if the replication volume is greater than 1 TB/day, there will be a delay in replication.

## Related Information

[Remote Database Setup for Oracle Real-time Replication \[page 359\]](#)

[Remote Database Cleanup for Oracle Real-time Replication \[page 362\]](#)

[Validate the Oracle Log Reader Environment \[page 362\]](#)

[Generate a Log Reader Remote Source Creation Script \[page 363\]](#)

## 6.18.2.1 Remote Database Setup for Oracle Real-time Replication

The remote Oracle database must be set up properly for this adapter to function correctly when using real-time replication.

This setup process is necessary only when using real-time replication.

### Oracle 12c Multitenant support

Multitenant databases are supported for Oracle 12c. Be aware that some of the setup procedures are different for multitenant. For example, in remote sources, the configuration, permissions, and cleanup procedures are different.

### LOB replication

When attempting LOB replication, be sure to set the `db_securefile` parameter to “PERMITTED” in the Oracle system. Depending on the Oracle version, the parameter may be set to a different value by default.

To do this, you can uncomment the following in the `oracle_init_example.sql` file:

```
ALTER SYSTEM SET db_securefile='PERMITTED';
```

#### i Note

SecureFiles LOB replication is not supported.

### Oracle to SAP HANA replication limitation

During real-time (CDC) replication for Oracle to SAP HANA, if the table in Oracle has a BLOB column as the first column, the replication fails due to `NullPointerException`, which LogMiner returns as an invalid SQL statement. This exception occurs on Oracle 11.2.0.3 and 11.2.0.4.

## Other Real-time Replication Limitations

The following limitations exist when performing real-time replication:

- Unsupported table types:
  - Table with all LOB columns
  - Table with computed columns
  - Table with LOB column and no primary key or unique index
  - Table with duplicated rows and no primary key
  - Table with user-defined identifier
  - Nested table

## Related Information

[Oracle Supplemental Logging \[page 360\]](#)

### 6.18.2.1.1 Oracle Supplemental Logging

Decide which logging level is best for you and set it up.

Set your logging level in the Adapter Preferences window of the Data Provisioning Agent configuration tool for the Oracle Log Reader adapter. Then, run the necessary scripts found in the `oracle_init_example.sql` file, located in `<DPAgent_root>\LogReader\Scripts`.

#### i Note

Be aware that the `oracle_init_example.sql` file is a template script. Execute only the DDL statements for your logging level by commenting or uncommenting lines as necessary.

## Table-level Logging

We recommend table-level logging, which turns on supplemental logging for subscribed tables and some required system tables.

To configure table-level logging, execute the following DDL statements from `oracle_init_example.sql` on your Oracle client and set the *Oracle supplemental logging level* Adapter Preferences option to [Table](#).

```
ALTER DATABASE ADD SUPPLEMENTAL LOG DATA;
```

```
ALTER TABLE <table_name> ADD SUPPLEMENTAL ...
```

## ! Restriction

When using Amazon Web Services in the cloud, you can configure only database-level supplemental logging for Oracle.

## Database-level Logging

Database-level logging turns on supplemental logging for all tables, including system tables.

To configure database-level logging, execute the following DDL statements from `oracle_init_example.sql` on your Oracle client and set the *Oracle supplemental logging level* Adapter Preferences option to *Database*.

```
ALTER DATABASE ADD SUPPLEMENTAL LOG DATA;  
ALTER DATABASE ADD SUPPLEMENTAL LOG DATA (PRIMARY KEY, UNIQUE) COLUMNS;
```

## Database-level Logging for Amazon Web Services

When using Amazon Web Services in the cloud, instead of using the ALTER DATABASE ADD SUPPLEMENTAL commands, enable database-level supplemental logging as shown in the following example:

```
begin  
    RDSADMIN.RDSADMIN_UTIL.ALTER_SUPPLEMENTAL_LOGGING(  
        P_ACTION => 'ADD');  
END;  
/  
begin  
    RDSADMIN.RDSADMIN_UTIL.ALTER_SUPPLEMENTAL_LOGGING(  
        P_ACTION => 'ADD',  
        P_TYPE => 'PRIMARY KEY');  
    RDSADMIN.RDSADMIN_UTIL.ALTER_SUPPLEMENTAL_LOGGING(  
        P_ACTION => 'ADD',  
        P_TYPE => 'UNIQUE');  
END;  
/
```

## Related Information

[OracleLogReaderAdapter Preferences \[page 367\]](#)

## 6.18.2.2 Remote Database Cleanup for Oracle Real-time Replication

Run SQL scripts to clean objects manually from the source database.

Cleanup scripts are used to drop database-level objects. Usually, you do not need to execute a cleanup script after an adapter is dropped, because the adapter drops these database-level objects automatically. However, in some cases, if any errors occur during or before automatically dropping these objects, the objects may not be dropped. At that point, you may need to execute the cleanup script to drop the objects.

You can find the script file at `<DPAgent_root>\LogReader\scripts\oracle_logreader_cleanup.sql`.

## 6.18.2.3 Validate the Oracle Log Reader Environment

You can use the Data Provisioning Agent command-line configuration tool to configure and validate the Oracle log reader environment before creating remote sources that use the Oracle Log Reader adapter.

### Prerequisites

Before validating the log reader environment, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA Smart Data Integration Product Availability Matrix (PAM)*.

Place your files in `<DPAgent_root>/lib`. Note that you must manually create the `/lib` folder.

### Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`
3. Choose *Oracle Replication Setup*.
4. Choose *Config Oracle Connection Info* to configure the connection used for other validation tasks.

Specify the information required to connect the configuration tool to the database:

- Whether to use SSL
- Whether the Oracle database is configured as a multitenant database
- Whether to use LDAP authentication
- The hostname, port number, database name, and service name for the Oracle database
- The Oracle username and password to use to connect to the database

The configuration tool connects to the database with the specified parameters when performing other validation tasks.



5. Perform validation and configuration tasks for the Oracle log reader environment.
  - To test whether the Oracle environment is ready for replication, choose [Oracle Replication Precheck](#).
  - To retrieve a list of all open transactions, choose [List Open Transactions](#).
  - To create an Oracle user with the permissions required for replication, choose [Create An Oracle User With All Permissions Granted](#).

For each task, provide any additional parameters required by the task. For example, to test whether the Oracle environment is ready for replication, you must specify the supplemental logging level when prompted.

## Next Steps

After you have validated the configuration of the Oracle log reader environment, you can create remote sources with the Oracle Log Reader adapter. You can manually create remote sources or generate a creation script with the command-line configuration tool.

## Related Information

[Generate a Log Reader Remote Source Creation Script \[page 363\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

### 6.18.2.4 Generate a Log Reader Remote Source Creation Script

Use the Data Provisioning Agent command-line configuration tool to validate parameters and generate a usable script to create a remote source for log reader adapters.

## Prerequisites

Before generating a remote source creation script for your source, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the *SAP HANA smart data integration Product Availability Matrix (PAM)*.

Before performing these steps, place your files in `<DPAgent_root>/lib`. Note that you must manually create the `/lib` folder.

## Procedure

1. At the command line, navigate to `<DPAgent_root>\bin`.
2. Start the configuration tool with the `--replicationSetup` parameter.
  - On Windows, `agentcli.bat --replicationSetup`
  - On Linux, `agentcli.sh --replicationSetup`
3. Choose the appropriate replication setup option for your remote source type.
4. Choose the appropriate log reader setup option for your remote source type.
5. Provide the configuration details for your remote source as prompted.

Specify the name of the agent to use and the name of the remote source to create, as well as any connection and configuration information specific to your remote source.

For more information each configuration parameter, refer to the remote source configuration section for your source type.

## Results

The configuration tool validates the configuration details for your remote source and generates a script that can be used to create the remote source. You can view the validation results in the Data Provisioning Agent log.

By default, the configuration tool generates the remote source creation script in the user temporary directory. For example, on Windows: `C:\Users\<username>\AppData\Local\Temp\remoteSource-<remote_source_name>.txt`.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

### 6.18.2.5 Connecting Multiple Remote Sources to the Same Oracle Source Database

You can connect multiple remote sources to the same remote database when the prerequisites are met.

To connect multiple remote sources to the same remote database, the following conditions must be met:

- Each remote source uses a unique Oracle database user to connect to the source database.
- A different source table is marked for replication; the same table cannot be marked for replication by different remote sources.

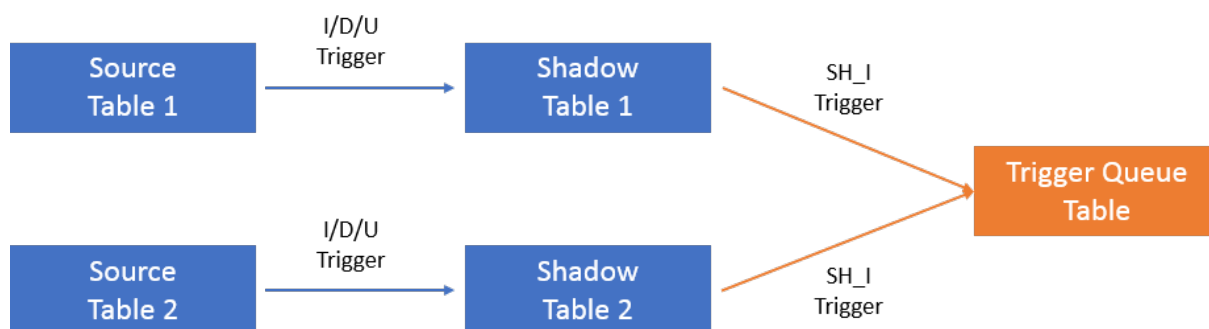
## 6.18.2.6 Oracle Trigger-Based Replication

Unlike like log reader functionality, which reads a remote database log to get changed data, trigger-based replication is based on triggers capturing changed data, and then the adapter continuously queries the source database to get the changed data. When a table is subscribed to replicate, the adapter creates three triggers (INSERT, UPDATE, and DELETE) on the table for capturing data. The supported operations are:

- Add a column
- Delete a column
- Alter a column datatype

The adapter also creates a shadow table for the subscribed table. Except for a few extra columns for supporting replication, the shadow table has the same columns as its replicated table. Triggers record changed data in shadow tables. For each adapter instance (remote source), the adapter creates a Trigger Queue table to mimic a queue. Each row in shadow tables has a corresponding element (or placeholder) in the queue. The adapter continuously scans the queue elements and corresponding shadow table rows to get changed data and replicate them to the target SAP HANA database.

### Architecture



### DDL Propagation

### Related Information

[System Objects Created in Oracle \[page 366\]](#)

[Required Permissions for Oracle Trigger-Based Replication \[page 367\]](#)

## 6.18.2.6.1 System Objects Created in Oracle

When you create a remote source to use trigger-based replication, a few system objects--such as tables, triggers, or procedures--are created on the Oracle source.

### Remote Source Level

(table) Trigger queue table: "LR\_USER"."SDI\_TRIGGER\_QUEUE"

(table) Mapping source to shadow table: "LR\_USER"."SDI\_SRC\_TO\_ST"

(table) Marker table: "LR\_USER"."SDI\_MARKERS"

(table) Shadow table of Marker table: "LR\_USER"."SDI\_<marker\_table\_oid>"

(trigger) Insert trigger on marker table: "LR\_USER"."SDI\_<marker\_table\_oid>\_I"

(trigger) Delete trigger on marker table: "LR\_USER"."SDI\_<marker\_table\_oid>\_D"

(trigger) Update trigger on marker table: "LR\_USER"."SDI\_<marker\_table\_oid>\_U"

(trigger) Insert trigger on shadow table of marker table: "LR\_USER"."SDI\_<marker\_table\_oid>\_SHI"

(table) DDL table: "LR\_USER"."SDI\_DDL\_CHANGE"

(table) Shadow table of DDL table: "LR\_USER"."SDI\_<DDL\_table\_oid>"

(trigger) Insert trigger on DDL table: "LR\_USER"."SDI\_<DDL\_table\_oid>\_I"

(trigger) Delete trigger on DDL table: "LR\_USER"."SDI\_<DDL\_table\_oid>\_D"

(trigger) Update trigger on DDL table: "LR\_USER"."SDI\_<DDL\_table\_oid>\_U"

(trigger) Insert trigger on shadow table of DDL table: "LR\_USER"."SDI\_<DDL\_table\_oid>\_SHI"

(procedure) Mark procedure: "LR\_USER"."SDI\_PROC\_V1"

(sequence) Scan sequence: "LR\_USER"."SDI\_SCAN\_SEQ"

(sequence) Trans sequence: "LR\_USER"."SDI\_TRIGGER\_SEQ"

(trigger) DDL trigger: "LR\_USER"."SDI\_DDL\_TRIG"

### Source Table Level

(table) Shadow table of source table: "LR\_USER"."SDI\_<source\_table\_oid>"

(trigger) Insert trigger on source table: "LR\_USER"."SDI\_<source\_table\_oid>\_I"

(trigger) Delete trigger on source table: "LR\_USER"."SDI\_<source\_table\_oid>\_D"

(trigger) Update trigger on source table: "LR\_USER"."SDI\_<source\_table\_oid>\_U"

(trigger) Insert trigger on shadow table of source table: "LR\_USER"."SDI\_<source\_table\_oid>\_SHI"

### 6.18.2.6.2 Required Permissions for Oracle Trigger-Based Replication

Grant permissions and privileges to use Oracle trigger-based replication.

```
GRANT CREATE SEQUENCE TO <remote_source_user>;
```

```
GRANT DROP SEQUENCE TO <remote_source_user>;
```

```
GRANT CREATE PROCEDURE TO <remote_source_user>;
```

```
GRANT DROP PROCEDURE TO <remote_source_user>;
```

```
GRANT CREATE ANY TRIGGER TO <remote_source_user>;
```

```
GRANT DROP ANY TRIGGER TO <remote_source_user>;
```

```
GRANT ADMINISTER DATABASE TRIGGER TO <remote_source_user>;
```

```
GRANT CREATE TABLE TO <remote_source_user>;
```

```
GRANT DROP TABLE TO <remote_source_user>;
```

```
GRANT ALTER TABLE TO <remote_source_user>;
```

```
GRANT SELECT TABLE TO <remote_source_user>;
```

```
GRANT CREATE INDEX TO <remote_source_user>;
```

## 6.18.3 OracleLogReaderAdapter Preferences

Configuration parameters for the Oracle Log Reader adapter.

#### Note

Log Reader adapter preferences - with the exception of Number of wrapped log files, Enable verbose trace, and Maximum log file size - are no longer set in the Data Provisioning Agent Configuration Tool. They are part of the remote source configuration options in SAP HANA. If you have upgraded from a previous version, then the settings you find in the Agent Configuration Tool are your previous settings, displayed for your reference.

You can adjust Oracle Log Reader adapter settings in the Data Provisioning Agent Configuration Tool.

(<DPAgent\_root>/configTool/dpagentconfigtool.exe)

Parameter	Description	Default value
Distinguished Name (DN) in Certificate	<p>The distinguished name (DN) of the primary data server certificate.</p> <ul style="list-style-type: none"> <li>This parameter is valid only if <a href="#">Use SSL</a> is set to "true".</li> <li>If this parameter is set, the DN field in the server certificate is verified to match this parameter. If it does not match, the connection to the primary data server fails.</li> </ul>	
Oracle supplemental logging level	<p>Specifies the level of supplemental logging.</p> <ul style="list-style-type: none"> <li>Table: Table level turns on supplemental logging for subscribed tables and some required system tables.</li> <li>Database: Database level turns on supplemental logging for all tables, including system tables.</li> </ul>	table
Maximum operation queue size	The maximum number of operations permitted in the log reader operation queue during replication.	1000
Maximum scan queue size	The maximum number of log records permitted in the log reader log scan queue during replication.	1000
Maximum session cache size	The maximum number of Oracle sessions to be cached in memory during replication.	1000
Enable parallel scanning	<p>Specifies whether to turn on parallel scanning.</p> <p>To achieve better performance for high volume log throughput, set the parameter to <b>true</b> to enable parallel scanning.</p>	false
Queue size of parallel scan tasks	Specifies the number of tasks in the queue.	0
Parallel scan SCN range	The maximum number of system change numbers (SCN) processed by each Oracle LogMiner scanner, when parallel scan is enabled, that is, when <code>lr_parallel_scan</code> is true.	1024
Number of parallel scanners	Specifies the number of parallel scanners.	4
Number of log record rows fetched by the scanner at a time	Specifies the number of log record rows fetched by the scanner.	1
Ignore log record processing errors	Determines whether to ignore log record processing errors.	false

Parameter	Description	Default value
Replicate LOB columns	Oracle logs all LOB data in the Oracle redo log, except for BFILE datatypes . This allows the agent to apply each LOB change. However, for BFILE data, the same technique is used.	true
Ignore data of unsupported types stored in ANYDATA	Specifies whether you want to ignore data with unsupported types housed in ANYDATA wrapper.	false
Database connection pool size	Maximum number of connections allowed in the connection pool on a secondary node.	15
Number of times to retry to connect if a connections fails	Instructs the client library, such as DBLIB, ODBC, ADO, and so on, to keep retrying the connection attempt, as long as the server is not found, for the specified number of times.	5
Timeout in seconds to retry connecting	The number of seconds the agent waits between retry attempts to connect to the primary database.	10
Number of wrapped log files	The maximum size, in 1K blocks, of the agent system log file before wrapping.	3
Enable verbose trace	Enables or disables additional diagnostic information in the agent system log files.	false
Maximum log file size	Limit the size of the message log to conserve disk space.	1000
Turn on asynchronous logging mode	Specifies whether or not LogReader should turn on asynchronous logging mode. (TRUE, FALSE)	TRUE
Maximum size of work queue for asynchronous logging	The maximum size of the work queue for asynchronous logging file handler to collect the log records (1 to 2147483647)	1000

Parameter	Description	Default value
Discard policy for asynchronous logging file handler	<p>Specifies the discard policy for the asynchronous logging file handler when the work queue is saturated.</p> <ul style="list-style-type: none"> <li>BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>DISCARD: The log records that cannot be offered into queue are dropped.</li> <li>DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried, which can fail again, causing this to be repeated.</li> </ul>	BLOCKING

## Related Information

[Oracle Database Permissions \[page 352\]](#)

[Oracle Supplemental Logging \[page 360\]](#)

## 6.18.4 Oracle Log Reader Remote Source Configuration

Configure the following options for a connection to an Oracle remote source.

### Note

When setting up a remote source and you use a remote source name longer than 30 characters, the generated log reader folder name under `<DPAgent_root>/LogReader/` is converted to `AGENT<xxxx>`.

The log file is located at `<DPAgent_root>/log/framework.trc`, and reads: "The instance name `<original_name>` exceeds 30 characters and it is converted to `<converted_name>`."

Category	Option	Description
Generic	Always Map Character Types to Unicode	Determines whether a CHAR/VARCHAR2/CLOB column in the source database is mapped to a Unicode column type in SAP HANA when the source database character set is non-ASCII. The default value is <i>False</i> .



Category	Option	Description
		<p>The value of this parameter can be changed when the remote source is suspended.</p> <div> <b>i Note</b> <p>Set this parameter to <i>True</i> only when the remote database is multibyte character sets, such as UTF-8, GBK, and JA16SJIS.</p> </div>
	Map INTEGER/NUMBER to DECIMAL(38,0)	<p>Set this parameter to <i>True</i> when you want to map INTEGER/NUMBER to DECIMAL(38,0). Otherwise, INTEGER/NUMBER maps to DECIMAL, which has a precision of 34.</p> <p>The default is <i>False</i>.</p>
	Timezone Format	<p>The time zone format to use for time stamps that include a time zone data type.</p> <ul style="list-style-type: none"> <li>• <i>TZR</i>: The time zone name. For example, <i>US/Pacific</i></li> <li>• <i>TZH:TZM</i>: The hour and minute time zone offset. For example, <i>+8:00</i></li> </ul>
	Load and Replicate LOB columns	<p>When this parameter is set to false, the LOB columns are filtered out when doing an initial load and real-time replication.</p> <div> <b>i Note</b> <p>This option isn't available for an ECC adapter.</p> </div> <p>The value of this parameter can be changed when the remote source is suspended.</p>
Database	Multitenant Database	<p>Specifies whether to enable multitenant support.</p> <ul style="list-style-type: none"> <li>• <i>True</i>: Replicate multitenant database</li> <li>• <i>False</i>: Replicate normal database</li> </ul>
	Use Oracle TNSNAMES File	<p>Specifies whether to use the connection information from the Oracle <code>tnsnames.ora</code> file to connect to the Oracle database. If set it to <i>False</i>, you must configure the <i>Host</i>, <i>Port</i></p>

Category	Option	Description
		<p><i>Number</i>, and <i>Database Name</i> parameters. If set to <i>True</i>, configure the <i>Oracle TNSNAMES File</i> and <i>Oracle TNSNAMES Connection</i> parameters.</p> <p>The default value is <i>False</i>.</p>
	Host	<p>The host name or IP address on which the remote Oracle database is running.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Port Number	The Oracle database server port number
	Database Name	The Oracle database name
	Service Name	Specifies the service name of Oracle database. When creating a remote source, you must set only one of the following parameters: <i>Database Name</i> and <i>Service Name</i> . If you set both, the Data Provisioning agent connects to Oracle by the service name as the first choice.
	Container Database Service Name	The service name of the container database
	Pluggable Database Service Name	The service name of the pluggable database
	Oracle TNSNAMES File	<p>The full path of the Oracle <code>tnsnames.ora</code> file. For example, <code>C:\usr\sap\dataprovagent\lib\tnsnames.ora</code>.</p> <div> <p><b>i Note</b></p> <p>The <code>tnsnames.ora</code> file must be local to the Data Provisioning Agent machine or available to the Data Provisioning Agent. Copy the file from the Oracle location to the Agent machine.</p> <p>The <code>tnsnames.ora</code> file is typically located at <code>\$ORACLE_HOME\NETWORK\ADMIN\tnsnames.ora</code> on the Oracle database machine.</p> </div>

Category	Option	Description
	Oracle TNSNAMES Connection	The Oracle connection name that identifies the primary database connection in the Oracle <code>tnsnames.ora</code> file.
	Container Database TNSNAMES Connection	The Oracle connection name that identifies the container database connection in the Oracle <code>tnsnames.ora</code> file.
	Pluggable Database TNSNAMES Connection	The Oracle connection name that identifies the pluggable database connection in the Oracle <code>tnsnames.ora</code> file.
	Whitelist Table in Remote Database	Enter the name of table that contains the whitelist in the remote database.
LDAP Authentication	Use LDAP Authentication	Set to <i>True</i> to enable LDAP authentication for the Oracle database. The default is <i>False</i> .
<div> <div>i Note</div> <p>The Oracle log reader adapter doesn't support the following LDAP scenarios:</p> <ul style="list-style-type: none"> <li>• Oracle multi-tenant architecture</li> <li>• LDAP + SSL authentication</li> <li>• LDAP + Kerberos authentication</li> <li>• LDAP failover mode</li> </ul> </div>		
	LDAP Server	The host name or IP address of the LDAP server
	LDAP Port	The port number of the LDAP server
	Database Service Name	The service name of the Oracle database
	Base Distinguished Name (DN)	The base distinguished name of a directory user on the LDAP server for authentication.
Schema Alias Replacements	Schema Alias	Schema name to be replaced with the schema provided in the <i>Schema Alias Replacement</i> parameter. If given, accessing tables under this alias is considered to be accessing tables under the schema given in <i>Schema Alias Replacement</i> .

Category	Option	Description
		The value of this parameter can be changed when the remote source is suspended.
	Schema Alias Replacement	<p>Schema name to be used to replace the schema given in <a href="#">Schema Alias</a>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
Security	Use SSL	<p>Specifies whether you're using SSL.</p> <p>The default value is <a href="#">False</a>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Distinguished Name (DN) in Certificate	<p>The distinguished name (DN) of the primary data server certificate.</p> <div> <p><b>i Note</b></p> <ul style="list-style-type: none"> <li>This parameter is valid only if <a href="#">Use SSL</a> is set to <a href="#">True</a>.</li> <li>If this parameter is set, the DN field in the server certificate is verified to match this parameter. If it doesn't match, the connection to the primary data server fails.</li> </ul> </div> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Require Client Authentication	<p>Specifies whether client authentication is required. If client authentication is required, the client sends its own certificate to the server and the server verifies that the client certificate is signed by a trusted CA.</p> <div> <p><b>i Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
	Use Agent Stored Credential	<p>Set to <a href="#">True</a> to use credentials that are stored in the Data Provisioning Agent secure storage.</p>

Category	Option	Description
		<p>The default value is <i>False</i>.</p> <div> <p><b>Note</b></p> <p>When you use credentials stored in the agent secure storage, you must still specify the user name in <i>Credentials</i>. Additionally, the <i>Credential Mode</i> must not be <i>none</i> or empty.</p> </div>
JDBC Driver Configuration	Include Table/Columns Remarks	<ul style="list-style-type: none"> <li><i>True</i>: Returns a description of the table/column. If you have many tables, setting this parameter to "True" can impede performance.</li> <li><i>False</i> (Default): Turns off the return of descriptions.</li> </ul> <p>The value of this parameter can be changed when the remote source is suspended.</p>
CDC Properties > Database Configuration	Oracle Supplemental logging level	<p>Specifies the level of supplemental logging.</p> <ul style="list-style-type: none"> <li><i>Table</i>: Enables supplemental logging for subscribed tables and some required system tables.</li> <li><i>Database</i>: Enables supplemental logging for all tables including system tables.</li> </ul> <p>The default value is <i>Table</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
CDC Properties > Parallel Scan	Enable parallel scanning	<p>Specifies whether to enable parallel scanning.</p> <p>To achieve better performance for high volume log throughput, set the parameter to <i>True</i> to enable parallel scanning.</p> <p>The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Number of parallel scanners	<p>Specifies the number of parallel scanners. The value range is 1–250.</p>

Category	Option	Description
		<p>As a general rule, the more scanners you have, the higher the memory usage and the better the throughput. Fewer scanners means less memory usage and lower throughput.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Queue size of parallel scan tasks	<p>Specifies the number of tasks in the queue. The value range is 0–2147483647 .</p> <p>Setting <i>Queue size of parallel scan tasks</i> to zero (0) means that each parallel scanner queue will be of unlimited size (based on the <i>SCN range of parallel scan tasks</i> parameter). This puts a lot of records in the queue and, because processing the queue is slower, the scanned records pile up and can lead to out-of-memory events.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Enable parallel scanning by archived log	<p>Determines whether the Replication Agent should run parallel Oracle LogMiner scanners using archive logs.</p> <p>This option takes effect when <i>Enable parallel scanning</i> is set to <i>True</i>, <i>Enable parallel scanning</i> by archived log is set to <i>True</i>.</p> <p>The default value is <i>False</i>.</p> <p>When <i>Enable parallel scanning</i> by archived log is set to <i>True</i>, Redo logs with a “current” status are never touched. Oracle Logminer may read transactions from a redo log that has a status of <code>archived=yes</code>. There may be a delay in replication until the redo logs get saved to an archived status.</p>

Category	Option	Description
		<p><b>i Note</b></p> <p>This parameter isn't supported for an Oracle RAC remote source.</p> <p><b>i Note</b></p> <p>Use this option only after consultation with SAP support.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	SCN range of parallel scan tasks	<p>The maximum number of system change numbers (SCN) processed by each Oracle LogMiner scanner when the <i>Enable parallel scanning</i> parameter is set to <i>True</i>. The value range is 0–2147483647 .</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
CDC Properties	Capture mode	<ul style="list-style-type: none"> <li>• <i>Trigger</i>: Choose <i>Trigger</i> to enable trigger-based change data capture.</li> <li>• <i>LogMiner</i>: Choose <i>LogMiner</i> to enable log-based change data capture.</li> </ul>
	Maintenance User Filter (Case Sensitive)	<p>Optional. Enter a source database user name. Source database transactions (INSERT, UPDATE, DELETE, and DDL changes such as ALTER TABLE) conducted by this user is filtered out (ignored) and not propagated to the SAP HANA target. For example, if you log in to the source database with this maintenance user and delete a row from a source table that is subscribed for replication, this row isn't deleted from the SAP HANA target table.</p> <p><b>i Note</b></p> <p>Don't use the same name as the database user name.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>

Category	Option	Description
	Ignore log record processing errors	<p>Specifies whether the Log Reader should ignore the errors that occur during log record processing. If set to <i>True</i>, the replication doesn't stop if log record processing errors occur. The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Ignore log record processing errors	<div> <b>i Note</b> <p>This parameter is available only when you're using the Oracle Log Reader ECC adapter.</p> </div> <p>Specifies whether to ignore log record declustering errors. If set to <i>True</i>, the replication doesn't stop if log record declustering errors occur. The default value is <i>False</i>.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Maximum operation queue size	<p>The maximum number of operations permitted in the log reader operation queue during replication. The value range is 25–2147483647.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Maximum scan queue size	<p>The maximum number of log records permitted in the log reader log scan queue during replication. The value range is 25–2147483647.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Maximum session cache size	<p>The maximum number of Oracle sessions to be cached in memory during replication. The value range is 128–2147483647.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>



Category	Option	Description
	Number of log record rows fetched by the scanner at a time	<p>Specifies the number of log record rows fetched by the scanner. The value range is 1–1000 .</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Use database link to query pluggable database	<p>Indicates whether the LogReader uses database link instead of the CONTAINERS clause to query the pluggable database. The default value is “true”.</p> <p>This parameter takes effect only when the <i>Multitenant Database</i> parameter is set to <i>True</i>.</p> <div> <p><b>i Note</b></p> <p>Ensure that the user is granted the GRANT CREATE DATABASE LINK to C##LR_USER; permission, located in the oracle_multitenant_init_example_for_pluggable_database.sql file.</p> </div> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Ignore data of unsupported types stored in ANYDATA	<p>Specifies whether you want to ignore data with unsupported types contained in the ANYDATA wrapper.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Database connection pool size	<p>Maximum number of connections allowed in the connection pool on a secondary node. The value range is 1–64.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Number of times to retry to connect if a connection fails	<p>Instructs the client library, such as DBLIB, ODBC, and ADO, to keep retrying the connection attempt, as long as the server isn't found, for the</p>

Category	Option	Description
		<p>specified number of times. The value range is 1 to 2147483647.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Timeout in seconds to retry connecting	<p>The number of seconds the Data Provisioning Agent waits between retry attempts to connect to the primary database. The value range is 1 to 3600.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Keep supplemental logging on table	<p>Determines whether the Data Provisioning Agent drops the supplemental logging when dropping the subscription of a table.</p> <ul style="list-style-type: none"> <li>• <b>True:</b> Keeps the supplemental logging.</li> <li>• <b>False:</b> Drops the supplemental logging. (Default value)</li> </ul> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Enable deferrable rescan	<p>By default, the Oracle adapter performs a rescan when encountering each invalid log record due to an Oracle LogMiner restriction. If there are many invalid log records in a transaction, the rescanning process may become a performance bottleneck. Deferred rescan provides a performance enhancement that performs a rescanning only one time per transaction to resolve all invalid log records together. Deferred rescan can also solve some types of invalid record problems in parallel scanning mode.</p> <div> <p><b>⚠ Caution</b></p> <p>Before using this feature, SAP Support must analyze to identify the root cause of performance issues and determine whether it's appropriate to enable deferrable rescan mode. Use the two deferrable rescan options only</p> </div>

Category	Option	Description
		<p>after consultation with SAP support.</p> <ul style="list-style-type: none"> <li>• <i>True</i>: If it encounters UNSUPPORTED LogMiner operations, it performs a deferred rescan on the current transaction.</li> <li>• <i>False</i>: Disables the deferred rescan and uses the default transaction processing logic. (Default value)</li> </ul>
	Start LogMiner with online dictionary in deferrable rescan	<p>By default, the Oracle adapter performs a rescan when encountering each invalid log record due to an Oracle LogMiner restriction. If there are many invalid log records in a transaction, the rescanning process may become a performance bottleneck. Deferred rescan provides a performance enhancement that performs a rescanning only one time per transaction to resolve all invalid log records together. Deferred rescan can also solve some types of invalid record problems in parallel scanning mode.</p> <div> <p><b>⚠ Caution</b></p> <p>Before using this feature, SAP Support must analyze to identify the root cause of performance issues and determine whether it's appropriate to enable deferrable rescan mode. Use the two deferrable rescan options only after consultation with SAP support.</p> </div> <ul style="list-style-type: none"> <li>• <i>True</i> Indicates that the deferred rescan on the current transaction uses the LogMiner DBMS_LOGMNR.DICT_FROM_ONLINE_CATALOG option. (Default value)</li> <li>• <i>False</i> Indicates that the deferred rescan on the current transaction doesn't use the LogMiner DBMS_LOGMNR.DICT_FROM_ONLINE_CATALOG option.</li> </ul>

Category	Option	Description
		<p><b>i Note</b></p> <p>Use this option only after consultation with SAP support.</p>
	Disable DDL scanner	Disable scanning for DDL operations.
	Enable rescan for rollback operations	Enable rescanning for rollback operations.
	Allow to read Oracle SYS.USER\$	<p>Specifies whether the log reader can access SYS.USER\$ for Oracle user identification.</p> <ul style="list-style-type: none"> <li>• <i>True</i> Indicates that the log reader can access SYS.USER\$ directly.</li> <li>• <i>False</i> Indicates that the log reader must use a different view for user identification. The name of the view must be specified in the <i>View to obtain users information</i> parameter.</li> </ul>
	View to obtain users information (Upper Case)	<p>Specifies the name of the view to use for user identification (upper case). This option takes effect when <i>Allow to read Oracle SYS.USER\$</i> is set to <i>False</i>.</p> <p>The default value is <i>RA_ALL_USERS_VIEW</i>. The template for the creation of this view can be found in <code>oracle_init_example.ini</code>.</p> <p><b>i Note</b></p> <p>This view must be created in the current database user schema and named in all upper-case characters.</p> <p><b>i Note</b></p> <p>The default view is based on ALL_USERS. Although this view requires lesser permission privileges, it may not include all Oracle users and may affect the replication process.</p>
	Trigger-based: System object prefix	(Case Insensitive) The prefix of the names of the Oracel adapter system objects created in the source Oracle database by the adapter. We

Category	Option	Description
		recommend keeping the default value of SDI_.
	Trigger-based: Connection pool size	<p>Maximum number of connections allowed in the connection pool. The default value is 8.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Trigger-based: Minimum scan interval in seconds	<p>The minimum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value is 0 (seconds), which means there is no waiting time before the next scan.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Trigger-based: Maximum scan interval in seconds	<p>The maximum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value is 10 (seconds). If the adapter scans the queue and finds that the queue is empty, it will gradually increase the scan interval from the minimum scan interval to the maximum scan interval.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Trigger-based: Maximum batch size	<p>The maximum number of consecutive change data on the same table that are batched to process and send to Data Provisioning Server together. The default value is 128.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Trigger-based: Batch queue size	<p>The internal batch queue size. The batch queue size determines the maximum number of batches of change data that are queued in memory. The default value is 64.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>

Category	Option	Description
	Trigger-based: Maximum transaction count in scan	<p>The maximum number of transactions being processed in a scan of the remote source database. The default value is 1000.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Trigger-based: Maximum scan size	<p>The maximum number of rows being fetched from the trigger queue table in one scan and assigned to batch jobs for further processing. The default value is 50000.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
	Trigger-based: Triggers record PK only	<p>Set to <i>True</i> to have the triggers record only primary keys of delta data during CDC processing. This action may improve the DML performance in the source database.</p> <p>The default value is <i>False</i>.</p> <div> <p><b>Note</b></p> <p>If this parameter is set to <i>False</i>, during the time period between when DDL changes occur on the source database and when they are replicated to the target HANA database, there must be no DML changes on the subscribed source tables. Replicating DDL changes would trigger the Oracle trigger-based adapter to update (drop and then re-create) triggers and shadow tables on the changed source tables. Errors may result if any data is inserted, updated, or deleted on the source tables during this time period.</p> <p>2. If this parameter is set to <i>True</i> simple table structure changes (for example, adding a non-key field) is supported in real time.</p> </div>

Category	Option	Description
	Trigger-based: Capture before and after images	<p>This option is only valid when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <ul style="list-style-type: none"> <li><i>True</i>: A trigger captures both before and after images of UPDATE operations on the remote table. Updates of primary key values are also supported, when this is set to True.</li> <li><i>False</i>: A trigger captures only the after image of UPDATE operations on the remote table.</li> </ul> <p>The default value is <i>False</i>.</p>
Credentials	Credentials Mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
Credentials > Oracle Connection Credential	User Name	Oracle user name (case-sensitive)
	Password	<p>Oracle user password</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
Credentials > Oracle Multitenant Credential	Common User Name	The common user name in the container database (case-sensitive)
	Common User Password	<p>The common user password in the container database</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>

## SQL Example

```
CREATE REMOTE SOURCE "oracleadapter_zhuj1" ADAPTER "OracleLogReaderAdapter" AT
LOCATION AGENT "JianbingAgentLocal" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
```

```

<ConnectionProperties name="configurations">
  <PropertyGroup name="database" displayName="Database">
    <PropertyEntry name="map_char_types_to_unicode"
displayName="map_char_types_to_unicode" isRequired="true">>false</PropertyEntry>
    <PropertyEntry name="pds_host_name" displayName="Host"
isRequired="true">10.9.44.56</PropertyEntry>
    <PropertyEntry name="pds_port_number" displayName="Port Number"
isRequired="true">1521</PropertyEntry>
    <PropertyEntry name="pds_database_name" displayName="Database Name"
isRequired="true">or1211a</PropertyEntry>
    <PropertyEntry name="capture_mode" displayName="Capture Mode"
isRequired="true">logminer</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="logreader" displayName="LogReader">
    <PropertyEntry name="lr_parallel_scan" displayName="Enable parallel
scanning" isRequired="false">>true</PropertyEntry>
    <PropertyEntry name="lr_parallel_scanner_count" displayName="Number of
parallel scanners" isRequired="false">4</PropertyEntry>
    <PropertyEntry name="lr_parallel_scan_queue_size" displayName="Queue
size of parallel scan tasks" isRequired="false">0</PropertyEntry>
    <PropertyEntry name="lr_parallel_scan_range" displayName="SCN range of
parallel scan tasks" isRequired="false">1024</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>LR_USER</user>
  <password>Sybase123</password>
</CredentialEntry>';

```

## Related Information

[CREATE REMOTE SUBSCRIPTION Statement \[Smart Data Integration\] \[page 543\]](#)

[Create Credentials for a Secondary User](#)

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

[Security Aspects of SAP HANA Smart Data Access \(SAP HANA Security Guide\)](#)

[Creating a Whitelist to Limit Access to a Source Database \[page 394\]](#)

[Using a Schema Alias \[page 386\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 82\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Command Line\] \[page 68\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

## 6.18.5 Using a Schema Alias

Using a schema alias can help you manage multiple schema, remote sources, and tables more easily.

The *Schema Alias* and *Schema Alias Replacement* options, available in the remote source configuration parameters for some Data Provisioning adapters, allow you to switch easily between schema, remote sources, and tables. The *Schema Alias* is the name of the schema in the original system. The *Schema Alias Replacement* is the name of the schema in the current system that replaces the *Schema Alias* name.

A common use case is to create a remote source pointing to a development database (for example, DB\_dev), and then create virtual tables under that remote source. Afterward, you may switch to the production database



(for example, DB\_prod) without needing to create new virtual tables; the same tables exist in both DB\_dev and DB\_prod, but under different schema and databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB\_dev, for example. Note that OWNER1.MYTABLE is the unique name of the source table, and it is a property of the virtual table. With it, the adapter knows which table in the source database it is expected to access. However, when you switch to the production database (DB\_prod), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name information of the virtual table cannot be changed once created.

You can resolve this problem using the Schema Alias options. In this case, we want to tell the adapter to replace OWNER1 with OWNER2. For example, when we access OWNER1.MYTABLE, the adapter should access OWNER2.MYTABLE. So here, OWNER1 is *Schema Alias* from the perspective of DB\_prod, while OWNER2 is *Schema Alias Replacement*.

To use this functionality, you must populate both of these options.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

[SAP HANA Remote Source Configuration \[page 444\]](#)

[SDI DB2 Mainframe \[page 460\]](#)

## 6.18.6 Oracle RAC Configuration

Configure an Oracle Real Application Cluster (RAC) source by, among other requirements, setting up the tnsnames.ora file.

When a Data Provisioning Adapter for an Oracle instance initializes, the Oracle database is queried to determine how many nodes are supported by the cluster. Based on this information, the Data Provisioning Adapter automatically configures itself to process the redo log information from all nodes.

You configure the Data Provisioning Adapter to connect to a single Oracle instance by supplying the required *Host*, *Port Number*, and *Database Name* remote source configuration parameters. However, in an Oracle RAC environment, the Data Provisioning Adapter must be able to connect to any node in the cluster in the event that a node fails or otherwise becomes unavailable. To support the configuration of multiple node locations, the Data Provisioning Adapter supports connectivity to all possible RAC nodes by obtaining necessary information from an Oracle tnsnames.ora file for one specified entry. As a result, instead of configuring individual host, port, and instance names for all nodes, the Data Provisioning Adapter requires only the location of a tnsnames.ora file and the name of the TNS connection to use. Therefore, it's recommended that you point the Data Provisioning Adapter to a tnsnames.ora entry that contains the address for all nodes in the cluster.

Refer to the following procedure for details on the correct configuration for an Oracle RAC source.

## Related Information

[Configure an Oracle RAC source \[page 388\]](#)

[Configure an Oracle RAC source \[page 388\]](#)

### 6.18.6.1 Configure an Oracle RAC source

Configure the remote source for Oracle Real Application Cluster (RAC) as follows.

#### Procedure

1. Use the `tnsnames.ora` file to connect to Oracle, instead of providing individual host names and SIDs, by setting the remote source property [Database > Use TNSNAMES file](#) to `true`.
2. Ensure the `tnsnames.ora` file includes details for all nodes.

```
RAC11G =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (LOAD_BALANCE = yes)
      (FAILOVER = ON)
      (ADDRESS = (PROTOCOL = TCP) (HOST = www.xxx.yyy.zz1)
        (PORT = 1521))
      (ADDRESS = (PROTOCOL = TCP) (HOST = www.xxx.yyy.zz2)
        (PORT = 1521))
      (ADDRESS = (PROTOCOL = TCP) (HOST = www.xxx.yyy.zz3)
        (PORT = 1521))
    )
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = rac11g)
    )
  )
```

3. Configure `tnsnames.ora` with the entry of the global SID to the remote source.

```
<net_service_name> =
  (DESCRIPTION =
    (ADDRESS = (<protocol_address_information>))
    (CONNECT_DATA =
      (SERVICE_NAME = <service_name>))
  )
```

For example:

```
ABC =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP) (HOST = hostname.com) (PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = ABC) ) )
```

4. If the Data Provisioning Agent and Oracle source are on different computers, for all versions up to and including HANA DP AGENT 1.0 SP03 Patch 2 (1.3.2), set the parameter [CDC Properties > Database](#)

[Configuration](#) ► [Oracle Timezone File](#) ► to a location that the Data Provisioning Agent can access. Note that the [Oracle Timezone File](#) parameter was removed in version HANA DP AGENT 1.0 SP03 Patch 3 (1.3.3).

5. Set the parameter ► [Database](#) ► [Oracle TNSNAMES Connection](#) ► to use `<net_service_name>`.
6. Set the location of the ► [Database](#) ► [Oracle TNSNAMES File](#) ► to `tnsnames.ora`. This location must be available to the Data Provisioning Agent computer.

[Oracle TNSNAMES file](#) = `/usr/sap/dataprovagent/tnsnames.ora`

7. For HANA DP AGENT 1.0 versions SP00, SP01, and SP02, edit the `dpagentconfig.ini` file to include the entry `logreader.rasd.type=DERBYEMB` and restart the DP Agent.

## 6.18.7 Amazon Web Services Configuration

Extra configuration steps and tips for Oracle on Amazon Relational Database Service (RDS).

### Procedure

1. To avoid remote access issues, in Amazon RDS ensure the database instance setting [Publicly Accessible](#) has been enabled.
2. To avoid remote access issues, in Amazon RDS configure the security group as follows.
  - a. Open the EC2 console.
  - b. Select [Security Group](#) in the left pane.
  - c. Choose the Security Group ID.
  - d. Click the [Inbound](#) tab and click [Edit](#).
  - e. Click [Add Rule](#) and configure the following options:
    - [Type](#) = [Oracle-RDS](#)
    - [Source](#) = [Anywhere](#)
  - f. Click [Save](#).
3. Grant access rights as described in the `oracle_init_example.sql` template file, which is located in the Data Provisioning Agent installation folder `<DPAgent_root>\LogReader\scripts`.
4. Enable database-level supplemental logging as described in the `oracle_init_example.sql` template file in `<DPAgent_root>\LogReader\scripts`.

### Related Information

[Oracle Database Permissions \[page 352\]](#)

[Oracle Supplemental Logging \[page 360\]](#)

[Amazon Virtual Private Cloud \(VPCs\) and Amazon RDS](#) ➡

[Controlling Access with Amazon RDS Security Groups](#) ➡

## 6.18.8 Log Reader Adapter Log Files

You can review processing information in the Log Reader log files.

The following files are available:

Log file name and location	Description
<code>&lt;DPAgent_root&gt;/LogReader/admin_logs/admin&lt;instance_name&gt;.log</code>	Log Reader administration log
<code>&lt;DPAgent_root&gt;/log/&lt;instance_name&gt;.log</code>	Log Reader instance log

### i Note

By default, the adapter instance name is the same as the remote source name when the remote source is created from the SAP HANA Web-based Development Workbench.

## 6.18.9 Synchronize the Oracle and Data Provisioning Agent Timestamp

### Context

If there is timestamp with a local time zone column in an Oracle table, the Data Provisioning Agent must have the same time zone. To change the timezone, use the following procedure before starting the Data Provisioning Agent.

### Procedure

1. Find the Oracle server time zone. For example, use “date -R” in linux. Example: -04:00.
2. Open the `dpagent.ini` file in Data Provisioning Agent install root directory.
3. Add “-Duser.timezone=GMT-4” to the `dpagent.ini` file.
4. Start the Data Provisioning Agent.

## 6.18.10 Configure SSL for the Oracle Log Reader Adapter

Set up secure SSL communication between Oracle and the Data Provisioning Agent.

### Context

If you want to use SSL communication between your Oracle source and the Data Provisioning Agent, you must create and import certificates and configure the source database.

#### Note

The SSLv3 protocol is disabled by default in JDK 8 Update 31 and newer. If SSLv3 is absolutely required for your environment, you can reactivate the protocol by removing **SSLv3** from the `jdk.tls.disabledAlgorithms` property in the `java.security` file.

### Procedure

1. On the Oracle source database host, create directories for the root certificate authority (CA) and server certificates.

For example:

- `c:\ssl\oracle\root`
- `c:\ssl\oracle\server`

2. Create and export a self-signed CA certificate.

Use the `orapki` tool on the Oracle host system.

- a. Create an empty wallet.

```
orapki wallet create -wallet c:\ssl\oracle\server -auto_login_only
```

- a. Add a self-signed CA certificate to the new wallet.

```
orapki wallet add -wallet c:\ssl\oracle\root -dn "CN=test_ca,C=US" -  
keysize 1024 -self_signed -validity 3650 -pwd <password>
```

- b. Export the certificate.

```
orapki wallet export -wallet c:\ssl\oracle\root -dn "CN=test_ca,C=US" -  
cert c:\ssl\oracle\root\cacert.cer -pwd <password>
```

3. Create the server certificate.

Use the `orapki` tool on the Oracle host system.

- a. Create a server wallet.

```
orapki wallet create -wallet c:\ssl\oracle\server -auto_login_only
```

- b. Add key pairs to the new server wallet.

```
orapki wallet add -wallet c:\ssl\oracle\server -dn
"CN=PVG50869480A.SAP.COM,C=US" -keysize 1024 -auto_login_only
```

- c. Export a request to sign the server certificate.

```
orapki wallet export -wallet c:\ssl\oracle\server -dn
"CN=PVG50869480A.SAP.COM,C=US" -request c:\ssl\oracle\server
\server_req.cer
```

- d. Sign the exported request using the CA certificate.

```
orapki cert create -wallet c:\ssl\oracle\root -request c:\ssl\oracle\server
\server_req.cer -cert c:\ssl\oracle\server\server_cert.cer -validity 3650 -
pwd <password>
```

- e. Add the trusted CA certificate into server wallet.

```
orapki wallet add -wallet c:\ssl\oracle\server -trusted_cert -cert c:\ssl
\oracle\root\cacert.cer -auto_login_only
```

- f. Add the server certificate into server wallet.

```
orapki wallet add -wallet c:\ssl\oracle\server -user_cert -cert c:\ssl
\oracle\server\server_cert.cer -auto_login_only
```

#### 4. Configure Oracle server SSL (Optional, if not yet set up).

- a. Configure the listener.ora file.

```
WALLET_LOCATION =
  (SOURCE =
    (METHOD = FILE)
    (METHOD_DATA = (DIRECTORY = C:\ssl\oracle\server)
    )
  )
LISTENER =
  (DESCRIPTION_LIST =
    (DESCRIPTION =
      (ADDRESS = (PROTOCOL = TCP) (HOST = PVG50869480A.SAP.COM) (PORT =
1521))
      (ADDRESS = (PROTOCOL = IPC) (KEY = EXTPROC1521))
      (ADDRESS = (PROTOCOL = TCPS) (HOST = PVG50869480A.SAP.COM) (PORT =
2484))
    )
  )

SSL_CLIENT_AUTHENTICATION = FALSE
SSL_CIPHER_SUITES = (SSL_RSA_WITH_RC4_128_SHA) (1)
```

- b. Configure the tnsnames.ora file.

```
ssl =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCPS) (HOST = PVG50869480A.SAP.COM) (PORT =
2484))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = ORCL)
    )
    (SSL_SERVER_CERT_DN = "CN=PVG50869480A.SAP.COM,C=US")
  )
```

- a. Configure the `sqlnet.ora` file.

```
SQLNET.AUTHENTICATION_SERVICES= (BEQ, TCPS, NTS)
SSL_CLIENT_AUTHENTICATION=FALSE
SSL_CIPHER_SUITES = (SSL_RSA_WITH_RC4_128_SHA) (1)
WALLET_LOCATION =
  (SOURCE =
    (METHOD = FILE)
    (METHOD_DATA = (DIRECTORY = C:\ssl\oracle\server)
  )
)
```

5. Configure SSL for the Data Provisioning Agent.

Use the Java `keytool` utility to configure the agent keystore. By default, `keytool` is located in `$JAVA_HOME/bin`.

- a. Copy and import the CA certificate.

```
keytool -importcert -keystore C:\usr\sap\dataprovagent\ssl\cacerts -
storepass changeit -file c:\ssl\oracle\root\cacert.cer -noprompt -alias
ora_ca_cert
```

- b. Copy and import the server certificate.

```
keytool -importcert -keystore C:\usr\sap\dataprovagent\ssl\cacerts -
storepass changeit -file c:\ssl\oracle\server\server_cert.cer -noprompt -
alias ora_srv_cert
```

6. Set the allowed cipher suites in the `dpagentconfig.ini` file.

```
oracle.net.ssl_cipher_suites=SSL_RSA_WITH_RC4_128_SHA
```

For TLS cipher protocols, add the additional `jdk.tls.client.protocols` parameter to the `dpagentconfig.ini` file. For example:

```
jdk.tls.client.protocols=TLSv1.2
```

7. Restart the Oracle listener and the Data Provisioning Agent.

## Next Steps

When you create an Oracle remote source, ensure that the following parameters are set appropriately:

- **Use SSL:** `true`
- **Distinguished Name (DN) in Certificate:** The distinguished name must contain no quotes, and there must be a space between CN and C. For example, `CN=..., C=...`

## Related Information

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

## 6.18.11 Creating a Whitelist to Limit Access to a Source Database

There are times when you may want to limit access to all of the tables in a source database. For data provisioning log reader adapters, as well as SAP HANA and SAP ECC adapters, an efficient way to limit access is to create a whitelist.

Restricting access to only those tables that are to be replicated is done by creating a whitelist of source database objects in a separate table.

### i Note

The whitelist impacts only the virtual table created and the replications created after the whitelist was created.

You can use SQL to create the whitelist table.

### i Note

- The whitelist table, which can have any name, must have two columns named REMOTE\_SOURCE\_NAME and WHITELIST.
- The whitelist items are separated by a comma.
- You can use an asterisk (\*) to represent any character or empty string. However, the asterisk must be placed at the end of a whitelist item. Otherwise, it is treated as a normal character.
- You can add multiple rows of whitelisted tables for a single remote source.

## Microsoft SQL Server Example

```
create table whitelist(REMOTE_SOURCE_NAME varchar(128), WHITELIST varchar(4000));
```

To add a whitelist for the remote source called "localmssqldb", insert a row into the whitelist table:

```
insert into whitelist values('localmssqldb', 'object.A, object.B*');  
insert into whitelist values('localmssqldb', 'object.C, object.D*');
```

object.A, object.B\*, and so on, means that the table (or procedure) object.A and the table (or procedure) starting with object.B are filtered for the remote source "localmssqldb".

## SAP HANA Example

```
create schema SAP_RESTRICTIONS;  
create table WHITE_LIST(REMOTE_SOURCE_NAME varchar(128) primary key, WHITELIST  
varchar(4000));
```



To add a whitelist for the remote source called "localhadp", insert a row into the whitelist table:

```
insert into WHITE_LIST values('localhadp', 'APP_USER.MERCHANT,APP_PRODUCT.B*');
```

APP\_USER.MERCHANT,APP\_PRODUCT.B\* means that the table (or procedure) APP\_USER.MERCHANT and the table (or procedure) starting with APP\_PRODUCT.B are filtered for remote source "localhadp".

## 6.18.12 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. Navigate to the Agent Adapter Framework Preferences.
  - In graphical mode, choose **Config > Preferences**, and then select **Adapter Framework**.
  - In command-line interactive mode, choose **Set Agent Preferences** in the **Agent Preferences** menu.
3. For the **Read-only Adapters** property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:
```

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start and Connect the Configuration Tool \[page 84\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

## 6.19 PostgreSQL Log Reader

Use the PostgreSQL Log Reader adapter to batch load or replicate changed data in real time from a PostgreSQL database to SAP HANA.

PostgreSQL, often referred to as “Postgres”, is an object-relational database management system (ORDBMS) with an emphasis on extensibility and standards compliance.

The PostgreSQL adapter is designed for accessing and manipulating data from a PostgreSQL database.

### Assign PostgreSQL Roles

Make sure that all users are assigned the SUPERUSER and REPLICATION roles.

### Adapter Functionality

This adapter supports the following functionality:

- Supports the following SQL statements: SELECT, INSERT, UPDATE, and DELETE
- Virtual table as a source, using a Data Source node in a flowgraph
- Real-time change data capture (CDC)
- Virtual table as a target using a Data Sink node in a flowgraph
- Batch loads (only) are supported for Greenplum databases.
- Replication monitoring and statistics
- DDL replication

## Restrictions

The following restriction applies to the PostgreSQL adapter:

- Remote subscriptions do not work with unlogged tables.

## Related Information

[Configure PostgreSQL Source for Real-time Replication \[page 397\]](#)

[PostgreSQL Remote Source Configuration \[page 398\]](#)

[Amazon Web Services Configuration \[page 401\]](#)

[Using a Schema Alias \[page 402\]](#)

[Disable Adapter Write-back Functionality \[page 403\]](#)

[PostgreSQL DDL Replication \[page 404\]](#)

## 6.19.1 Configure PostgreSQL Source for Real-time Replication

Information about how to configure your source system for real-time replication.

### Context

If you plan on performing real-time replication from a PostgreSQL source, you must prepare that source by configuring a few system parameters.

### Procedure

1. Open the PostgreSQL main server configuration file `postgresql.conf`.
2. Set the following parameters to the suggested values:

Parameter	Value
<code>wal_level</code>	<code>logical</code>
<code>archive_mode</code>	<code>true</code>

Parameter	Value
max_replication_slots	2

**i Note**

If you want to replicate multiple databases in one server, set this value to: "max\_replication\_slots = database\_need\_to\_replicate \* 2". You need 2 slots per instance.

3. Restart the PostgreSQL server.

## 6.19.2 PostgreSQL Remote Source Configuration

Information about configuration parameters for creating a PostgreSQL remote source.

Configure the following options for a connection to a PostgreSQL remote source:

Category	Option	Description
Database Connection	Host	Specifies the host name  The default value is <i>localhost</i>
	Port Number	Specifies the port number  The default value is 5432.
	Database Name	Specifies the database name
Schema Alias Replacements	Schema Alias	Schema name to be replaced with the schema given in the <i>Schema Alias Replacement</i> parameter. If given, accessing tables under this alias is considered to be accessing tables under the schema given in the <i>Schema Alias Replacement</i> parameter.
	Schema Alias Replacement	Schema name to use to replace the schema given in the <i>Schema Alias</i> parameter.
Data Type Mapping	Map timestamptz type to	<ul style="list-style-type: none"> <li>VARCHAR</li> <li>TIMESTAMP</li> </ul> <p>When mapping as VARCHAR, target string values use a fixed ISO format, such as 2019-04-29 02:08:52.123456-06, using DP Agent's client time zone.</p> <p>When mapping as TIMESTAMP, target timestamp values are always in UTC.</p> <p>PostgreSQL timestamptz type does not store the time zone into database storage, so we can't replicate that information.</p>

Category	Option	Description
LogReader	Ignore log record processing errors	<p>Specifies whether the Log Reader ignores the errors that occur during log record processing. If set to <i>True</i>, the replication does not stop if log record processing errors occur.</p> <p>The default value is <i>False</i>.</p>
	Enable DDL replication	<p>Specifies whether to enable replicating DDL.</p> <p>The default value is <i>False</i>.</p>
	Number of parallel operation processor threads	<p>Specifies the number of processor threads to use</p> <p>The default value is 4.</p>
	Maximum operation queue size	<p>The maximum number of log records permitted in the log reader log operation queue during replication</p> <p>The default value is 1000.</p>
	Maximum scan queue size	<p>The maximum number of operations permitted in the log reader scan queue during replication</p> <p>The default value is 1000.</p>
	Number of rows to fetch for each scan	<p>Specifies the batch size for fetching the log record.</p> <p>The default value is 1000.</p>
	Maximum wait interval for polling a message	<p>Specifies the amount of time in seconds to wait for an element to become available for processing</p>
	Seconds to add to each log scan wait interval	<p>The default value is 5 seconds.</p>
	Maximum wait interval between log scans	<p>The default value is 60 seconds.</p>
	Number of parallel formatter threads	<p>Specifies the number of such threads to use to format the raw records to the change data row set in the Data Provisioning Agent</p> <p>The default value is 4.</p>
	Maximum sender queue size	<p>Specifies the buffer size</p> <p>Before formatting the raw records to the change data row, the records are placed into a queue, and then the formatter component (threads) attempts to pick up records to format.</p> <p>The default value is 1000.</p>

Category	Option	Description
	Maximum number of rows sent to server in a batch	<p>Specifies the number of rows per batch to send to the Data Provisioning Server after the Data Provisioning Agent processes them.</p> <p>The default value is 512.</p>
	Amount of time to allow for a batch to fill before flushing the batch	<p>Specifies the amount of elapsed time in seconds before flushing the batch of rows</p> <p>Depending on the number of rows you specified, there may be a lot of time to fill that batch. To avoid a long latency period, you can adjust the amount of time using this parameter.</p> <p>The default value is 5 seconds.</p>
	Ignore formatting errors	<p>Specifies whether to ignore any errors from the formatter component and allow records to continue processing</p>
	Interval of transaction log truncation	<p>The interval to truncate the PostgreSQL transaction log in minutes. Set to 0 to disable the truncation.</p> <p>The default value is 10 minutes.</p> <p>The value of this parameter can be changed when the remote source is suspended.</p>
Security	Use Agent Stored Credential	<p>Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage.</p> <p>The default value is <i>False</i>.</p>
Credentials	Credentials Mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li>• <i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li>• <i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
Postgresql Connection Credentials	User Name	<p>The PostgreSQL user name</p> <p>Make sure that all users are assigned the SUPERUSER and REPLICATION roles.</p>
	Password	<p>The PostgreSQL password</p>

## SQL Configuration

```
CREATE REMOTE SOURCE "posgresqladapter_sample" ADAPTER
"PostgreSQLLogReaderAdapter" AT LOCATION AGENT "PostgreSQLAgentLocal"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="database" displayName="Database">
    <PropertyEntry name="pds_host_name" displayName="Host"
isRequired="true">localhost</PropertyEntry>
    <PropertyEntry name="pds_port_number" displayName="Port Number"
isRequired="true">5432</PropertyEntry>
    <PropertyEntry name="pds_database_name" displayName="Database Name"
isRequired="true">sample</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="logreader" displayName="logreader">
    <PropertyEntry name="skip_lr_errors" displayName="Ignore log record
processing errors">true</PropertyEntry>
    <PropertyEntry name="lr_processor_parallelism">5</PropertyEntry>
    <PropertyEntry name="lr_max_op_queue_size" >1500</PropertyEntry>
    <PropertyEntry name="lr_max_scan_queue_size">1500</PropertyEntry>
    <PropertyEntry name="scan_sleep_increment">6</PropertyEntry>
    <PropertyEntry name="scan_sleep_max">70</PropertyEntry>
    <PropertyEntry name="lr_scan_batch_size">1500</PropertyEntry>
    <PropertyEntry name="sender_formatter_parallelism">5</PropertyEntry>
    <PropertyEntry name="sender_max_row_queue_size">1500</PropertyEntry>
    <PropertyEntry name="skip_format_errors">true</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
  <user>postgres</user>
  <password>password</password>
</CredentialEntry>';
```

## Related Information

[Using a Schema Alias \[page 402\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

## 6.19.3 Amazon Web Services Configuration

More configuration steps and tips for PostgreSQL on Amazon Relational Database Service (RDS).

### Procedure

1. To avoid remote access issues, in Amazon RDS ensure the database instance setting *Publicly Accessible* has been enabled.
2. Configure the PostgreSQL database for real-time replication by adding a parameter group in Amazon RDS as follows.

- a. Create a Parameter Group.
- b. Search for the parameter *rds.logical\_replication*. Change its *Values* default to *1*.
- a. Associate the parameter group to the database instance.
- b. Restart the database instance.

## Related Information

[Amazon Virtual Private Cloud \(VPCs\) and Amazon RDS](#) ➡

[Working with DB Parameter Groups](#) ➡

## 6.19.4 Using a Schema Alias

Using a schema alias can help you manage multiple schema, remote sources, and tables more easily.

The *Schema Alias* and *Schema Alias Replacement* options, available in the remote source configuration parameters for some Data Provisioning adapters, allow you to switch easily between schema, remote sources, and tables. The *Schema Alias* is the name of the schema in the original system. The *Schema Alias Replacement* is the name of the schema in the current system that replaces the *Schema Alias* name.

A common use case is to create a remote source pointing to a development database (for example, DB\_dev), and then create virtual tables under that remote source. Afterward, you may switch to the production database (for example, DB\_prod) without needing to create new virtual tables; the same tables exist in both DB\_dev and DB\_prod, but under different schema and databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB\_dev, for example. Note that OWNER1.MYTABLE is the unique name of the source table, and it is a property of the virtual table. With it, the adapter knows which table in the source database it is expected to access. However, when you switch to the production database (DB\_prod), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name information of the virtual table cannot be changed once created.

You can resolve this problem using the Schema Alias options. In this case, we want to tell the adapter to replace OWNER1 with OWNER2. For example, when we access OWNER1.MYTABLE, the adapter should access OWNER2.MYTABLE. So here, OWNER1 is *Schema Alias* from the perspective of DB\_prod, while OWNER2 is *Schema Alias Replacement*.

To use this functionality, you must populate both of these options.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

[SAP HANA Remote Source Configuration \[page 444\]](#)

[SDI DB2 Mainframe \[page 460\]](#)



## 6.19.5 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. Navigate to the Agent Adapter Framework Preferences.
  - In graphical mode, choose **Config > Preferences**, and then select *Adapter Framework*.
  - In command-line interactive mode, choose *Set Agent Preferences* in the *Agent Preferences* menu.
3. For the *Read-only Adapters* property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start and Connect the Configuration Tool \[page 84\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

## 6.19.6 PostgreSQL DDL Replication

Learn how to replicate your PostgreSQL DDL.

The PostgreSQL adapter uses event triggers to capture changes to tables so that you can apply those same changes to a target.

Only 'ALTER TABLE' events are supported, and only the following triggers are supported:

- Column added
- Column deleted
- Column modified
- Column renamed

### Enabling DDL Replication

You enable DDL replication by setting the PostgreSQL *Enable DDL Replication* remote source parameter to *True*. No other configuration is necessary. The default value is *True*.

### New Repository Objects

For informational purposes, the following repository objects are created in your PostgreSQL database:

- ddl\_constraint\_keys\_shadow (table)
- ddl\_tables\_shadow (table)
- ddl\_columns\_shadow (table)
- dpagent\_\${<pds\_database\_name>}\_replication\_ddl\_trigger (function)
- dpagent\_\${<pds\_database\_name>}\_replication\_ddl\_trigger (event trigger)

### Limitations

Currently, replicating DDL and DML in the same transaction is not supported.

## Related Information

[Event Triggers](#) 

[PostgreSQL Remote Source Configuration](#) [page 398]

## 6.20 SAP ABAP


Use the ABAP adapter to retrieve various types of SAP data.

The ABAP adapter retrieves data from virtual tables through RFC for ABAP tables and ODP extractors. You can find more information about setting up your environment and adapter by reading the topics in the Related Information section of this topic.

### ABAP Adapter Functions

The SAP ABAP Adapter is a client to functions delivered via modules that are delivered via PI\_BASIS.

Extra coding was required in order for these functions to support RAW and/or STRING data types.

The valid PI\_BASIS releases are listed in the Support Packages and Patches section of this SAP Note <https://launchpad.support.sap.com/#/notes/2166986> .

Please note that these functions were originally developed for SAP Data Services.

All references in this SAP Note relevant to PI\_BASIS are also relevant for SAP HANA Smart Data Integration.

Ignore references to the SAP Data Services version. This SAP Note applies to all SAP HANA smart data integration versions.

### Prerequisites

You may need to perform extra tasks to access the data you need. For example:

- To access the M\_MTVMA, M\_MVERA, KONV, and NWECDM\_PRPTDVS tables, via /SAPDS/RFC\_READ\_TABLES, you must apply SAP Note [2166986](#) .

### Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Change data capture for ODP extractors

### **i** Note

Hierarchy extractors are not supported.

- Calling BAPI functions as virtual procedures
- Virtual procedures

In addition, this adapter supports the following capabilities:

- SELECT, WHERE, TOP, or LIMIT

## **Related Information**

[Authorizations \[page 406\]](#)

[Using RFC Streaming With Tables \[page 412\]](#)

[SAP ABAP Adapter Preferences \[page 414\]](#)

[SAP ABAP Adapter Remote Source Configuration \[page 414\]](#)

[Installing BW Content DataSources](#)

[Installing Application Component Hierarchies](#)

[Error opening the cursor for the remote database Error with ASSIGN ... CASTIN in program /SAPDS/SAPLRS\\_BASIS](#) 📄

## **6.20.1 Authorizations**

Authorizations for accessing various ABAP adapter operations.

This section describes the authorizations that support SAP ABAP adapter operations. For improved security, avoid using wildcards, generic values, or blank values for authorization fields, especially in a production environment. Enter more specific values that are appropriate to your business applications.

### **i** Note

Even though some of the listed authorizations are described as being necessary for SAP Data Services, they are also necessary for the ABAP adapter.

## **Related Information**

[G\\_800S\\_GSE \[page 407\]](#)

[S\\_BTCH\\_ADM \[page 407\]](#)

[S\\_BTCH\\_JOB \[page 407\]](#)

[S\\_DEVELOP \[page 408\]](#)

[S\\_RFC \[page 409\]](#)

[S\\_RFC\\_ADM \[page 409\]](#)

[S\\_SCRP\\_TXT \[page 410\]](#)

[S\\_SDSPGMCK \[page 410\]](#)

[S\\_SDSDEV \[page 410\]](#)

[S\\_SDSAUTH \[page 411\]](#)

[S\\_TABU\\_DIS \[page 411\]](#)

[S\\_TCODE \[page 412\]](#)

[S\\_USER\\_GRP \[page 412\]](#)

## 6.20.1.1 G\_800S\_GSE

Authorization for SAP Data Services to access ERP hierarchies.

**Use:** DEV, PROD

**Text (Description):** Special Purpose Ledger Sets: Set

**Class:** Financial Accounting

Field	Values
Authorization group	Not used
Activity	03

## 6.20.1.2 S\_BTCH\_ADM

Authorization that checks background processing privileges.

**Use:** DEV, PROD

**Text (Description):** Background Processing: background Administrator

**Class:** Basis

Field	Values
Background administrator ID	Y

## 6.20.1.3 S\_BTCH\_JOB

Authorization that checks privileges for releasing batch jobs.

**Use:** DEV, PROD

**Text (Description):** Batch processing

**Class:** Basis

Field	Values
Job operation	RELE
Summary of jobs for a group	Not used

## 6.20.1.4 S\_DEVELOP

Authorization for SAP Data Services to perform a column search.

**Use:** DEV, PROD

**Text (Description):** ABAP Workbench

**Class:** Basis - Development Environment

Field	Values
Package	List of packages for tables that a user is allowed to access
Object type	TABL
Object name	List of tables that a user is allowed to access
Authorization group ABAP/4 program	Not used
Activity	03

Purpose: This authorization allows Data Services to run generated programs on the SAP server.

Use: DEV

Text (Description): ABAP Workbench

Class: Basis - Development Environment

Field	Values
Package	\$TMP
Object type	PROG
Object name	List of temporary program names that are allowed to be generated
Authorization group ABAP/4 program	Not used
Activity	01 and 02

Purpose: This implementation allows Data Services to import a table or to search for a table.

Use: DEV, PROD (table search)

Text (Description): ABAP Workbench

Class: Basis - Development Environment

Field	Values
Package	List of packages for tables that a user is allowed to access
Object type	VIEW, TABL and TTYP
Object name	List of tables and views that a user is allowed to access
Authorization group ABAP/4 program	Not used
Activity	03

## 6.20.15 S\_RFC

Authorization that allows users to execute remote functions on an SAP server.

**Use:** DEV, PROD

**Text (Description):** Authorization check for RFC access

**Class:** Cross-application authorization object

Field	Values
Activity	16
Name of RFC to be protected	BAPI, CADR, RFC1, SCAT, SDIF, SLST, SUNI, SUTL, SDTX, SYST, /SAPDS/ SAPDS, RSAB, SDIFRUNTIME, and any other required function group
Type of RFC object to be protected	FUGR

## 6.20.16 S\_RFC\_ADM

Authorization for RFC streaming.

**Use:** DEV, PROD

**Text (Description):** Administration for RFC Destination

**Class:** Cross-application

Field	Values
Activity	03
Type of Entry in RFCDES	Not used
Logical Destination (Specified in Function Call)	RFC destination
Internet Communication Framework Values	Not used

## 6.20.1.7 S\_SCRP\_TXT

Authorization for SAP Data Services to read SAP texts.

**Use:** DEV, PROD

**Text (Description):** SAPscript: Standard text

**Class:** SBOP Data Services Authorization Object

Field	Values
Language Key	List of language keys that a user is allowed to access
Text ID	List of text IDs that a user is allowed to access
Name	List of text names that a user is allowed to access
Activity	SHOW

## 6.20.1.8 S\_SDSPGMCK

Authorize specified programs to execute in a production environment.

**Use:** PROD

**Text (Description):** SBOP Data Services Authorization Object for program names

**Class:** SBOP Data Services Authorization Object

Field	Values
ACTVT: Activity	16 (Execute)
PROGRAM: ABAP program name	Program names that are allowed to be executed in a production environment

### i Note

In previous SAP Data Services versions, this authorization was named ZPGMCHK in version 3.x and S\_DSPGMCHK in version 4.1 SP3 Patch 2, 4.2 SP1 Patch 5, 4.2 SP2, and some later versions.

## 6.20.1.9 S\_SDSDEV

SAP Data Services general authorization object that is equivalent to the SAP S\_DEVELOP authorization.

**Use:** DEV, PROD

**Text (Description):** SBOP Data Services Authorization Object for development

**Class:** SBOP Data Services Authorization Object



Field	Values
Package	List of packages for tables that a user is allowed to access
Object type	VIEW, TABL, and TTYP
Object name	DD objects that a user is allowed to access
Authorization group ABAP/4 program	Not used
Activity	03

### **i Note**

In previous SAP Data Services versions, this authorization was named ZDSDEV in version 3.x and S\_DSDEV in version 4.1 SP3 Patch 2, 4.2 SP1 Patch 5, 4.2 SP2, and some later versions.

## 6.20.1.10 S\_SDSAUTH

Authorizes access to SAP Data Services functions.

**Use:** DEV, PROD

**Text (Description):** SBOP Data Services - general authorization

**Class:** SBOP Data Services Authorization Object

Field	Values
ACTVT: Activity	16 (Execute)

### **i Note**

In previous SAP Data Services versions, this authorization was named ZDSAUTH in version 3.x and S\_DSAUTH in version 4.1 SP3 Patch 2, 4.2 SP1 Patch 5, 4.2 SP2, and some later versions.

## 6.20.1.11 S\_TABU\_DIS

Authorizes SAP Data Services to access table data in an SAP system.

**Use:** DEV, PROD

**Text (Description):** Table Maintenance (via standard tools such as SM30)

**Class:** Basis

Field	Value
Activity	03
Authorization group	Table groups that a user is allowed to access

## 6.20.1.12 S\_TCODE

Data Services uses the S\_TCODE authorization in several ways.

**Purpose:** This authorization grants the user access to specific transactions.

**Text (Description):** Authorization check for transaction start

**Class:** Cross-application authorization object

Field	Value
Transaction Code	SE37, SE38, SU53

**Purpose:** This authorization allows Data Services to execute functions in the Data Warehousing Workbench.

**Use:** DEV, PROD

**Text (Description):** Transaction Code Check at Transaction Start

**Class:** Cross-application Authorization Objects

Field	Values
Transaction Code	RSA1

## 6.20.1.13 S\_USER\_GRP

Authorization for SAP Data Services to establish a connection to the SAP server.

**Use:** DEV, PROD

**Text (Description):** User Master Maintenance: User Groups

**Class:** Basis: Administration

Field	Values
User group in user master maintenance	User group for Data Services user

## 6.20.2 Using RFC Streaming With Tables

There are advantages and disadvantages to using either RFC or non-RFC streaming.

The non-RFC streaming is done by extracting the whole target recordset as one batch. That process is anywhere between 0.1second and 10 seconds faster (depends on the SAP ECC response) than the small-batch RFC streaming. So, non-RFC streaming is noticeably faster on very small queries, especially with a slow SAP ECC system. Extracting a whole recordset at once comes with the obvious requirement to have enough memory for the whole recordset. A general rule (depending on the record length) is 1 GB of RAM on the Data Provisioning Agent machine per 1 million records, and several concurrent sessions would require further calculations. Because the non-RFC streaming mode runs in the ECC “dialog mode,” it is also subject to various limitations on the ECC side, like dialog mode timeout.

We recommend using RFC streaming based on the fact that it works for many different scenarios, such as small, large, and long queries, multiple concurrent sessions, and so on. There are tradeoffs, such as the performance cost already mentioned for small queries and the cost of requiring extra configuration, including on the ECC side.

To activate RFC streaming, you must configure the following ABAP adapter remote source parameters:

- Streaming Read: This parameter must be set to *True* to expose the following parameters.

The following parameters must be set to have RFC streaming work:

- Gateway Server
- Gateway Host
- RFC Destination

The following parameters are optional when RFC streaming is enabled:

- Batch size
- RFC Trace
- Batch receive timeout

## ECC Client and Gateway Service Configuration

- Successful registration on an SAP Gateway requires that suitable security privileges are configured. For example:
  - Set up an Access Control List (ACL) that controls which host can connect to the gateway. That file should contain something similar to the following syntax: `<permit> <ip-address[/mask]> [tracelevel] [# comment]`
  - You may also want to configure a `reginfo` file to control permissions to register external programs.
- The host where the Data Provisioning agent is running must have a service configured with the name matching the remote SAP gateway name.

## Related Information

[SAP ABAP Adapter Remote Source Configuration \[page 414\]](#)

[Gateway Access Control Lists](#) 

## 6.20.3 SAP ABAP Adapter Preferences

Options to control the SAP ABAP adapter.

Parameter	Description
Context Whitelist	<p>The <code>Context Whitelist</code> parameter provides you the ability to restrict which objects - tables, BAPI functions, ODP extractors - are available to a user. For example, shown/imported/executed/selected from/subscribed to.</p> <p>If the property is empty, there are no restrictions; all objects that the ABAP adapter reads from an ECC system are exposed to the target SAP HANA system.</p> <p>The property value is expected to be a comma-separated list of either prefixes, such as a prefix ending with "*", or full names of allowed objects or exact full names. For example:</p> <p>To allow all BAPI functions and ABAPTABLES and exclude all extractors:</p> <p><b><code>BAPI* , ABAPTABLES*</code></b></p> <p>To allow all BAPI functions starting either with <code>RODPS_*</code> or <code>BAPI_BANK*</code>, and only one ABAP table <code>KNB1</code></p> <p><b><code>BAPI.RODPS_* , BAPI.BAPI_BANK* , ABAPTABLES.KNB1</code></b></p> <div><p><b>i Note</b></p><p>The asterisk (*) is used only as the last character to distinguish a prefix from an exact name.</p></div>

## 6.20.4 SAP ABAP Adapter Remote Source Configuration

Remote source configuration options for the SAP ABAP adapter. Also included is sample code for creating a remote source using the SQL console.

### i Note

Depending on the values you choose for the remote source configuration parameters, different parameters appear. Thus, some of the following parameters do not appear.

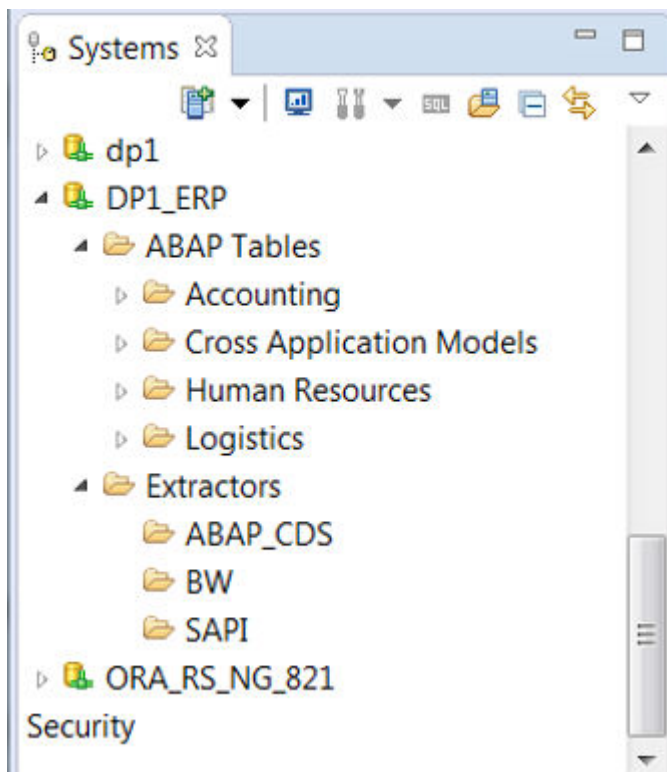
Category	Option	Description
Connectioninfo	Connection Type	Message Server and Custom Application Server
	Application Server	The name of the host to which you want to connect
	Message Server	Enter the name of the message server or its IP address.
	Message Server Port	(Optional) If the message server isn't on the default port, enter the port to use to connect to the message server.

Category	Option	Description
	Client	The SAP ECC client number
	Instance Number	The SAP ECC instance number
	System ID	Specifies the system ID of the SAP system to which you want to connect.
	Server Group	The Logon group name.
	Connections Pool Size	Maximum number of idle connections kept open for the remote source. The default value of 0 states that there is no connection pooling; that is, connections will be closed after each request.
	Connections Limit	Maximum number of active connections that can be created for a remote source simultaneously.
	Extractors ODP Version	Specifies the ODP version to use. ODP 2.0 is the default value.
	CDC Batch Size, MB	Specifies the CDC batch size in MB. 1 MB is the default value.
	Streaming Read	Set to <i>On</i> to expose the necessary parameters to enable RFC streaming.  Set to <i>Off</i> to use non-RFC streaming.
	Gateway Host	This parameter is optional. It is necessary only if you are streaming ABAP tables for loading.  Specifies the gateway host where the ABAP adapter would register an RFC server instance to receive callbacks with the table data batches. Usually, the gateway host is the same as the target ECC system host.
	Gateway Server	This parameter is optional. It is necessary only if you are streaming ABAP tables for loading.  Specifies the gateway server where the ABAP adapter would register an RFC server instance to receive callbacks with the table data batches. The gateway server has the value <code>sapgw&lt;target_ECC_system_instance_number&gt;</code> .
	RFC Destination	This parameter is optional. It is necessary only if you are streaming ABAP tables for loading.  Using transaction SM59, you must create a TCP/IP connection with a user-defined name and provide that name as the value of the RFC Destination parameter. The connection in SM59 should be created with "Registered Server Program" as "Activation Type". Specify "IM_HANA_ABAPADAPTER_*" as a filter for the "Program ID" field, or leave it empty.

Category	Option	Description
	Batch Size, MB	(Optional) The size (in MB) of the data packet sent by ECC in one callback. On the Data Provisioning Agent, upon receiving, the batch is copied into a queue to be sent to Data Provisioning server, and thus the memory requirements for that process is "2 x batchsize". The default value is 1 MB.
	RFC Trace	(Optional) Set to <i>On</i> to turn RFC tracing on. By default, this parameter is set to <i>Off</i> .
	Batch Receive Timeout	(Optional) The maximum time period in seconds that the adapter would be waiting for the next batch to come or to push the batch to Data Provisioning server. It wouldn't make sense for this value to be larger than the value of the "framework.messageTimeout" parameter of Data Provisioning server. Thus, the default value is the same as the default value of the Data Provisioning server property (600 seconds).
	SNC Mode	Activate SNC by setting this parameter to <i>On</i> .
	SNC Library	Specifies the path and file name of the external library.  The default is the system-defined library as defined in the environment variable <code>SNC_LIB</code> .  The destination service uses the property <code>snc/gssapi_lib</code> on SAP NetWeaver AS for Java.
	SNC Name of Client	Specifies the SNC name of SAP NetWeaver AS for Java.  Although this parameter is optional, we do recommend setting it to make sure that the correct SNC name is used for the connection.  For the Destination service, set it in the property <code>snc/identity/as</code> on SAP NetWeaver AS for Java.
	SNC Name of SAP Server	Specifies the SNC name of SAP NetWeaver Application Server for ABAP.  This parameter is required, if SNC is turned on.  You can find the application server SNC name in the profile parameter <code>snc/identity/as</code> on SAP NetWeaver Application Server for ABAP.
	SNC SSO	Turn on/off the SSO mechanism of SNC. If you set this parameter to <i>Off</i> , you must provide alternative credentials.

Category	Option	Description
	SNC Quality of Protection	<p>Specifies the level of protection to use for the connection.</p> <p>Possible values:</p> <p>1: Authentication only</p> <p>2: Integrity protection</p> <p>3: Privacy protection (default)</p> <p>8: Use the value from <code>snc/data_protection/use</code> on the application server</p> <p>9: Use the value from <code>snc/data_protection/max</code> on the application server</p> <p>Default value = 3</p>
Credentials	Credentials Mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li>• <i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li>• <i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
	User Name	The user name that is used to connect to the SAP ECC system
	Password	The user password

After you have created the remote source, the directory structure will look similar to the following screenshot, depending on the structure of the source system.



## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyABAPSource" ADAPTER "ABAPAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyEntry name="host" displayName="Host" isRequired="true"
isPassword="false">myhost.sap.corp</PropertyEntry>
  <PropertyEntry name="systemid" displayName="System ID" isRequired="true"
isPassword="false">01</PropertyEntry>
  <PropertyEntry name="client" displayName="Client" isRequired="true"
isPassword="false">001</PropertyEntry>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="user">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>';
```

## Related Information

[Using RFC Streaming With Tables \[page 412\]](#)



## 6.21 SAP ASE

The SAP ASE adapter provides real-time replication and change data capture functionality to SAP HANA or back to a virtual table.

The SAP ASE Adapter receives the data stream from an SAP ASE database, reformats the data, and then sends the data change to the downstream Data Provisioning Server to replicate from SAP ASE to SAP HANA.

The SAP ASE adapter service provider is created as a remote source, and requires the support of artifacts like virtual tables and remote subscription for each source table to perform replication.

### ! Restriction

For real-time replication, you can initialize each source database by only one instance of the adapter. You cannot configure two adapter instances for real-time replication of the same source database, even when using a different Data Provisioning Agent or schema in the source database.

## Data Transfer Protocol

Depending on the ASE Server and Data Provisioning Agent platforms you are using, there are restrictions on what data transfer protocol you can use. Data transfer protocol is set in the remote source configuration parameters.

ASE Server Platform	DP Agent Platform	Allowed Data Transfer Protocol
Linux	Linux	CI and LTL
Linux	Linux PPCLE	CI and LTL
Linux	Windows	LTL

## Adapter Functionality

The SAP ASE adapter supports the following functionality:

- Virtual table as a source
- Real-time change data capture
- Virtual table as a target using a Data Sink node in a flowgraph
- Loading options for target tables
- Search for a table
- Replication monitoring and statistics

## Real-time Replication Limitations

The following limitations exist when performing real-time replication:

- Unsupported table types:
  - Table with all LOB columns
  - Table with LOB column and no primary key or unique index
  - Table with duplicated rows and no primary key
  - Table with minimal logging option

## Related Information

[Configure Your SAP ASE Database \[page 420\]](#)

[SAP ASE Adapter Preferences \[page 421\]](#)

[SAP ASE Remote Source Configuration \[page 422\]](#)

[Load Behavior Options for Targets in Replication Tasks](#)

### 6.21.1 Configure Your SAP ASE Database

The remote database must be set up properly when using the SAP ASE adapter.

## Procedure

1. Connect to an SAP ASE data server using ISQL or another utility, and create a database to replicate if one does not already exist.
2. Create the primary user and grant permissions.

#### Sample Code

```
SQL> use master
SQL> go
SQL> create login <login_name> with password <password> default database
<database_name>
SQL> go
SQL> use <database_name>
SQL> go
SQL> sp_adduser <login_name>
SQL> go
SQL> sp_role 'grant', replication_role, <login_name>
SQL> go
```

3. Create the maintenance user.

#### Sample Code

```
SQL> use master
SQL> go
SQL> create login <login_name> with password <password> default database
<database_name>
SQL> go
SQL> use <database_name>
SQL> go
SQL> sp_adduser <login_name>
SQL> go
```

4. Add an entry for the SAP ASE adapter in the interface file of the SAP ASE data server. For example:

#### Sample Code

```
<entry name>
    master tcp ether <host name or IP> <port>
    query tcp ether <host name or IP> <port>
```

#### Note

- The entry name must be the same as the *Adapter Instance Name* specified when creating the remote source.
- The host name or IP must be the same IP of the computer where the SAP ASE adapter is running.
- The port must be the same as the SAP ASE Adapter Server port that you set up in the SAP ASE adapter interface file located in <DPAgent\_root>/Sybase/interfaces.

5. Reboot the SAP ASE data server.

## Related Information

[SAP ASE Remote Source Configuration \[page 422\]](#)

[SAP ASE Adapter Preferences \[page 421\]](#)

## 6.21.2 SAP ASE Adapter Preferences

Options to control the SAP ASE adapter.

Parameter	Description
Adapter Server Name	The name of the SAP ASE adapter server that receives data changes from the SAP ASE data server.
Adapter Server Port	The port number for the SAP ASE adapter server.
Enable SSL for Adapter Server	Specifies whether to use SSL for the adapter server.

Parameter	Description
SSL Certificate File Path	Location of the SSL certificate file.
SSL Certificate File Password	The password for accessing the SSL certificate file.

## 6.21.3 SAP ASE Remote Source Configuration

Options for connecting to the remote SAP ASE data server. Also included is sample code for creating a remote source using the SQL console.

Category	Option	Description
Data Server Information	Data Server Name	The SAP ASE data server name.
	Data Server Host	Host name or IP address on which the remote SAP ASE data server is running.
	Data Server Port Number	The SAP ASE data server port number.
	Database Name	The SAP ASE database name.
Security Properties	Enable SSL Encryption	Specifies whether to SSL encryption between the source SAP ASE data server and SAP ASE adapter.
<div> <div>i Note</div> <div>The CA certificate for the remote source must be imported into the adapter truststore on the Data Provisioning Agent host.</div> </div>		
	Common Name in Server Certificate	The common name in SAP ASE Adapter certificate file.
Adapter Properties	Adapter Instance Name	<p>The SAP ASE adapter instance name, which must be specified when creating remote source. You can name the adapter instance anything you want, and it should be unique in the same SAP HANA server.</p> <p>ASEAdapter sends this name to the source ASE, then ASE RepAgent (the log extract and transfer engine) searches this name from its specified interfaces file to find the section of the same name. So in the source ASE's interfaces files, there must be a section that contains the connection information.</p>

Category	Option	Description
	Data Transfer Protocol	<p>The protocol the SAP ASE data server and SAP ASE adapter uses to transfer data.</p> <p><i>LTL</i>: The Sybase Log Transfer Language. Logs are transferred in text format. A syntax parser in ASEAdapter will parse data from the text. This mode is a traditional method, and the log data is transferred in readable format, which is helpful when an error occurs.</p> <p><i>CI</i>: The Sybase Component Interfaces. Logs are transferred in binary format. The data extractor in ASEAdapter translates the binaries into actual data. Usually, CI has better performance than LTL mode.</p> <p>Only CI or LTL is allowed. The default value is CI.</p>
	Maintenance User	The maintenance user that is used by the SAP ASE LogReader Thread to filter transactions applied by this user.
	Read-only Remote Source	Specifies that the remote source should be a read-only resource and disables write-back functionality, including INSERT, UPDATE, and DELETE queries.
Credential Properties	Credentials Mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
	User Name	The SAP ASE database user, which the adapter needs to log on to the SAP ASE database to configure the ASE log reader, query data for initial load, and write back data into SAP ASE. Certain permissions may be required. See <a href="#">Configure Your SAP ASE Database [page 420]</a> for more information.
	Password	SAP ASE database user password.

## LTL mode with SSL

### Example

#### Sample Code

```
CREATE REMOTE SOURCE "MyASESource" ADAPTER "ASEAdapter" AT LOCATION AGENT
"MyAgent"
```

```

CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations" displayName="Configurations">
<PropertyGroup name="dataserver" displayName="Data Server Information">
  <PropertyEntry name="dataserver_name" displayName="Data Server
Name">myserver</PropertyEntry>
  <PropertyEntry name="host" displayName="Data Server
Host">myhost.sjc.sap.corp</PropertyEntry>
  <PropertyEntry name="port" displayName="Data Server Port Number">12020</
PropertyEntry>
  <PropertyEntry name="database_name" displayName="Database Name">mydb</
PropertyEntry>
</PropertyGroup>
<PropertyGroup name="security" displayName="Security Properties">
  <PropertyEntry name="ssl_enable" displayName="Enable SSL
Encryption">true</PropertyEntry>
  <PropertyEntry name="cn_in_certificate" displayName="Common Name in
Server Certificate">myserver</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="aseadapter" displayName="Adapter Properties">
  <PropertyEntry name="adapter_instance_name" displayName="Adapter Instance
Name" isRequired="true">myinstance</PropertyEntry>
  <PropertyEntry name="data_transfer_protocol" displayName="Data Transfer
Protocol" isRequired="true">LTL</PropertyEntry>
  <PropertyEntry name="maint_user" displayName="Maintenance User"
isRequired="true">mydb_maint</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>'

```

## Related Information

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

[Configure Your SAP ASE Database \[page 420\]](#)

## 6.22 SAP ECC

SAP ERP Central Component (ECC) adapters are a set of data provisioning adapters to provide access to and interaction with SAP ECC data and metadata.

All adapters designed to work with SAP ECC are built on top of Data Provisioning log reader adapters for the same database. Currently supported are the following:

- IBM DB2
- Oracle

### i Note

The Oracle Log Miner maximum throughput is approximately 1 TB per day; therefore, for replication volumes greater than 1 TB per day, expect delays in replication.

- Microsoft SQL Server
- SAP ASE

These adapters provide extra ECC-specific functionality: ECC metadata browsing and support for cluster tables and pooled tables in SAP ECC. Please see the description of Log Reader adapters for the common functionality.

### i Note

For IBM DB2, Oracle, and Microsoft SQL Server (does not apply to SAP ASE), before registering the adapter with the SAP HANA system, download and install the correct JDBC libraries. See the *SAP HANA smart data integration Product Availability Matrix (PAM)*. In the `<DPAgent_root>` folder, create a `/lib`

## Adapter Functionality

The ECC adapters support the following functionality:

- Real-time change-data capture

### ! Restriction

For real-time replication, you can initialize each source database by only one remote source. You cannot configure two remote sources for real-time replication of the same source database, even when using a different Data Provisioning Agent or schema in the source database.

- DDL propagation (transparent tables only, not supported for SAP ASE ECC)
- Search for tables
- Agent-stored credentials (not supported for SAP ASE ECC)
- SELECT, WHERE, JOIN, GROUP BY, DISTINCT, TOP, LIMIT

## Limitations

There is a 30,000 column limit for records.

## Related Information

[Terminology \[page 426\]](#)

[Installation and Setup \[page 426\]](#)

[SAP ECC Adapter Preferences \[page 427\]](#)

[Permissions for ECC Dictionary Tables \[page 436\]](#)

[Create an ECC Remote Source \[page 436\]](#)

[SAP ECC Remote Source Configuration \[page 437\]](#)

[Creating a Whitelist to Limit Access to a Source Database \[page 439\]](#)

[SQL Pushdown for Pooled and Cluster Tables \[page 440\]](#)

[Loading Metadata for Cluster and Pooled Tables \[page 441\]](#)

[SAP ASE \[page 419\]](#)

[IBM DB2 Log Reader \[page 254\]](#)

[Microsoft SQL Server Log Reader \[page 301\]](#)

[Oracle Log Reader \[page 349\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



[SAP Note 2166986](#)

## 6.22.1 Terminology

Setting up ECC adapters requires an understanding of certain SAP ERP and ECC concepts.

Here are some key terms and concepts that help you understand how to set up your ECC adapters.

Term	Description
SAP ERP	Enterprise Resource Planning software that allows you to leverage role-based access to critical data, applications, and analytical tools – and streamline your processes across procurement, manufacturing, service, sales, finance, and HR.
SAP ECC (SAP ERP Central Component)	The central technical component of SAP ERP system.
Cluster table	A logical table type, where the data of several such tables are stored together as a table cluster in the database. The intersection of the key fields of the cluster tables forms the primary key of the table cluster. Therefore, a cluster table is known in the ABAP Dictionary, but not in the database.
Pooled table	A logical table type, where the data of several such tables are stored together as a table pool in the database. Therefore, a pooled table is known in the ABAP Dictionary, but not in the database.

## Related Information

[Loading Metadata for Cluster and Pooled Tables \[page 441\]](#)

## 6.22.2 Installation and Setup

Refer to Log Reader and SAP ASE adapters for installation and setup information.

Because the SAP ECC adapters are built on top of existing Data Provisioning adapters, you must use the procedures of those adapters to build your SAP ECC adapters.



## Related Information

[SAP ASE \[page 419\]](#)

[Oracle Log Reader \[page 349\]](#)

[Microsoft SQL Server Log Reader \[page 301\]](#)

[IBM DB2 Log Reader \[page 254\]](#)

## 6.22.3 SAP ECC Adapter Preferences

Access adapter settings specific to your source.

You can adjust adapter settings specific to your source in the Data Provisioning Agent Configuration Tool by running `<DPAgent_root>/configTool/dpagentconfigtool.exe`.

Use these settings to tune performance, enhance security, and so on.

## Related Information

[DB2ECCAdapter Preferences \[page 427\]](#)

[MssqlECCAdapter Preferences \[page 429\]](#)

[OracleECCAdapter Preferences \[page 432\]](#)

[SAP ASE ECC Adapter Preferences \[page 435\]](#)

### 6.22.3.1 DB2ECCAdapter Preferences

Configuration parameters for the DB2 ECC adapter.

#### Note

Log Reader and ECC adapter preferences, except for *Number of wrapped log files*, *Enable verbose trace*, and *Maximum log file size*, are no longer set in the Data Provisioning Agent Configuration Tool. They are now moved to the remote source configuration options in SAP HANA. If you have upgraded from a previous version, then the settings you find in the Agent Configuration Tool are your previous settings, displayed for your reference.

Parameter	Description	Default value
Maximum operation queue size	The maximum number of operations permitted in the log reader operation queue during replication.	1000

Parameter	Description	Default value
Maximum scan queue size	The maximum number of log records permitted in the log reader log scan queue during replication.	1000
Ignore log record processing errors	Determines whether to ignore log record processing errors.	false
Replicate LOB columns	Determines whether the agent applies each individual LOB change.	true
Database connection pool size	Maximum number of connections allowed in the connection pool on a secondary node.	15
Number of times to retry to connect if a connection fails	Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt, as long as the server is not found, for the specified number of times.	5
Timeout in seconds to retry connecting	The number of seconds the agent waits between retry attempts to connect to the primary database.	10
Number of wrapped log files	The maximum size, in 1-K blocks, of the LogReader system log file before wrapping.	3
Enable verbose trace	Enables or disables extra diagnostic information in the agent system log files.	false
Maximum log file size	Limit the size of the message log to conserve disk space.	1000
Turn on asynchronous logging mode	Specifies whether or not LogReader should turn on a-synchronized logging mode. (TRUE, FALSE)	TRUE
Maximum size of work queue for asynchronous logging	The Maximum size of the work queue for asynchronous logging file handler to collect the log records (1 to 2147483647)	1000

Parameter	Description	Default value
Discard policy for asynchronous logging file handler	<p>Specifies the discard policy for asynchronous logging file handler when the work queue is saturated.</p> <ul style="list-style-type: none"> <li>• BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>• DISCARD: The log records that cannot be offered into queue are dropped.</li> <li>• DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried, which can fail again, causing this process to be repeated.</li> </ul>	BLOCKING

## 6.22.3.2 MssqlECCAdapter Preferences

Configuration parameters for the MS SQL ECC adapter.

### Note

Log Reader and ECC adapter preferences, except for [Number of wrapped log files](#), [Enable verbose trace](#), and [Maximum log file size](#), are no longer set in the Data Provisioning Agent Configuration Tool. They are now moved to the remote source configuration options in SAP HANA. If you have upgraded from a previous version, then the settings you find in the Agent Configuration Tool are your previous settings, displayed for your reference.

Parameter	Description	Default value
Maximum operation queue size	The maximum number of operations permitted in the log reader operation queue during replication.	1000
Maximum scan queue size	The maximum number of log records permitted in the log reader log scan queue during replication.	1000

Parameter	Description	Default value
Maximum wait interval between log scans	The maximum wait interval between Log Reader transaction log scans.	60

**Note**

- The value of the parameter is the maximum number of seconds that can elapse before the Log Reader component scans the transaction log for a transaction to be replicated, after a previous scan yields no such transaction.
- For reduced replication latency in an infrequently updated database, we recommend lower number settings for the parameter.
- If the primary database is continuously updated, the value of the parameter is not significant to performance.

Parameter	Description	Default value
Seconds to add to each log scan wait interval	<p>The number of seconds to add to each wait interval before scanning the transaction log, after a previous scan yields no transaction to be replicated.</p> <div> <p><b>Note</b></p> <ul style="list-style-type: none"> <li>The value of the parameter is the number of seconds added to each wait interval before the LogReader component scans the log for a transaction to be replicated, after a previous scan yields no such transaction.</li> <li>The number of seconds specified by the parameter is added to each wait interval, until the wait interval reaches the value specified by the "Maximum wait interval between log scans" parameter.</li> <li>For optimum performance, the value of the parameter should be balanced with the average number of operations in the primary database over a period of time. In general, better performance results from reading more operations from the transaction log during each LogReader scan.</li> <li>With a primary database that is less frequently updated, increasing the value of the parameter may improve overall performance.</li> <li>If the database is continuously updated, the value of the parameter may not be significant to performance.</li> </ul> </div>	5
Replicate LOB columns	Determines whether the agent applies each individual LOB change.	true
Database connection pool size	Maximum number of connections allowed in the connection pool on a secondary node.	15
Number of times to retry to connect if a connection fails	Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt, as long as the server is not found, for the specified number of times.	5

Parameter	Description	Default value
Timeout in seconds to retry connecting	The number of seconds the agent waits between retry attempts to connect to the primary database.	10
Number of wrapped log files	The maximum size, in 1 K blocks, of the agent system log file before wrapping.	3
Enable verbose trace	Enables or disables extra diagnostic information in the agent system log files.	false
Maximum log file size	Limit the size of the message log to conserve disk space.	1000
Turn on asynchronous logging mode	Specifies whether or not LogReader should turn on a-synchronized logging mode. (TRUE, FALSE)	TRUE
Maximum size of work queue for asynchronous logging	The Maximum size of the work queue for asynchronous logging file handler to collect the log records (1 to 2147483647)	1000
Discard policy for asynchronous logging file handler	<p>Specifies the discard policy for asynchronous logging file handler when the work queue is saturated.</p> <ul style="list-style-type: none"> <li>• BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>• DISCARD: The log records that cannot be offered into queue are dropped.</li> <li>• DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried (which can fail again, causing this process to be repeated.).</li> </ul>	BLOCKING

### 6.22.3.3 OracleECCAdapter Preferences

Configuration parameters for the Oracle ECC adapter.

#### i Note

Log Reader and ECC adapter preferences, except for *Number of wrapped log files*, *Enable verbose trace*, and *Maximum log file size*, are no longer set in the Data Provisioning Agent Configuration Tool. They are now moved to the remote source configuration options in SAP HANA. If you have upgraded from a previous version, then the settings you find in the Agent Configuration Tool are your previous settings, displayed for your reference.

Parameter	Description	Default value
Distinguished Name (DN) in Certificate	<p>The distinguished name (DN) of the primary data server certificate.</p> <ul style="list-style-type: none"> <li>This parameter is only valid if <a href="#">Use SSL</a> is set to "true".</li> <li>If this parameter is set, the DN field in the server certificate is verified to match this parameter. If it does not match, the connection to the primary data server fails.</li> </ul>	
Oracle supplemental logging level	<p>Specifies the level of supplemental logging.</p> <ul style="list-style-type: none"> <li>Table: Table level turns on supplemental logging for subscribed tables and some required system tables.</li> <li>Database: Database level turns on supplemental logging for all tables, including system tables.</li> </ul>	table
Maximum operation queue size	Specifies the maximum number of operations permitted in the log reader operation queue during replication.	1000
Maximum scan queue size	The maximum number of log records permitted in the log reader log scan queue during replication.	1000
Maximum session cache size	The maximum number of Oracle sessions to be cached in memory during replication	1000
Enable parallel scanning	<p>Specifies whether to turn on parallel scanning.</p> <p>To achieve better performance for high-volume log throughput, set the parameter to <b>true</b> to enable parallel scanning.</p>	false
Queue size of parallel scan tasks	Specifies the number of tasks in the queue.	0
Parallel scan SCN range	The maximum number of system change numbers (SCN) processed by each Oracle LogMiner scanner, when parallel scan is enabled, that is, when <code>lr_parallel_scan</code> is true.	1024
Number of parallel scanners	Specifies the number of parallel scanners.	4
Number of log record rows fetched by the scanner at a time	Specifies the number of log record rows fetched by the scanner.	1
Ignore log record processing errors	Determines whether to ignore log record processing errors.	false

Parameter	Description	Default value
Replicate LOB columns	Oracle logs all LOB data (except for BFILE datatypes) in the Oracle redo log. This action allows the agent to apply each individual LOB change. However, for BFILE data, the same technique is used.	true
Ignore data of unsupported types stored in ANYDATA	Specifies whether you want to ignore data with unsupported types housed in ANYDATA wrapper.	false
Database connection pool size	Maximum number of connections allowed in the connection pool on a secondary node.	15
Number of times to retry to connect if a connection fails	Instructs the client library (DBLIB, ODBC, ADO, and so on) to keep retrying the connection attempt, as long as the server is not found, for the specified number of times.	5
Timeout in seconds to retry connecting	The number of seconds the agent waits between retry attempts to connect to the primary database.	10
Number of wrapped log files	The maximum size, in 1-K blocks, of the agent system log file before wrapping.	3
Enable verbose trace	Enables or disables extra diagnostic information in the agent system log files.	false
Maximum log file size	Limit the size of the message log to conserve disk space.	1000
Turn on asynchronous logging mode	Specifies whether or not LogReader should turn on asynchronous logging mode. (TRUE, FALSE)	TRUE
Maximum size of work queue for asynchronous logging	The Maximum size of the work queue for asynchronous logging file handler to collect the log records (1 to 2147483647)	1000



Parameter	Description	Default value
Discard policy for asynchronous logging file handler	<p>Specifies the discard policy for asynchronous logging file handler when the work queue is saturated.</p> <ul style="list-style-type: none"> <li>• BLOCKING: If the executor is not shut down, insert the specified element at the end of this queue and wait for space to become available.</li> <li>• DISCARD: The log records that cannot be offered into queue are dropped.</li> <li>• DISCARD_OLDEST: The log record at the head of the work queue is dropped, and then the log record offering is retried (which can fail again, causing this process to be repeated.).</li> </ul>	BLOCKING

## Related Information

[Oracle Database Permissions \[page 352\]](#)

[Oracle Supplemental Logging \[page 360\]](#)

### 6.22.3.4 SAP ASE ECC Adapter Preferences

Options to control the SAP ASE ECC adapter.

Parameter	Description
Adapter Server Name	The name of the SAP ASE adapter server that receives data changes from the SAP ASE data server.
Adapter Server Port	The port number for the SAP ASE adapter server.
Enable SSL for Adapter Server	Specifies whether to use SSL for the adapter server.
SSL Certificate File Path	Location of the SSL certificate file.
SSL Certificate File Password	The password for accessing the SSL certificate file.

## 6.22.4 Permissions for ECC Dictionary Tables

To replicate SAP ECC dictionary tables, you need specific permissions, depending on the database you are using.

Table 49:

Database	Permissions or instructions
DB2	GRANT DBADM, CREATETAB, BINDADD, CONNECT, CREATE_NOT_FENCED_ROUTINE, IMPLICIT_SCHEMA, LOAD, CREATE_EXTERNAL_ROUTINE, QUIESCE_CONNECT ON DATABASE TO USER DPADM
Oracle	Permissions are granted when setting up your adapter by running the script found in the <code>oracle_init_example.sql</code> file, which is located in the <code>Scripts</code> folder of the Data Provisioning Agent installation ( <code>&lt;DPAgent_root&gt;\LogReader\Scripts</code> ).

### Related Information

[Remote Database Setup for Oracle Real-time Replication \[page 359\]](#)

[Remote Database Setup for DB2 Real-time Replication \[page 256\]](#)



## 6.22.5 Create an ECC Remote Source

Create a remote source for your ECC adapter.

### Context

The following is an example of creating an ECC Adapter remote source in SAP HANA studio.

### Procedure

1. In the Systems view, open  [Provisioning](#) > [Remote Sources](#) .
2. Right-click [Remote Sources](#), and select [New Remote Source](#).
3. Enter the required information for your particular database and ECC information.
4. Click the [Save](#) icon in the upper right-hand corner of the screen.

## Related Information

[SAP ECC Remote Source Configuration \[page 437\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

[Create Credentials for a Secondary User](#)

[SAP ASE Remote Source Configuration \[page 422\]](#)

## 6.22.6 SAP ECC Remote Source Configuration

Configuration settings for accessing ECC remote sources. Also included are sample codes for creating remote sources using the SQL console.

The following ECC-specific parameter is for creating a remote source. You can find information about database-specific parameter information in the remote source parameter topics for Log Reader adapters.

ERP Additional Info Options	Description
Owner/Schema	The source database owner/schema for all ECC tables. Typically, this value is "SAPSR3".
Dictionary Schema	If you want to use pool or cluster tables, you have to replicate a set of DD* tables into SAP HANA. The Dictionary Schema must be the schema name where those tables are replicated. <div><b>i Note</b> This parameter is available only with the SAP ASE ECC adapter.</div>
Use empty string for values only containing white space	Set this parameter to <i>True</i> so that any column value containing only white space is converted to an empty string; otherwise, the white space remains. The default value is <i>False</i> .  The value of this parameter may not be changed when the remote source is suspended.

## Example: IBM DB2 ECC Adapter

### Sample Code

```
CREATE REMOTE SOURCE "MyDB2Source" ADAPTER "DB2ECCAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
```

```

<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="pds_host_name" displayName="Host">myhost.sap.corp</
PropertyEntry>
<PropertyEntry name="pds_port_number" displayName="Port Number">50000</
PropertyEntry>
<PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
<PropertyEntry name="pds_datasource_name" displayName="Database
SourceName">mydb</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="erppadditionalinfo" displayName="ERP Additional Info">
<PropertyEntry name="schema" displayName="Owner/Schema">SAPSR3</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>';

```

## Example: Microsoft SQL Server ECC Adapter

### Sample Code

```

CREATE REMOTE SOURCE "MySQLServerSource" ADAPTER "MssqlECCAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="data_type_conversion" displayName="Data Type Conversion">
<PropertyEntry name="map_char_types_to_unicode" displayName="Always Map
Character Types to Unicode">false</PropertyEntry>
<PropertyEntry name="map_time_to_timestamp" displayName="Map SQL Server Data
Type Time to Timestamp">true</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="pds_server_name" displayName="Host">myserver.sap.corp</
PropertyEntry>
<PropertyEntry name="pds_port_number" displayName="Port Number">1433</
PropertyEntry>
<PropertyEntry name="pds_database_name" displayName="Database Name">mydb</
PropertyEntry>
<PropertyEntry name="pdb_dcmode" displayName="Database Data Capture
Mode">MSCDC</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="cdc" displayName="CDC Properties">
<PropertyGroup name="logreader" displayName="LogReader">
<PropertyEntry name="skip_lr_errors" displayName="Ignore log record decluster
errors">false</PropertyEntry>
</PropertyGroup>
</PropertyGroup>
<PropertyGroup name="erppadditionalinfo" displayName="ERP Additional Info">
<PropertyEntry name="schema" displayName="Owner/Schema">SAPSR3</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>'

```

## Example: Oracle ECC Adapter

### Sample Code

```
CREATE REMOTE SOURCE "MyOracleSource" ADAPTER "OracleECCAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="pds_host_name" displayName="Host">myhost.sap.corp</
PropertyEntry>
<PropertyEntry name="pds_port_number" displayName="Port Number">1521</
PropertyEntry>
<PropertyEntry name="pds_database_name" displayName="Database Name">myoradb</
PropertyEntry>
</PropertyGroup>
<PropertyGroup name="erpadditionalinfo" displayName="ERP Additional Info">
<PropertyEntry name="schema" displayName="Owner/Schema">SAPSR3</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>';
```

## 6.22.7 Creating a Whitelist to Limit Access to a Source Database

There are times when you may want to limit access to all of the tables in a source database. For data provisioning log reader adapters, as well as SAP HANA and SAP ECC adapters, an efficient way to limit access is to create a whitelist.

Restricting access to only those tables that are to be replicated is done by creating a whitelist of source database objects in a separate table.

### i Note

The whitelist impacts only the virtual table created and the replications created after the whitelist was created.

You can use SQL to create the whitelist table.

### i Note

- The whitelist table, which can have any name, must have two columns named REMOTE\_SOURCE\_NAME and WHITELIST.
- The whitelist items are separated by a comma.
- You can use an asterisk (\*) to represent any character or empty string. However, the asterisk must be placed at the end of a whitelist item. Otherwise, it is treated as a normal character.
- You can add multiple rows of whitelisted tables for a single remote source.

## Microsoft SQL Server Example

```
create table whitelist(REMOTE_SOURCE_NAME varchar(128), WHITELIST varchar(4000));
```

To add a whitelist for the remote source called "localmssqldb", insert a row into the whitelist table:

```
insert into whitelist values('localmssqldb', 'object.A, object.B*');  
insert into whitelist values('localmssqldb', 'object.C, object.D*');
```

object.A, object.B\*, and so on, means that the table (or procedure) object.A and the table (or procedure) starting with object.B are filtered for the remote source "localmssqldb".

## SAP HANA Example

```
create schema SAP RESTRICTIONS;  
create table WHITE_LIST(REMOTE_SOURCE_NAME varchar(128) primary key, WHITELIST  
varchar(4000));
```

To add a whitelist for the remote source called "localhadp", insert a row into the whitelist table:

```
insert into WHITE_LIST values('localhadp', 'APP_USER.MERCHANT,APP_PRODUCT.B*');
```

APP\_USER.MERCHANT,APP\_PRODUCT.B\* means that the table (or procedure) APP\_USER.MERCHANT and the table (or procedure) starting with APP\_PRODUCT.B are filtered for remote source "localhadp".

## 6.22.8 SQL Pushdown for Pooled and Cluster Tables

There are limitations for SQL pushdown operations to SAP ECC pooled and cluster tables.

There is no SQL pushdown for pool tables. For cluster tables, there is limited SQL pushdown.

If SQL pushdown is not available for a given SQL statement, then the SQL is performed within the SAP HANA system. Pushing down the SQL results in better performance.

Keep the following in mind when using pushdown for cluster tables:

- The SELECT statement's WHERE clause must contain only fields that are keys in both the parent table cluster and the contained cluster table.
- The SELECT clause is limited to field names from the cluster table or \*.

For example, the cluster table KONV is contained within the table cluster KOCLU. The table cluster KOCLU has three keys MANDT, KNUMV, and PAGENO. The cluster table KONV has keys MANDT, KNUMV, KPOSN, STUNR, ZAEHK. The only keys which they have in common are MANDT and KNUMV. So, the WHERE clause cannot refer to any fields other than MANDT and KNUMV.

If VT\_KONV is a virtual table to the KONV cluster table, then:

```
SELECT * FROM VT_KONV WHERE MANDT='001' AND KNUMV='321'
```

can be pushed down, because both MANDT and KNUMV are keys in both the KONV cluster table and the parent KOCLU table cluster.

However,

```
SELECT COUNT(*) FROM VT_KONV WHERE MANDT='001' AND KNUMV='321'
```

cannot be pushed down, because the SELECT clause contains something other than KONV field names or \*.

## 6.22.9 Loading Metadata for Cluster and Pooled Tables

Load cluster and pooled table metadata. This only applies to the SAP ASE ECC adapter.

Before working with SAP ASE ECC cluster or pooled tables, their metadata must be loaded into SAP HANA into a schema specified by the `dictionarySchema` attribute. To do this, execute the `replicate_dictionary.sql` script, and then create and execute the stored procedures that are listed below.

### i Note

We previously created remote subscriptions for the dictionary tables (DD\* tables). Because these tables are typically static, it suffices to materialize these tables once. If there are changes to the contents of the dictionary tables, you will need to truncate and reload these dictionary tables again by running Step 3.

### i Note

Beginning with the ABAP Platform 1808/1809 release, cluster and pooled tables are not supported in SAP S/4 HANA.

1. In SAP HANA studio, choose **File > Open** and navigate to `<DPAgent_root>/LogReader/scripts`.
2. Select `replicate_dictionary.sql`.
3. Right click on the text screen, and click **Choose Connection**. Select your connection, and click **OK**.
4. Click **Execute**.
5. Call this stored procedure with the following parameters, after making appropriate replacements for `<HANA_SCHEMA>` and `<remote_source_name>` in `replicate_dictionary.sql`:

### i Note

`<HANA_SCHEMA>` should be replaced with the name of the schema where you would replicate the DD\* tables. This schema is also specified as the Dictionary Schema while configuring the remote source. The source (virtual tables) and target tables must also reside in the same schema as the Dictionary Schema.

- call `materialize_dictionary_table('<HANA_SCHEMA>','<remote_source_name>','DD02L');`
- call `materialize_dictionary_table('<HANA_SCHEMA>','<remote_source_name>','DD03L');`

### i Note

Use this procedure to initial load the DD03L table if your SAP HANA system has plenty of free memory.

- call `materialize_dictionary_table('<HANA_SCHEMA>','<remote_source_name>','DD16S');`
- call `materialize_dictionary_table('<HANA_SCHEMA>','<remote_source_name>','DDNTT');`
- call `materialize_dictionary_table('<HANA_SCHEMA>','<remote_source_name>','DDNTF');`
- call  
`materialize_dictionary_table_dd03l('<HANA_SCHEMA>','<remote_source_name>','<remote_source_table>');`

#### **i Note**

This procedure initial loads specific rows for the cluster/pooled table in DD03L if free memory in your SAP HANA target is limited. Be sure that this procedure is run prior to creating a replication task or flowgraph for this cluster/pooled table.

## 6.23 SAP HANA

The SAP HANA adapter provides real-time change data capture capability in order to replicate data from a remote SAP HANA database to a target SAP HANA database.

Unlike Log Reader adapters, which read a remote database log to get changed data, the SAP HANA adapter is trigger-based: triggers capture changed data, and the adapter continuously queries the source database to get the changed data. When a table is subscribed to replicate, the adapter creates three triggers (INSERT, UPDATE, and DELETE) on the table for capturing data.

The adapter also creates a shadow table for the subscribed table. Except for a few extra columns for supporting replication, the shadow table has the same columns as its replicated table. Triggers record changed data in shadow tables. For each adapter instance (remote source), the adapter creates a Trigger Queue table to mimic a queue. Each row in shadow tables has a corresponding element (or placeholder) in the queue. The adapter continuously scans the queue elements and corresponding shadow table rows to get changed data and replicate them to the target SAP HANA database.

### Adapter Functionality

This adapter supports the following functionality:

- Source support for ECC on SAP HANA
- Virtual table as a source
- Virtual table as a target using a Data Sink in a flowgraph
- Search for tables in a remote source
- DDL propagation. This adapter supports the ADD COLUMN, and DROP COLUMN operations.
- Real-time change data capture
- Replication monitoring and statistics

In addition, this adapter supports the following capabilities:



Table 50: Global Settings

Functionality	Supported?
SELECT from a virtual table	Yes
INSERT into a virtual table	Yes
Execute UPDATE statements on a virtual table	Yes
Execute DELETE statements on a virtual table	Yes
Different capabilities per table	No
Different capabilities per table column	No
Real-time	Yes

Table 51: Select Options

Functionality	Supported?
Select individual columns	Yes
Add a WHERE clause	Yes
JOIN multiple tables	Yes
Aggregate data via a GROUP BY clause	Yes
Support a DISTINCT clause in the select	Yes
Support a TOP or LIMIT clause in the select	Yes
ORDER BY	Yes
GROUP BY	Yes

## Related Information

[User Permissions \[page 444\]](#)

[SAP HANA Adapter Preferences \[page 444\]](#)

[SAP HANA Remote Source Configuration \[page 444\]](#)

[SAP HANA DDL Propagation \[page 456\]](#)

[Use a Shadow Remote Source \[page 457\]](#)

[Creating a Whitelist to Limit Access to a Source Database \[page 458\]](#)

[Disable Adapter Write-back Functionality \[page 459\]](#)

## 6.23.1 User Permissions

Configure the necessary permissions for SAP HANA adapters.

Ensure that you configure the following permissions:

- For real-time change data capture: TRIGGER on source tables or schema of source tables
- For SAP HANA virtual tables used as a source: SELECT
- For SAP HANA virtual tables used as a target (Data Sink) in an `.hdbflowgraph`: INSERT, UPDATE, and DELETE
- If `<Schema>` is not empty and its value is not equal to `<User>` in Credentials, GRANT CREATE ANY ON SCHEMA `<Schema>` TO `<User>` WITH GRANT OPTION

## 6.23.2 SAP HANA Adapter Preferences

Set the thread pool size when executing jobs of querying shadow tables to get change data.

Parameter	Description
Thread Pool Size	<p>The size of the SAPHANA adapter global thread pool. SAP HANA adapter remote sources shares the thread pool. The thread pool is used to execute jobs of querying shadow tables to get change data.</p> <p>We recommend that you configure the thread pool size to the number of available processors in the system, if possible.</p>

## 6.23.3 SAP HANA Remote Source Configuration

Use the SAP HANA adapter to move data from one SAP HANA instance to another. Also included is sample code for creating a remote source using the SQL console.

### Privileges

The following schema privileges on the schemas, under which there are tables to be accessed, must be granted to the configured user on the remote SAP HANA database:

- For real-time change data capture: TRIGGER on source tables or schema of source tables
- For SAP HANA virtual tables used as a source: SELECT
- For SAP HANA virtual tables used as a target (Data Sink) in an `.hdbflowgraph`: INSERT, UPDATE, and DELETE
- If `<Schema>` is not empty and its value is not equal to `<User>` in Credentials, GRANT CREATE ANY ON SCHEMA `<Schema>` TO `<User>` WITH GRANT OPTION

## Remote Source Parameters

Category	Option	Description
Database	Host Auto Failover	Enable auto failover for scale-out SAP HANA. The default is <i>False</i> .
	Host	The host name or IP address on which the remote SAP HANA server is running.  <b>i Note</b> The value of this parameter can be changed when the remote source is suspended.
	Port Number	The port number of the remote SAP HANA server.  If the remote SAP HANA server is a single-container system, the port number is 3<instance>15, and the <i>Database Name</i> parameter must be empty.  If the remote SAP HANA server is a multiple-container system, the port number is 3<instance>13, and the tenant database name must be specified in the <i>Database Name</i> parameter.  <b>i Note</b> Use an arbitrary port like 1234. Do not put 1433 or 1434 as the instance number.  Execute the following query to obtain the system database SQL port.  <pre>SELECT DATABASE_NAME, SQL_PORT FROM SYS_DATABASES.M_SERVICES WHERE DATABASE_NAME='SYSTEMDB' and SERVICE_NAME='nameserver' and COORDINATOR_TYPE= 'MASTER';</pre>
	Auto-Failover Hosts Connection	The connection string for scale-out HANA auto failover, format is <b>host1:port1;host2:port2;host3:port3</b> . This parameter is configurable if <i>Host Auto-Failover</i> is <i>True</i> .  <b>i Note</b> The value of this parameter can be changed when the remote source is suspended.
	Whitelist Table in Remote Database	Enter the name of table that contains the whitelist in the remote database.

Category	Option	Description
	Database Name	Specifies the database name, if the remote database is a tenant database. Leave this parameter empty if the remote database is not a tenant database.
	Schema (Case Sensitive)	<p>If <code>&lt;Schema&gt;</code> is not empty and its value is not equal to <code>&lt;User&gt;</code> in <i>Credentials</i>, the SAP HANA adapter creates a series of system objects under this schema, instead of <code>&lt;User&gt;</code>.</p> <div> <p><b>Note</b></p> <p>This option is no longer required. It is visible solely for backward compatibility purposes. It was used in previous versions to restrict the viewing of tables to those tables under the given schema. Now, you can view all tables, regardless of the schema they are located under. For those remote sources that were created in a previous version, this option value must keep unchanged.</p> </div>
	JDBC Connection Properties	<p>Extra SAP HANA-supported JDBC connection properties.</p> <p>Separate each property definition with an ampersand (&amp;). For example:</p> <pre>distribution=OFF&amp;autocommit=true</pre> <p>For a complete list of supported properties, see "" in the <i>SAP HANA Client Interface Programming Reference</i>.</p>
	Retrieve Last Modified Dates for Objects in Dictionary	<p>The process of creating a table dictionary queries metadata-LastModifiedTimestamp from the source database, which may take a lot of time.</p> <ul style="list-style-type: none"> <li><b>True</b> (default): Keeps the current behavior of querying metadataLastModifiedTimestamp.</li> <li><b>False</b>: Disables the current behavior. If you do not need the data from metadataLastModifiedTimestamp, set this parameter to false. Doing so can help with performance.</li> </ul>
Schema Alias Replacements	Schema Alias	<p>Schema name to be replaced with the schema given in Schema Alias Replacement. If given, accessing tables under it is considered to be accessing tables under the schema given in Schema Alias Replacement.</p> <div> <p><b>Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>

Category	Option	Description
	Schema Alias Replacement	<p>Schema name to be used to replace the schema given in Schema Alias.</p> <div> <p><b>i Note</b></p> <p>If the schema alias is not configured, leave this blank.</p> </div> <div> <p><b>i Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
CDC Properties	System Object Prefix	(Case Insensitive) The prefix of the names of the SAP HANA adapter system objects created in the source SAP HANA database by the adapter. We recommend keeping the default value of HADP_.
	In-Memory Sequences	If <i>In-Memory Sequence</i> is set to <i>True</i> , the SAP HANA adapter creates sequence objects with the statement <code>CREATE SEQUENCE ... RESET BY ...</code> . The default value is <i>True</i> .
	Sequence Cache Size	<p>If <i>Sequence Cache Size</i> is set to a value of &gt; 1, the SAP HANA adapter creates sequence objects with statement <code>CREATE SEQUENCE ... CACHE &lt;cache size&gt; ...</code>, where <i>&lt;cache size&gt;</i> equals the value of the <i>Sequence Cache Size</i> parameter. If <i>Sequence Cache Size</i> is set to value of &lt;=1, no CACHE parameter is appended in the <code>CREATE SEQUENCE</code> statement.</p> <p>The default value is 1000. The valid range is 0 to 30000</p>
	Reserve System Sequences	<p>Set to <i>True</i> (default) if you want the SAP HANA adapter to reserve the scan_seq and trigger_seq system sequences, even though all of the subscriptions are dropped or reset.</p> <p>If you do not want to use this remote source, and you want to remove the environment, first, set this parameter to <i>False</i>, then drop the subscription and drop the remote source.</p> <div> <p><b>i Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>

Category	Option	Description
	Connection Pool Size	<p>Maximum number of connections allowed in the connection pool. The default value is 4.</p> <div> <b>i Note</b> </div>
	Minimum Scan Interval in Seconds	<p>The minimum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value is 0 (seconds), which means there is no waiting time before the next scan. The value of this parameter can be changed when the remote source is suspended.</p> <div> <b>i Note</b> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
	Maximum Scan Interval in Seconds	<p>The maximum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value is 10 (seconds). If the adapter scans the queue and finds that the queue is empty, it gradually increases the scan interval from the minimum scan interval to the maximum scan interval.</p> <div> <b>i Note</b> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
	DDL Scan Interval in Minutes	<p>The interval for detecting DDL changes in the source.</p> <p>A zero or negative integer disables this parameter.</p> <p>The default value is 10 (minutes).</p> <div> <b>i Note</b> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
	Maximum Batch Size	<p>The maximum number of consecutive change data on the same table that is batched to process and send to Data Provisioning Server together. The default value is 128.</p> <div> <b>i Note</b> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>

Category	Option	Description
	Batch Queue Size	<p>The internal batch queue size. The batch queue size determines the maximum number of batches of change data that are queued in memory. The default value is 64.</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
	Maximum Transaction Count in Scan	The maximum number of transactions being processed in a scan of the remote source database.
	Maximum Scan Size	The maximum number of rows being fetched from the trigger queue table in one scan and assigned to batch jobs for further processing.
	Maintenance User Filter (Case Sensitive)	<p>Optional. Enter a source database user name. Source database transactions (INSERT, UPDATE, and DELETE) conducted by this user is filtered out (ignored) and not propagated to the SAP HANA target. For example, if you log in to the source database with this maintenance user and delete a row from a source table that is subscribed for replication, this row is not deleted from the SAP HANA target table.</p> <div> <b>i Note</b>  Do not use the same name as the SAP HANA database username. </div> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. However, the changed value takes effect only on newly created remote subscriptions afterward. The existing subscriptions are still using the old value. </div>

Category	Option	Description
	Manage System Objects Life-Cycle	<ul style="list-style-type: none"> <li>• <a href="#">Create and Clear Normally</a>: Normal behavior in system objects life-cycle (Default). Support for dropping and creating system objects.</li> <li>• <a href="#">Clear Only</a>: Support for dropping system objects, if they exist. This setting is normally used in unsubscribing tables and cleaning up the environment.</li> <li>• <a href="#">Create and Reuse</a>: Support for creating system objects, if they do not exist. For the existing objects, the SAP HANA adapter reuses them.</li> <li>• <a href="#">Reuse Only</a>: No support for dropping or creating system objects. For the existing objects, the SAP HANA adapter reuses them. This setting is normally used in a shadow remote source that wants to retrieve the subscription in a remote source and replicate continuously.</li> </ul>
	Last Committed Sequence Id	<p><a href="#">Last Committed Sequence Id</a> is required only when <a href="#">Manage System Objects Life-Cycle</a> is set to <a href="#">Reuse Only</a>.</p> <p>If you set this parameter to 0, the HANA adapter scans new cached data without rescanning.</p> <p>You can get its value by executing the following SQL statement in your target system:</p> <pre>SELECT MAX (LAST_PROCESSED_COMMIT_SEQUENCE_ID) FROM M_REMOTE_SUBSCRIPTIONS WHERE SUBSCRIPTION_NAME IN ( SELECT SUBSCRIPTION_NAME FROM "PUBLIC"."REMOTE_SUBSCRIPTIONS" WHERE REMOTE_SOURCE_NAME = 'normal_rs' )</pre>
	Triggers Record PK Only	<p>Set to <a href="#">True</a> to have the triggers record only primary keys of delta data during CDC processing. This action may improve the DML performance in the source database.</p> <p>The default value is <a href="#">False</a> and the SAP HANA adapter does not support UPDATE primary key value in this mode. If you want to enable this functionality, please add a system property in <code>dpagentconfig.ini</code> first:</p> <pre>hanaadapter.recordPKOnly.capture_before_and_after_images=true</pre> <p>There are side effects to using this parameter. For example, a drop in replication performance is expected. This side effect is a compromise to achieve better trigger/DML performance on the source DB.</p>



Category	Option	Description
	Enable Upsert Trigger	<p>This option is only valid when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <ul style="list-style-type: none"> <li><i>True</i>: A trigger captures change data from the remote table into shadow table through an UPSERT operation.</li> <li><i>False</i>: A trigger captures change data from the remote table into shadow table through an INSERT operation.</li> </ul> <p>The default value is <i>False</i>.</p>
	Capture Before and After Images	<p>This option is only valid when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <ul style="list-style-type: none"> <li><i>True</i>: A trigger captures both before and after images of UPDATE operations on the remote table.</li> <li><i>False</i>: A trigger captures only the after image of UPDATE operations on the remote table.</li> </ul> <p>The default value is <i>False</i>.</p>
	Shadow Table Type	<p>Configures the type of shadow table.</p> <p>This option is only valid when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <p>The default value is <i>COLUMN</i>.</p>
	Trigger Queue Table Type	<p>Configures the type of trigger queue table.</p> <p>This option is only valid when <i>Triggers Record PK Only</i> is set to <i>True</i>.</p> <p>The default value is <i>COLUMN</i>.</p>

Category	Option	Description
	Source Data Pattern Analysis	<p>When set to <i>True</i>, files are created to record the scan history. These files are placed in a folder created in the framework log directory: <code>&lt;DPAgent_root&gt;/log&lt;remote_source_prefix&gt;_&lt;timestamp&gt;/&lt;sequence&gt;.csv</code></p> <p>The generated CSV file contains the following columns:  SCAN_NUMBER; START_PROCESS_TIME;  END_PROCESS_TIME; TRANSACTION_ID;  COMMIT_TIME; TABLE_NAME; INSERT_COUNT;  BEFORE_IMAGE_COUNT; AFTER_IMAGE_COUNT;  DELETE_COUNT</p> <p>You can control the number and size of these files by tuning the following Agent Adapter Framework Preferences logging parameters: <i>Log max backup</i> and <i>Log file max file size</i>.</p> <p>The default value is <i>True</i>.</p> <div> <p><b>i Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
	Transmit Data in Compact Mode	<p>Specifies whether to transmit data in compact mode. If you set <i>Transmit Data in Compact Mode</i> to <i>True</i>, the SAP HANA adapter packs and sends out the data of one table together with other tables, which could speed up applying data in DPServer. However, doing so breaks referential integrity among tables.</p> <p>The default value is <i>False</i>.</p>
	Enable Transaction Merge	<ul style="list-style-type: none"> <li><i>True</i>: Transactions on same remote table are grouped together into one transaction and replicated to the target.</li> <li><i>False</i>: Transactions are replicated as-is.</li> </ul> <p>The default value is <i>False</i>.</p>

Category	Option	Description
Connection Security	Enable SSL Encryption	<p>Specifies whether to enable SSL encryption on connections to a remote SAP HANA database. The default value is <i>False</i>.</p> <p>To use SSL encryption with a remote SAP HANA database, the Data Provisioning Agent must already be correctly configured for SSL support:</p> <ul style="list-style-type: none"> <li>• <a href="#">Configure SSL for SAP HANA On-Premise [Command Line Batch] [page 509]</a></li> </ul> <div> <p><b>i Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
	Validate Server Certificate	<p>Specifies whether to validate the certificate of a remote SAP HANA server.</p> <p>This configuration is only meaningful if <i>Enable SSL Encryption</i> is set to <i>True</i>. The default value is <i>False</i>.</p> <div> <p><b>i Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
	Host Name in Server Certificate	<p>Controls the verification of the host name field of the server certificate:</p> <ul style="list-style-type: none"> <li>• If not set, the host name used for the connection is used for verification. Note that SSL is name-based; connecting to an IP address, or to "localhost" is unlikely to work.</li> <li>• If set to a string, <ul style="list-style-type: none"> <li>◦ If the string is "*", any name matches.</li> <li>◦ If the string starts with "CN=", it is treated as a common name, and the textual representation of the common name entry in the certificate must be exactly the same.</li> <li>◦ Enable SSLOtherwise, the host name in the server certificate must match this string (case insensitive).</li> </ul> </li> </ul> <div> <p><b>i Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>

Category	Option	Description
	Use Agent Stored Credential	<p>Set to <i>True</i> to use credentials that are stored in the Data Provisioning Agent secure storage.</p> <p>The default value is <i>False</i>.</p> <div> <b>i Note</b>            When you use credentials stored in the agent's secure storage, you must still specify the user name in <i>Credentials &gt; User</i>. Additionally, the <i>Credential Mode</i> must not be <i>None</i> or empty.         </div>
Credentials	Credentials Mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
	User	<p>Database user name (case sensitive)</p> <div> <b>i Note</b>            The value of this parameter can be changed when the remote source is suspended.         </div>
	Password	<p>The appropriate corresponding password</p> <div> <b>i Note</b>            The value of this parameter can be changed when the remote source is suspended.         </div>

## Basic

The following sample codes illustrate how to create a remote source using the SQL console.

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyHanaSource" ADAPTER "HanaAdapter" AT LOCATION AGENT
"MyAgent"
```

```

CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="host" displayName="Host">myhost.sap.corp</PropertyEntry>
<PropertyEntry name="port" displayName="Port Number">30115</PropertyEntry>
<PropertyEntry name="schema" displayName="Schema">myschema</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="cdc_properties" displayName="CDC Properties">
<PropertyEntry name="prefix" displayName="System Object Prefix">HADP_</
PropertyEntry>
<PropertyEntry name="conn_pool_size" displayName="Connection Pool Size">8</
PropertyEntry>
<PropertyEntry name="min_scan_interval" displayName="Minimum Scan Interval in
Seconds">0</PropertyEntry>
<PropertyEntry name="max_scan_interval" displayName="Maximum Scan Interval in
Seconds">10</PropertyEntry>
<PropertyEntry name="max_batch_size" displayName="Maximum Batch Size">128</
PropertyEntry>
<PropertyEntry name="batch_queue_size" displayName="Batch Queue Size">64</
PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>';

```

## DDL scan enabled

### Example

#### Sample Code

```

CREATE REMOTE SOURCE "MyHanaSource" ADAPTER "HanaAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" displayName="Database">
<PropertyEntry name="host" displayName="Host">myhost.sap.corp</PropertyEntry>
<PropertyEntry name="port" displayName="Port Number">30115</PropertyEntry>
<PropertyEntry name="schema" displayName="Schema">myschema</PropertyEntry>
</PropertyGroup>
<PropertyGroup name="cdc_properties" displayName="CDC Properties">
<PropertyEntry name="prefix" displayName="System Object Prefix">HADP_</
PropertyEntry>
<PropertyEntry name="ddl_scan_interval" displayName="DDL Scan Interval in
Minutes">1</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>';

```

## Related Information

[SAP HANA DDL Propagation \[page 456\]](#)

[Using a Schema Alias \[page 277\]](#)

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

[Use a Shadow Remote Source \[page 457\]](#)

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

[Creating a Whitelist to Limit Access to a Source Database \[page 458\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Batch\] \[page 82\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Command Line\] \[page 68\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

[JDBC Connection Properties \(SAP HANA Client Interface Programming Reference\)](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

## 6.23.4 SAP HANA DDL Propagation

Information about DDL propagation when using the SAP HANA adapter.

### DDL Scan Interval

Enabling DDL propagation can impact the performance of the source SAP HANA database. Setting an appropriate value for the remote source option *DDL Scan Interval in Minutes* matters.

From the time the DDL changes occur on the source database to the time the DDL changes are propagated to the target SAP HANA database, no DML changes on the tables are allowed. At configured intervals (*DDL Scan Interval in Minutes*, By default, 10 minutes), the HANA adapter queries the metadata of all subscribed tables from the source HANA database, and it determines if changes to the DDL have occurred. If changes are detected, it propagates the DDL changes to the target database through the Data Provisioning Server.

Because the HANA adapter detects DDL changes by querying source HANA system tables, the source database might be burdened if you configure a small value for the *DDL Scan Interval in Minutes* option. However, configuring a large value would increase the latency of DDL propagation. Therefore, you should experiment to figure out what value works best for you. If changes to the DDL are rare, you might even want to disable DDL propagation by setting the value of the *DDL Scan Interval in Minutes* option to zero. Setting to zero prevents the HANA adapter from querying metadata from the source database periodically.

### Limitation

Remember that during the time period between when DDL changes occur on the source database and when they are replicated to the target HANA, there must be no DML changes on the subscribed source tables.

Replicating DDL changes would trigger the SAP HANA adapter to update (drop and then re-create) triggers and shadow tables on the changed source tables. Errors may result if any data is inserted, updated, or deleted on the source tables during this time period.

## Related Information

[SAP HANA Remote Source Configuration \[page 444\]](#)

### 6.23.5 Use a Shadow Remote Source

Use a shadow remote source to reduce maintenance while performing real-time replication.

## Context

During real-time replication, if there are exceptions that prevent replicating under a current remote source, and these exceptions cannot be ignored, you can only drop and re-create the replication tasks. This limitation can be very cumbersome in production environments. In this scenario, you can create a shadow remote source to mitigate this problem.

The SAP HANA adapter is based on triggers, and it creates system objects when setting up the environment, such as triggers, shadow tables, and trigger\_queue tables. Every remote source has a trigger\_queue table, and every table has a relevant shadow table. A shadow remote source continues to replicate, so all the subscriptions under it reuse those system objects.

## Procedure

1. Suspend the normal remote source (referred to as “normal\_rs” in this example).
2. Create a shadow remote source (referred to as “shadow\_rs” in this example).

For the *Manage System Objects Life-Cycle* parameter, choose *Reuse Only*, and for the *Last Committed Sequence Id* parameter, type in the ID. The *Schema* and *System Object Prefix* parameters must be the same as the normal\_rs remote source.

3. Create virtual tables at shadow\_rs and create subscriptions (for example, subs1\_shadow, subs2\_shadow, subs3\_shadow...)
4. QUEUE and DISTRIBUTE your remote subscriptions.

When retrieving existing subscriptions, the HANA adapter checks to see if the subscribed tables are legal. If a user subscribes the wrong table, the following exception occurs: “Add the subscription for table [`<table_name>`] is prohibited when Manage System Objects Life-Cycle is Reuse Only! Please check `dpagent framework.trc` for the recovery steps”.

5. After shadow\_rs is working, if you want to subscribe other tables,
  - a. Suspend shadow\_rs.
  - b. Change *Manage System Objects Life-Cycle* to *Create and Reuse*.
  - c. Resume shadow\_rs.
  - d. Create and start subscriptions.
6. If you want to reset/drop subscriptions under shadow\_rs,
  - a. Suspend shadow\_rs.
  - b. Change *Manage System Objects Life-Cycle* to *Clear Only*.
  - c. Resume shadow\_rs.
  - d. Reset/drop subscriptions.
7. When cleaning up the environment, do not forget to resume normal\_rs, through reset/drop subscriptions.

## Related Information

[SAP HANA Remote Source Configuration \[page 444\]](#)

### 6.23.6 Creating a Whitelist to Limit Access to a Source Database

There are times when you may want to limit access to all of the tables in a source database. For data provisioning log reader adapters, as well as SAP HANA and SAP ECC adapters, an efficient way to limit access is to create a whitelist.

Restricting access to only those tables that are to be replicated is done by creating a whitelist of source database objects in a separate table.

#### i Note

The whitelist impacts only the virtual table created and the replications created after the whitelist was created.

You can use SQL to create the whitelist table.

#### i Note

- The whitelist table, which can have any name, must have two columns named REMOTE\_SOURCE\_NAME and WHITELIST.
- The whitelist items are separated by a comma.
- You can use an asterisk (\*) to represent any character or empty string. However, the asterisk must be placed at the end of a whitelist item. Otherwise, it is treated as a normal character.
- You can add multiple rows of whitelisted tables for a single remote source.



## Microsoft SQL Server Example

```
create table whitelist(REMOTE_SOURCE_NAME varchar(128), WHITELIST varchar(4000));
```

To add a whitelist for the remote source called “localmssqldb”, insert a row into the whitelist table:

```
insert into whitelist values('localmssqldb', 'object.A, object.B*');  
insert into whitelist values('localmssqldb', 'object.C, object.D*');
```

object.A, object.B\*, and so on, means that the table (or procedure) object.A and the table (or procedure) starting with object.B are filtered for the remote source “localmssqldb”.

## SAP HANA Example

```
create schema SAP RESTRICTIONS;  
create table WHITE_LIST(REMOTE_SOURCE_NAME varchar(128) primary key, WHITELIST  
varchar(4000));
```

To add a whitelist for the remote source called “localhadp”, insert a row into the whitelist table:

```
insert into WHITE_LIST values('localhadp', 'APP_USER.MERCHANT,APP_PRODUCT.B*');
```

APP\_USER.MERCHANT,APP\_PRODUCT.B\* means that the table (or procedure) APP\_USER.MERCHANT and the table (or procedure) starting with APP\_PRODUCT.B are filtered for remote source “localhadp”.

## 6.23.7 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. Navigate to the Agent Adapter Framework Preferences.
  - In graphical mode, choose **Config** > **Preferences**, and then select **Adapter Framework**.
  - In command-line interactive mode, choose **Set Agent Preferences** in the **Agent Preferences** menu.

3. For the [Read-only Adapters](#) property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```

## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start and Connect the Configuration Tool \[page 84\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

## 6.24 SDI DB2 Mainframe

SDI DB2 Mainframe adapter is designed to replicate transactional operations from IBM DB2 UDB on z/OS to SAP HANA.

The adapter extracts data from IBM DB2 UDB on z/OS databases as initial load and real-time change data capture.

### i Note

The SDI DB2 Mainframe adapter does not come pre-installed with the Data Provisioning Agent; you must install it separately. Before installing the SDI DB2 Mainframe adapter, you must install the Data Provisioning Agent.

This adapter is supported on Linux only.

## Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source

### i Note

INSERT, UPDATE, and DELETE on a virtual table are not supported.

- Initial load
- Real-time change data capture

### i Note

DDLs are not supported. Also, transactional operations include only INSERT, UPDATE, and DELETE

Encoding schemes supported on the source system: ASCII, EBCDIC, and Unicode

- Replication Monitoring and Statistics
- Search for Tables

In addition, this adapter supports the following capabilities:

- SELECT (WHERE, JOIN, GROUP BY, DISTINCT, TOP or LIMIT, ORDER BY)

## Related Information

[SDI DB2 Mainframe Adapter Architecture \[page 462\]](#)

[Mandatory Changes on Mainframe Systems \[page 463\]](#)

[Install the SDI DB2 Mainframe Adapter \[page 464\]](#)

[SDI DB2 Mainframe Adapter Preferences \[page 465\]](#)

[Install Replication Agent for SDI DB2 Mainframe Adapter \[page 467\]](#)

[Replication Agent for SDI DB2 Mainframe Adapter Configuration \[page 470\]](#)

[Change the OCS Server Port Number Using Command-Line Utility \[page 472\]](#)

[Preparing JDBC JAR Files \[page 473\]](#)

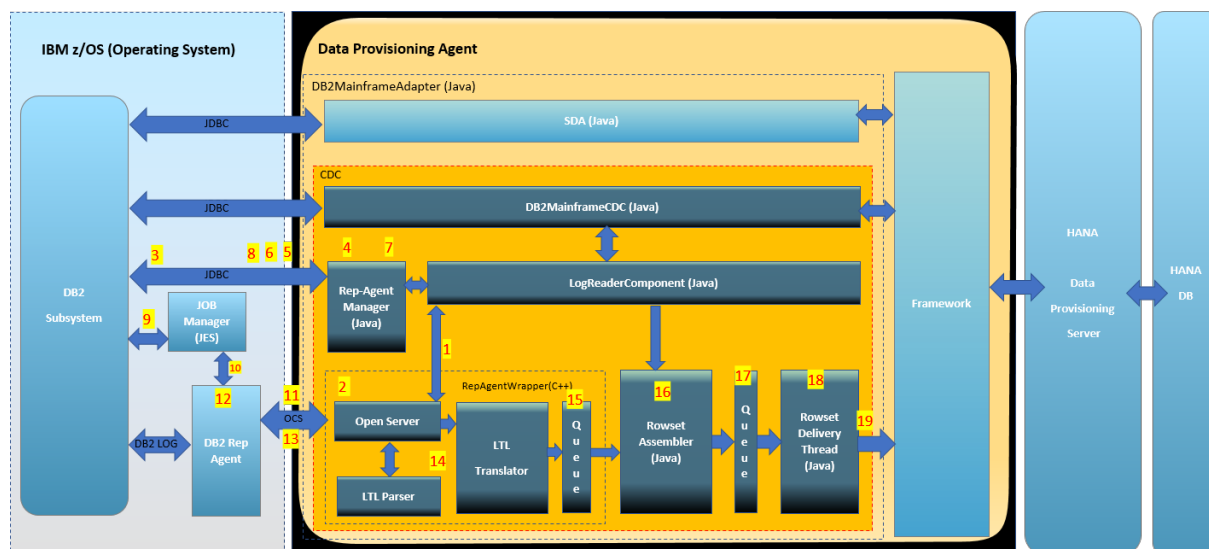
[IBM DB2 Mainframe Remote Source Configuration \[page 473\]](#)

[SAP HANA Smart Data Integration and Smart Data Quality Product Availability Matrix !\[\]\(1ed10657a19f9137278430c48fd18626\_img.jpg\)](#)

[Replication Agent Overview](#)

## 6.24.1 SDI DB2 Mainframe Adapter Architecture

As you work with the SDI DB2 Mainframe adapter, it is helpful to know how the adapter interacts with the various SAP HANA and IBM DB2 components.



The following leads you through a workflow of events that take place after the first subscription is enabled. The Data Provisioning Agent routes this request to SDI DB2 Mainframe adapter.

### Note

This workflow applies to both Auto and Manual modes, except for 4-11, which apply to only Auto mode.

1. Start OCS listener.
2. The OCS server listens on a predefined port. This port number is configurable. The default listener port number is 17000.
3. Replication Agent Manager downloads the Replication Agent Configuration File over JDBC connection via DB2 stored procedure.
4. Replication Agent Manager customizes the Replication Agent Configuration File based on remote source definition. The OCS server listener port number is also written into the Replication Agent Configuration File.
5. Replication Agent Manager uploads the modified Replication Agent Configuration File through JDBC connection.
6. Replication Agent Manager downloads the STARTRA JCL template through JDBC connection.
7. Replication Agent Manager customizes the STARTRA JCL script based on remote source definition.
8. Replication Agent Manager submits the STARTRA JCL through the JDBC connection.
9. DB2 submits the STARTRA JCL to JOB Manager (JES2)
10. After receiving the Job, JOB Manager (JES2) starts the Replication Agent.
11. Once Replication Agent is started, it connects to OCS server automatically based on the server and port information specified in the Replication Agent Configuration File.
12. DML's on the subscribed table will be identified by the Replication Agent via the DB2 logs.
13. Replication Agent sends the changes to OCS server with LTL protocol.
14. LTL Parser and LTL translator parse the LTL data and translate them into interpretable data.

15. The translated data is put into the queue.
16. Rowset assembler thread reads the data from the queue and assembles them into SAP HANA format rowset.
17. Rowset is put into a queue.
18. Rowset delivery thread decides when to send the rowsets in the queue based on different delivery strategy.
19. Rowsets are sent to DPServer by the Rowset delivery thread, and then DPserver applies them to the SAP HANA tables.

## Related Information

[Architecture \[page 12\]](#)

## 6.24.2 Mandatory Changes on Mainframe Systems

Ensure that you have made the necessary changes to your mainframe system.

- Ensure that Replication Agent link libraries are APF authorized.
- When replication agent is started in auto mode, SAP HANA needs exclusive access for Replication Agent installation dataset HLQ.LLQ.VER.JCL. Keeping it open in view/edit mode during Replication Agent startup results in errors.
- The replication TSO user should have the following permissions:
  - TRACE authority to issue the START TRACE command.
  - DISPLAY authority to issue a DISPLAY TRACE to determine if the MONITOR TRACE is already active.
  - MONITOR2 authority to issue the READS request to get the log data that includes the changes to capture.
- For auto mode, the following stored procedures must be installed on DB2:
  - ADMIN\_DS\_BROWSE
  - ADMIN\_DS\_SEARCH

### **i** Note

Be sure to grant permissions for these stored permissions to the replication TSO user.

- For manual mode, the following stored procedures must be installed on DB2:

## 6.24.3 Install the SDI DB2 Mainframe Adapter

You can use either the command-line utility or the GUI mode to install the adapter.

### Context

Install the SDI DB2 Mainframe adapter separately; it is not included in the Data Provisioning Agent.

### Procedure

1. Download the [SDI DB2 MAINFRAME ADAPTER 2.x.x](#) component TGZ file.

Find this file in the software download area where you commonly find the download for the Data Provisioning Agent and other components.

2. Extract the TGZ file.
3. To use command line, execute the following command. To use the GUI installer, skip to the next step.

```
cd HANA_SDI_DB2MainframeAdapter_20_LIN_X86_64
./hdbinst --silent --batch --path=<dpagent installation path>
```

4. Execute the following command to begin the GUI-based installer:

```
cd HANA_SDI_DB2MainframeAdapter_20_LIN_X86_64
./hdbsetup
```

The installation GUI appears.

5. Provide the Data Provisioning Agent installation path in the [Install new SAP HANA SDI DB2 Mainframe Adapter](#) box, and then click [Next](#).
6. Confirm the installation path, and click [Next](#).
7. Click [Install](#).
8. When you receive a message that the installation is successful, click [Finish](#).
9. Verify that the following files are installed in the desired location:

- <DPAgent\_root>/plugins/com.sap.hana.dp.db2mainframelogreaderadapter-n.n.n.jar
- <DPAgent\_root>/t/lib/libDB2MainframeLogReaderAdapter.so

10. Restart the Data Provisioning Agent.

## Next Steps

After Data Provisioning Agent is started, you should be able to see the following messages in

`<DPAgent_root>/log/framework.trc:`

```
2019-07-24 00:20:32,780 [INFO ] DPFramework | AdapterTracker.addingService [] -
Adapter Type: DB2MainframeLogReaderAdapter is added to framework
2019-07-24 00:20:32,790 [INFO ] DPFramework | AdapterManager.setSDKVersion [] -
DB2MainframeLogReaderAdapter Version: 2.4.0.1 with SDKVersion: 9 (2.4.0)
registered.
2019-07-24 00:20:32,792 [INFO ] Activator | Activator.start [] - Adapter
DB2MainframeLogReaderAdapter started.
```

## Related Information

[Software Download \[page 39\]](#)

### 6.24.4 SDI DB2 Mainframe Adapter Preferences

Configuration parameters for the SDI DB2 Mainframe adapter in the Data Provisioning Agent.

Parameter	Description	Default Value
Adapter server name	The name of the SDI DB2 Mainframe adapter server that receives data changes from the DB2 Mainframe data server.	DB2MFAdapterOCSServer
Adapter server port	The port number for the SDI DB2 Mainframe adapter's OCS Listener.	17000
Time to wait for Replication Agent to connect (Seconds)	Max time SDI DB2 Mainframe adapter would wait for Replication Agent to start and send the first transaction to the adapter.	60

**i Note**  
Ensure the value of this parameter is set to double or more than the retry parameter value in the mainframe configuration file

Parameter	Description	Default Value
Time to wait for Replication Agent to re-connect (Seconds)	<p>The maximum seconds that the SDI DB2 Mainframe adapter waits for Replication Agent to reestablish the connection from Replication Agent to the SDI DB2 Mainframe adapter.</p> <p>Valid values include:</p> <ul style="list-style-type: none"> <li>Zero (0) - If the connection to Replication Agent breaks, SDI DB2 Mainframe adapter waits indefinitely for the connection to be re-established.</li> <li>Negative value - SDI DB2 Mainframe adapter reports an error if Replication Agent gets disconnected. This stops the OCSListener, which then stops replication.</li> <li>Positive value (time in seconds) - If there is a broken connection, SDI DB2 Mainframe adapter waits for the specified time for the connection to Replication Agent to be re-established. However, if the connection is not reestablished in the specified time, OCSListener stops, which then stops replication.</li> </ul>	30
<div> <div></div> <div> <b>Note</b> <p>In order to avoid data loss, re-materialization is required when starting replication again.</p> </div> </div>		
Log level (ERROR WARN INFO DEBUG)	The log level for the SDI DB2 Mainframe adapter dynamic library.	INFO
Number of wrapped log files	The maximum number of dynamic library log files.	10
Maximum log file size (KB)	Limit the size of the dynamic library log file.	100000
Convert GRAPHIC/VARGRAPHIC data in Java	Indicate whether the GRAPHIC/VARGRAPHIC data is to be converted in Java code.	TRUE



## Related Information

[Change the OCS Server Port Number Using Command-Line Utility \[page 472\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

## 6.24.5 Install Replication Agent for SDI DB2 Mainframe Adapter

Install the Replication Agent to work with the SDI DB2 Mainframe adapter.

### Context

The GUI installer walks you through the installation process. Provide information about your DB2 system, OCS Server, logon credentials, and so on.

### Procedure

1. Download the *SDI DB2 MF ADAPT REP AGENT 2.0* component (`REPAGENTSDI*.EXE`), and execute the file.  
The graphical interface installer launches.
2. Review the information on the first screen, and click *Next*.
3. Provide the following information, and click *Next*

Parameter	Notes
JCL Line 1	Add the job card details.  For example, if the mainframe ID is "MDAWAR", change the <i>JCL Line 1</i> text box to <b>MDAWARAB JOB class="A",NOTIFY=&amp;SYSUID</b>
JCL Line 2	
JCL Line 3	
High Level Qualifier	You can find all of your Replication Agent JCLs under the PDS whose qualifier starts with HLQ.* (For example, "MDAWAR.*")  This value should not exceed eight characters.
Volume	
Unit	
Work Unit	

Parameter	Notes
TCP Address Space Name	

4. Provide the following information, and click [Next](#)

Parameter	Notes
DB2 DSN Name	DB2 subsystem ID (SSID)
DB2 Version	
DB2 Plan Name	
DB2 System Loadlib	
RepAgent System table creator name	Qualifier of LTMMARKER and LTMOBJECTS system tables
Data Sharing	

5. Provide the following information, and click [Next](#)

Values for these parameters must be specified only when Replication Agent is started in manual mode; otherwise the parameters can be left unaltered. In auto mode, these parameters are populated automatically during run-time.

Parameter	Notes
OCSServer Name	SDI DB2 Mainframe adapter server name as updated in NOTIFY=&SYSUID <DPAgent_root>/configuration/ com.sap.hana.dp.adapterframework/ DB2MainframeLogReaderAdapter/ DB2MainframeLogReaderAdapter.ini file
OCSServer IP Address	SDI DB2 Mainframe adapter server's address
OCSServer Port	SDI DB2 mainframe adapter's port as updated in <DPAgent_root>/ configuration/com.sap.hana.dp.adapterframework/ DB2MainframeLogReaderAdapter/ DB2MainframeLogReaderAdapter.in file
Source Data Server	DB2 data server name
Source Database	DB2 database name

6. Provide the following information, and click [Next](#)

Parameter	Notes
User ID	Your mainframe user ID to be used for FTPing product libraries to the mainframe.
Password	Your mainframe password
NOTIFY=Mainframe Host Name	Mainframe server that you are using (either Hostname or IP address)
FTP Port Number	21
VOL/UNIT Assignment	

Parameter	Notes
Log FTP Session?	<p>Provide a file name for a file that is created and used for capturing log information during FTP. This file will help you analyze issues that might occur during dataset upload.</p> <p>The file name specified here has to be a location on the local machine where the installer is being executed.</p>

7. Click [Install](#).
  8. Click [Installation Complete](#).
  9. Log on to the mainframe, and go to PDS with the High Level Qualifier used in Step 3.
  10. From the above list, open PDS with low-level qualifier as `.JCL`.
  11. Run the following JCLs in `HLQ.*.JCL` in order:
    - RECEIVE: This job runs the IKJEFT01 program to use TSO Receive Command to build and populate the product libraries
    - ALLOC: This job creates TRUNC point Dataset and Generations Data Group (GDG)
  12. Execute the following SQL statements:
    - GRANT: To give authorization for BIND and EXECUTE on the plan used
    - SQLINT: To create LTMOBJECTS and LTMMARKER tables
  13. Execute LTMBIND job from `HLQ.*JCL` PDS
- This job binds the DB2 LOG Extract Plan.

#### **i** Note

If you get an authorization error, issue the GRANT command for the BIND privilege.

## Results

Before starting Replication Agent, be sure that the following pre-requisites are established:

- Link libraries must be APF authorized. Contact your mainframe team for APF authorization.
- Tables to be replicated through Replication Agent must be created with the “DATA CAPTURE CHANGES” option specified.
- The LTMOBJECT and LTMMARKER tables owner name must match the creator parameter value assigned in the mainframe configuration file.

## Related Information

[Replication Agent Overview](#)  
[Software Download \[page 39\]](#)

# 6.24.6 Replication Agent for SDI DB2 Mainframe Adapter Configuration

Set up the configuration file for Replication Agent for SDI DB2 Mainframe adapter.

Update some of the parameters in the configuration file to work with the SDI DB2 Mainframe adapter.

i Note

In manual mode, the configuration file must be updated manually. When using auto mode, most adapter-related configuration parameters are updated automatically.

Section	Parameters
DB2MFAAdapterOCSServer Parameters	<div>The following parameters are auto-populated in auto mode; there is no need to update them manually. However, in manual mode, these parameters should match the remote source configuration and OCSServer configuration.</div> <div><ul style="list-style-type: none"><li>DP=&lt;host name of DPAgent to connect to&gt;</li><li>DP_source_ds=&lt;DB2 server name&gt;</li><li>DP_source-db=&lt;Database containing system tables&gt;</li><li>*DPHost=&lt;host name of DPAgent to connect to&gt;</li><li>DPIPAAddress=&lt;IP address of DP Agent&gt;</li><li>DPPort=&lt;OCS port number&gt;</li></ul></div> <div>Update the following parameters manually:</div> <div><ul style="list-style-type: none"><li>DP_ccid=&lt;HANA CCID&gt;</li><li>DPCsetname=&lt;HANA Code Setname&gt;</li></ul></div>
LTM Parameters	<div><ul style="list-style-type: none"><li>Minimal_cols=N</li><li>Timestamp_in_char=Y</li><li>Date_in_char=Y</li><li>Time_in_char=Y</li></ul></div>
Log Extract Parameters	<div>Creator=&lt;Userid&gt;</div>
Trace Configs	<div>The trace configurations are helpful during troubleshooting; however, they are optional during a normal execution.</div> <div><div><div>i Note</div><div>Remember to turn off trace functions after you obtain the necessary information. If you allow trace functions to continue, the trace output files can fill and consume disk space, causing abends or impaired LTM for MVS performance.</div></div></div>

## Example: Sample LTMCFG file

```
*-----RS configs-----
* Parameter names are not case sensitive.
*-----
*
*-----
```

```

*----- DB2MFAdapterOCSServer Parameters ( Auto Populated )-----
*----- (DO NOT UPDATE MANUALLY)-----
*-----
DP=DB2MFAdapterOCSServer
DP_source_ds=DSNDB2D
DP_source_db=LTMDB1
DP_ccsid=819          ☐ update manually
DPCsetname=iso_1      ☐ update manually
*DPHost=
DPIPAAddress=10.56.179.10
DPPort=45500
*-----
*
*-- LTM Parameters -----
TCPName=TCPIP                      name of the TCPIP address space
Communications_Protocol=IBMTCP      The only supported protocol
Packet_size=32K                     Size of OC buffer to be sent
Maximum_connect_retries=10
API_QID_request_interval=1000       How often the API requests a QID
batch_ltl_cmds=on                   on or off, Y or N
Minimal_cols=N                       Y or N
Stop_on_error=N                     Y or N
Suppress_col_names=N                Y or N
Support_DB2_comp_rec=Y              Y or N
Minimum_year=0000                   1949, 1998, etc. must be 4 digits
Long_varchar=Y                      Y or N < 256 or up to cc 32K
Low_activity_latency=10              To send last Buffer when not full
Timestamp_in_char=Y                 Y or N
Date_in_char=Y                      Y or N
Time_in_char=Y                      Y or N
Ltl_table_col_case=asis              asis, upper, lower
DateTime_conv_err=Default
Date_conv_default=1900-01-01         1998-12-25
Time_conv_default=00:00:00           11:22:33
Graphictype=binary
API_com_test=N                      Y or N
LTL_test_only=N                     Y or N
*User_exit=
*-----
*
*-- Log Extract Parameters -----
Log_extractor=LTMEXTX                Use LTMEXTX- DB2v11 LTMEXTC- DB2v12
Log_identifier=DB2D                  DB2 SSID
DataSharingOption=None
*DataSharingMember=                  Used for DataSharingOption=Single
*BSDS=
DetectDataCapture=Y                 Yes for DC changes/none
LogTrace=no                          yes or no
GenID=1                             The QID Generation ID
CIMax=20                             Maximum CI's for the Log Reader
LogExtractError=Msg                 Term or Msg
Buffers=25                           Max Buffers for the Log Reader
PollInterval=0.0.20.0               How often to check for new data
LTMPPlan=RAPLAN76                   Log extract plan
SetTruncPoint=10                    Trunc point request interval
Creator=TABOWN                       it should be Table owner name.
retry=10
tablehandler=LTMINFOX               Use LTMINFOX for DB2 Version 11+
datahandler=LTMIFIX                 Use LTMIFIX for DB2 Version 11
ExtendedRba=Y                       Use Y for DB2 Version 11
Codepage=500,force                  DB2 base Code page
*-----Trace configs-----
*trace=Calls
*trace=General
*trace=QIDs
*trace=TruncPoint
*trace=LTLcyclic
*trace=LTLascii

```

```
*trace=Connections
```

```
*-----
```

## 6.24.7 Change the OCS Server Port Number Using Command-Line Utility

The OCS port number (and other adapter preference parameters) can be changed by using Data Provisioning Agent Configuration Tools (both GUI or Command-Line Utility).

### Context

The following instructions are for changing the OCS port number by using the Command-Line Utility:

### Procedure

1. Start DPAgent Configuration Tools Command-Line Utility to configure adapters by entering:

```
dm1_test@xiyl50833394a:/usr/sap/dataprovagent> bin/agentcli.sh -  
configAdapters.
```

2. Enter option 2 to set adapter preferences.
3. Enter option 16 to set DB2MainframeLogReaderAdapter preferences.

A wizard appears where you can change values for the adapter preferences. Press  to skip optional or default settings. If a setting cannot be skipped, it is required.

4. Modify the port number in the `Enter Adapter Server Port [17000]` parameter.

### Results

The changes will take place after you restart the Data Provisioning agent.

#### **i** Note

In manual mode, make sure to update the Replication agent configuration file with the updated port number.

### Related Information

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

## 6.24.8 Preparing JDBC JAR Files

Prepare the IBM DB2 JDBC JAR files to use one of the DB2 Mainframe adapters.

To use one of the DB2 Mainframe adapters, you are required to copy the following IBM DB2 JDBC JAR files to the `/lib` folder of the Data Provisioning Agent installation directory (`<DPAgent_root>\lib`).

- `db2jcc4.jar` (Required)  
You can download this file here: <http://www-01.ibm.com/support/docview.wss?uid=swg21363866> .  
Download the JDBC JAR file according to your DB2 database version.
- `db2jcc_license_cisuz.jar` (Required)  
You can find information about this file here: <http://www-01.ibm.com/support/docview.wss?uid=swg21191319> .

You can find these JAR files in the following ways:

- These JAR files are available in the installation directory after you installed the IBM DB2 client. For example, on a Windows system, the JAR files are located in `C:\Program Files\IBM\SQLLIB\java`.
- Download them from the IBM Support and Download Center.

### Note

If the source z/OS DB2 system contains a non-English CCSID table space, you are required to update the JVM to an internationalized version. At a minimum, the `charsets.jar` file within the current JVM should contain the required `CharToByteCP<XXX>.class`, where `<XXX>` corresponds to the source system's language locale.

## 6.24.9 IBM DB2 Mainframe Remote Source Configuration

Options for connecting to the remote mainframe data server. Also included is sample code for creating a remote source using the SQL console.

Category	Option	Description
Database	Host	Mainframe host name or IP address on which the remote DB2 data server is running
	Port Number	The DB2 data server port number.
	Database Name	The DB2 database name where the LTMOBJECTS and LTMMARKER tables reside.

Category	Option	Description
	Database Source Name	<p>The DB2 instance name.</p> <p>The name of the DB2 subsystem can be found by running the following command on SPUFI:</p> <pre> ''' . . . . . . . . . . . . . . . ''' DB2 COMMANDS SSID: P8L0 .,,===&gt;,  '''  .,, ''' .,,Position cursor on the command line you want to execute and press ENTER '''  .,,Cmd 1,===&gt;,-DIS DDF  DSNL080I -P8L0 DSNLTDDF DISPLAY DDF REPORT FOLLOWS:, DSNL081I STATUS=STARTD, DSNL082I LOCATION LUNAME          GENERICLU, DSNL083I DDFP8L0 DESAPW00.DB2P8L0 -NONE, DSNL084I TCPPORT=9023 SECPORT=0        RESPORT=9024 IPNAME=- NONE, DSNL085I IPADDR=::10.17.200.30, DSNL086I SQL DOMAIN=ihsapke.wdf.sap.corp, DSNL105I CURRENT DDF OPTIONS ARE:, DSNL106I PKGREL = COMMIT, DSNL099I DSNLTDDF DISPLAY DDF REPORT COMPLETE, ***, </pre>
	Database Tablespace Name	The DB2 database tablespace name.



Category	Option	Description
z/OS DB2 Additional Info	Bind Packages	<p>When this option is set to <a href="#">Yes</a>, the DB2 mainframe adapter automatically checks and binds all of the required missing JAR files.</p> <p>We recommend that you set this option to Yes the first time you attempt to establish a connection, then set this option to No for subsequent attempts.</p> <div> <p><b>i Note</b></p> <p>If any necessary packages are missing, an error occurs.</p> </div> <p>Setting this option for subsequent attempts help improve performance by eliminating the need for redundant checks for the necessary JDBC packages.</p>
	Use Auto Mode	<p>If you set this parameter to <a href="#">True</a>, the replication agent starts automatically.</p> <p>If you set the parameter to <a href="#">False</a>, you must start the replication agent manually and create LTMMARKER and LTMOBJECTS manually on the mainframe.</p> <p>The default value is <a href="#">True</a>.</p>
	LTM Configuration File Location	The Replication Agent's configuration file location
	LTM Configuration File Name	The Replication Agent's configuration file name
Schema Alias Replacements	Alias Name	The name of the schema in the original system.
	Alias Replacements	The name of the schema in the current system that replaces the Schema Alias name.
Security Properties	Use SSL	<p>Specifies whether you are using SSL.</p> <p>The default value is <a href="#">False</a>.</p>
	Credentials Mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><a href="#">Technical User</a>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><a href="#">Secondary User</a>: A unique access credential on the remote source assigned to a specific user.</li> </ul>

Category	Option	Description
	User Name	The TSO user that would be used to start the replication agent job in mainframe.
<div><b>i Note</b></div> <div>This user name is only used as an owner of replication agent start job. The qualifier of system tables (LTMOBJECTS and LTMMARKER) should match creator parameter in the configuration file. The creator parameter in the configuration file does not need to be the same as the user name parameter in the remote source.</div>		
	Password	The mainframe TSO user password

## Example

```
CREATE REMOTE SOURCE "MyDB2MainframeSource" ADAPTER
"DB2MainframeLogReaderAdapter" AT LOCATION AGENT "DB2MFAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="database" displayName="DATABASE">
    <PropertyEntry name="pds_host_name" displayName="Host"> <Mainframe Host
Name></PropertyEntry>
    <PropertyEntry name="pds_port_number" displayName="Port Number">9023</
PropertyEntry>
    <PropertyEntry name="pds_database_name" displayName="Database
Name">LTMDB1</PropertyEntry>
    <PropertyEntry name="pds_datasource_name" displayName="Database
SourceName">DDFP8L0</PropertyEntry>
    <PropertyEntry name="pds_tablespace_name" displayName="Database
Tablespace Name">LTMTS1</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="zodb2sadditionalinfo" displayName="z/OS DB2 Additional
Info">
    <PropertyEntry name="bind_packages" displayName="Bind Packages">Yes</
PropertyEntry>
    <PropertyEntry name="auto_mode" displayName="Use auto mode">true</
PropertyEntry>
    <PropertyEntry name="ltm_cfg_file_loc" displayName="LTM Configuration
File Location">SYREP.SP09.RA150.JCL</PropertyEntry>
    <PropertyEntry name="ltm_cfg_file_name" displayName="LTM Configuration
File Name">LTMCFG</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="schema alias replacements" displayName="Schema Alias
Replacements">
    <PropertyEntry name="schema_alias" displayName="Alias name">Schema name</
PropertyEntry>
    <PropertyEntry name="schema_alias_replacement" displayName="Alias
replacement">Replacement schema name</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="security" displayName="Security Properties">
    <PropertyEntry name="pds_use_ssl" displayName="Use SSL">>false</
PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
```

```
' WITH CREDENTIAL TYPE 'PASSWORD' USING
  '<CredentialEntry name="credential">
    <user><TSO username></user>
    <password><TSO password></password>
  </CredentialEntry>'
;
```

## Related Information

[Using a Schema Alias \[page 477\]](#)

### 6.24.9.1 Using a Schema Alias

Using a schema alias can help you manage multiple schema, remote sources, and tables more easily.

The *Schema Alias* and *Schema Alias Replacement* options, available in the remote source configuration parameters for some Data Provisioning adapters, allow you to switch easily between schema, remote sources, and tables. The *Schema Alias* is the name of the schema in the original system. The *Schema Alias Replacement* is the name of the schema in the current system that replaces the *Schema Alias* name.

A common use case is to create a remote source pointing to a development database (for example, DB\_dev), and then create virtual tables under that remote source. Afterward, you may switch to the production database (for example, DB\_prod) without needing to create new virtual tables; the same tables exist in both DB\_dev and DB\_prod, but under different schema and databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB\_dev, for example. Note that OWNER1.MYTABLE is the unique name of the source table, and it is a property of the virtual table. With it, the adapter knows which table in the source database it is expected to access. However, when you switch to the production database (DB\_prod), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name information of the virtual table cannot be changed once created.

You can resolve this problem using the Schema Alias options. In this case, we want to tell the adapter to replace OWNER1 with OWNER2. For example, when we access OWNER1.MYTABLE, the adapter should access OWNER2.MYTABLE. So here, OWNER1 is *Schema Alias* from the perspective of DB\_prod, while OWNER2 is *Schema Alias Replacement*.

To use this functionality, you must populate both of these options.

## Related Information

[DB2 Log Reader Remote Source Configuration \[page 270\]](#)

[Microsoft SQL Server Log Reader Remote Source Configuration \[page 325\]](#)

[Oracle Log Reader Remote Source Configuration \[page 370\]](#)

[SAP HANA Remote Source Configuration \[page 444\]](#)

[SDI DB2 Mainframe \[page 460\]](#)

## 6.25 SOAP

The SOAP adapter provides access to SOAP Web Services via HANA SQL.

The SOAP adapter is a SOAP web services client that can talk to a web service using the HTTP protocol to download the data. The SOAP adapter uses virtual functions instead of virtual tables to expose server-side operations.

The SOAP adapter supports the following functionality:

- Virtual function as a source

### Related Information

[SOAP Adapter Remote Source Configuration \[page 478\]](#)

[Setting up the SOAP Adapter: SQL Example \[page 480\]](#)

[CREATE VIRTUAL FUNCTION](#)

### 6.25.1 SOAP Adapter Remote Source Configuration

Configuration settings for creating a SOAP adapter remote source. Also included is sample code for creating a remote source using the SQL console.

Category	Option	Description
Connection	WSDL File	The location of the WSDL file. Enter a URL or a path to the local WSDL file where the Data Provisioning Agent is installed.
	Use System Proxy	If set to <a href="#">Yes</a> , the adapter uses the proxy information saved in the <code>dpagentconfig.ini</code> file ( <code>http.proxyHost</code> , <code>http.proxyPort</code> ) or that is set up in the DP Agent Configuration Tool.  If <code>http.proxyHost</code> and <code>http.proxyPort</code> properties are not in the <code>dpagentconfig.ini</code> file, you must add them.
	Socket Timeout (milliseconds)	The time to establish the connection with the remote host. The default value is 6000 ms.
	Connection Timeout (milliseconds)	The time waiting for data after the connection was established (maximum time of inactivity between two data packets). The default value is 6000 ms.

Category	Option	Description
	Treat WebServiceError (SOAP Fault) as failure	<p>If set to <b>Yes</b>, fail the web services call if there is a failure. The default value is <b>No</b>.</p> <p>By default, the SOAP Adapter writes the fault to one of the output columns if the call fails. In certain scenarios, you may want to fail the call itself. For example, the proxy was incorrectly configured.</p> <div> <div>Sample Code</div> <pre>Select * from getWeatherByZip(...94403...)</pre> </div> <ul style="list-style-type: none"> <li>If set to <b>No</b>, the select call is a success and the actual error is populated in the SOAP_FAULT column.</li> <li>If set to <b>Yes</b>, the select call fails itself and writes the error to a caller.</li> </ul>
	WS-Security Password Type	<ul style="list-style-type: none"> <li><b>None</b>: Choose this option if you do not want to use WS-Security.</li> <li><b>plainText</b>: Choose this option if you intend to use WS-Security with a plaintext password.</li> <li><b>Digest</b>: Choose this option if you intend to use WS-Security with an encrypted password.</li> </ul>
Credentials	Credentials Mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li><b>Technical User</b>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li><b>Secondary User</b>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
Basic Authentication	User	The user name, which is case sensitive.
	Password	The password corresponding to the user.
WS-Security	WS-Security User-name	The WS-Security user ID
	WS-Security Password	The WS-Security password

## SQL Example

```
CREATE REMOTE SOURCE "soapSalesDemo4" ADAPTER "SOAPAdapter" AT LOCATION AGENT
"MyAgent"
CONFIGURATION '<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="Configuration">
  <PropertyEntry name="wsdl">https://xxxxxxx.successfactors.com/sfapi/v1/
soap?wsdl</PropertyEntry>
  <PropertyEntry name="axisFault">no</PropertyEntry>
  <PropertyEntry name="useProxy">no</PropertyEntry>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialProperties name="Credential">
<CredentialEntry name="basicAuth">
```

```

        <user>xxxxx</user>
        <password>Password1</password>
    </CredentialEntry>
    <CredentialEntry name="WSSAuth">
        <user>xxxxxx</user>
        <password>Password2</password>
    </CredentialEntry>
</CredentialProperties>;

```

## 6.25.2 Setting up the SOAP Adapter: SQL Example

SQL example for setting up the SOAP adapter to use a remote web service.

The following is an example of how to set up the SOAP adapter to use a remote web service (<http://www.webserviceX.net/stockquote.asmx?WSDL>). You can use the Web-based Development Workbench to complete some of these tasks (for example, creating a virtual function).

### Sample Code

```

drop agent "agent_local" cascade;
CREATE AGENT "agent_local" PROTOCOL 'TCP' HOST
'pald00486396a.amer.global.corp.sap' PORT 5050;
drop adapter "SOAPAdapter" cascade;
CREATE ADAPTER "SOAPAdapter" at location agent "agent_local";
drop remote source "WebServiceRS" cascade;
CREATE REMOTE SOURCE "WebServiceRS" ADAPTER "SOAPAdapter" AT LOCATION AGENT
"agent_local" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8"?>
<ConnectionProperties name="connection">
  <PropertyEntry name="wsdl">http://www.webserviceX.net/stockquote.asmx?
WSDL</PropertyEntry>
  <PropertyEntry name="useProxy">Yes</PropertyEntry>
  <PropertyEntry name="axisFault">No</PropertyEntry>
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="webservice_credential"><user></user><password></
password></CredentialEntry>';
--Get the function definition from adapter
CALL "PUBLIC"."GET_REMOTE_SOURCE_FUNCTION_DEFINITION"
('WebServiceRS', '{"serviceName":"StockQuote","portName":"StockQuoteSoap",
"operationName":"GetQuote","nodeType":"OPERATION"}',?,?,?);
--Using the json configuration we can now create a virtual function.
drop FUNCTION getStockQuote;
CREATE VIRTUAL FUNCTION getStockQuote(SOAP_REQUEST Nvarchar(5000))
RETURNS TABLE (SOAP_HEADERS Nvarchar(5000), SOAP_FAULT NVARCHAR(5000),
SOAP_BODY NCLOB)
CONFIGURATION 'use the json data returned from
GET_REMOTE_SOURCE_FUNCTION_DEFINITION' AT "WebServiceRS";
--Invoking the SOAP Request is as below.

select * from getStockQuote(
'<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:web="http://www.webserviceX.NET/">
  <soapenv:Header/>
  <soapenv:Body>
    <web:GetQuote xmlns:web="http://www.webserviceX.NET/">
      <!--Optional:-->
      <web:symbol>NASDAQ</web:symbol>
    </web:GetQuote>
  </soapenv:Body>
</soapenv:Envelope> ');

```

## 6.26 Teradata

The Teradata adapter can be used to connect to a Teradata remote source and create a virtual table to read from and write to.

### **i** Note

Before registering the adapter with the SAP HANA system, ensure you have downloaded and installed the correct JDBC libraries. See the *SAP HANA smart data integration Product Availability Matrix (PAM)* for details. Place the files in the `<DPAgent_root>/lib` folder.

## Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Real-time change data capture
- Search for tables
- Loading options for target tables
- DDL propagation
- Replication monitoring and statistics
- Access to multiple schemas

In addition, this adapter supports the following capabilities:

Table 52: Global Settings

Functionality	Supported?
SELECT from a virtual table	Yes
INSERT into a virtual table	Yes
Execute UPDATE statements on a virtual table	Yes
Execute DELETE statements on a virtual table	Yes
Different capabilities per table	No
Different capabilities per table column	No
Real-time	Yes

Table 53: Select Options

Functionality	Supported?
Select individual columns	Yes

Functionality	Supported?
Add a WHERE clause	Yes
JOIN multiple tables	Yes
Aggregate data via a GROUP BY clause	Yes
Support a DISTINCT clause in the select	Yes
Support a TOP or LIMIT clause in the select	Yes
ORDER BY	Yes
GROUP BY	Yes

## Related Information

[Authentication and User Privileges \[page 482\]](#)

[Teradata Adapter Preferences \[page 483\]](#)

[Teradata Remote Source Configuration \[page 483\]](#)

[Disable Adapter Write-back Functionality \[page 490\]](#)

[Permissions for Accessing Multiple Schemas \[page 489\]](#)

[Update JCE Policy Files for Stronger Encryption \[page 518\]](#)

[SAP HANA smart data integration and all its patches Product Availability Matrix \(PAM\) for SAP HANA SDI 2.0](#)



## 6.26.1 Authentication and User Privileges

Authentication and user privileges requirements for connecting to a Teradata remote source.

### Authentication

You can set up authentication by using TD2, LDAP, or Kerberos.

If you are using LDAP, provide a user name and password when setting up your remote source.

If you are using Kerberos, the adapter uses the default Kerberos settings of the computer on which it is deployed. If the Kerberos configuration file (`krb5.conf`) is in a nonstandard location, the path must be specified via the `java.security.krb5.conf` system property by adding it to `dpagent.ini` file. The Realm and KDC connection parameters in the remote source are optional. Both must be specified in order to override the computer's default `krb5.conf` settings. To use Kerberos, use the Kerberos principal name for the user name with the corresponding password.



## Privileges

The following database user privileges are required for accessing databases, tables, and so on, so that the adapter can read metadata. You need SELECT access on the following DBC tables:

- "DBC"."UDTInfo"
- "DBC"."DBase"
- "DBC"."AccessRights"
- "DBC"."TVM"
- "DBC"."TVFields"

The following privileges are required to support real-time replication (CDC):

- CREATE TABLE
- DROP TABLE
- CREATE TRIGGER
- DROP TRIGGER
- CREATE PROCEDURE
- DROP PROCEDURE

## 6.26.2 Teradata Adapter Preferences

Options for controlling the Teradata adapter.

Parameter	Description
Thread Pool Size	The size of the Teradata global thread pool. Teradata adapter remote sources share the thread pool. The thread pool is used to execute jobs of querying shadow tables to get change data.


## 6.26.3 Teradata Remote Source Configuration

Options for setting up the connection to the remote Teradata data server. Also included is sample code for creating a remote source using the SQL console.

### Configuration parameters

Category	Option	Description
Connection	Host	Host name or IP address on which the remote Teradata data server is running

Category	Option	Description
	Port Number	The Teradata data server port number
	Encoding	Session encoding between the adapter and Teradata. Some restrictions apply to UTF-8. For example, character columns with Graphic encoding are not supported.
	Encrypt traffic	<p>Specifies whether the traffic between the adapter and the database is encrypted.</p> <p>If turned off, data exchanged between the adapter and the database is unencrypted, and anyone with access to the network may be able to read the data. This setting does not affect logon data, because this data is always sent encrypted by the Teradata JDBC driver.</p>
	Logon mechanism	<p>Specifies the authentication (+authorization) method used, and which username and password values to enter in the credentials fields.</p> <ul style="list-style-type: none"> <li>• <a href="#">TD2 (Teradata Method 2)</a>: Use the database username and password</li> <li>• <a href="#">LDAP</a>: Directory authentication. Use credentials of users defined and configured via LDAP (Database has to be configured to use external LDAP authentication)</li> <li>• <a href="#">Kerberos (KRB5)</a>: Use Kerberos principal and its username (Database has to be configured to use Kerberos external authentication)</li> </ul>
	Realm	(Optional when using Kerberos) authenticate using a principal from this realm (instead of the systems default realm). The Realm option must be used together with KDC.
	KDC	(Optional when using Kerberos) address of KDC (Key Distribution Center) to be used with the specified Realm (has to be used together with Realm)
	JDBC FastExport	Speeds up retrieving large amounts of data from Teradata (disabled when using Kerberos authentication)

Category	Option	Description
	Transaction Mode	<p>Specifies the transaction mode for the connection.</p> <ul style="list-style-type: none"> <li>• <b>ANSI</b>: Uses American National Standards Institute (ANSI) transaction semantics. This mode is recommended. <b>ANSI</b> is the default value.</li> <li>• <b>TERA</b>: Uses legacy Teradata transaction semantics. This mode is only recommended for legacy applications that require Teradata transaction semantics.</li> <li>• <b>DEFAULT</b>: Uses the default transaction mode configured for the Teradata Database, which may be either ANSI or TERA mode.</li> </ul>
	Additional Connection Parameters	<p>Extra Teradata JDBC connection options. The parameters must be specified in the following format: key=value,key=value,...</p> <p><a href="http://developer.teradata.com/doc/connectivity/jdbc/reference/current/frameset.html">http://developer.teradata.com/doc/connectivity/jdbc/reference/current/frameset.html</a> </p> <div> <p><b>i Note</b></p> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
CDC Properties	Database	Name of the database.
	System Object Prefix	<p>The prefix of the names of the Teradata adapter system objects created in the source Teradata database by the adapter. We recommend keeping the default value of TADP_.</p>
	Shadow Table Prefix	<p>The prefix of the names of the Teradata adapter shadow tables created in the source Teradata database by the adapter.</p> <p>The default value is <b>SHADOW_</b></p>
	Stored Procedure Suffix	<p>The prefix of the names of the Teradata adapter stored procedures created in the source Teradata database by the adapter.</p> <p>The default value is <b>PROC</b></p>
	Trigger Suffix	<p>The suffix of the names of the Teradata adapter triggers created in the source Teradata database by the adapter.</p> <p>The default value is <b>TRIG</b></p>

Category	Option	Description
	Connection Pool Size	<p>Maximum number of connections allowed in the connection pool on a secondary node. The default value is 8.</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
	Minimum Scan Interval in Seconds	<div> <b>i Note</b> </div>
	Maximum Scan Interval in Seconds	<p>The minimum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default value is 10 (seconds). If the adapter scans the queue and finds that the queue is empty, it gradually increases the scan interval from the minimum scan interval to the maximum scan interval. The value of this parameter can be changed when the remote source is suspended. The minimum interval in seconds that the adapter scans the Trigger Queue table to get change data. The default minimum scan interval is 3 seconds to avoid putting excessive load on the database with frequent repeat scans.</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
	DDL Scan Interval in Minutes	<p>The interval for detecting DDL changes in the source.</p> <p>A zero or negative integer disables this parameter.</p> <p>The default value is 10 (minutes).</p> <div> <b>i Note</b>  The value of this parameter can be changed when the remote source is suspended. </div>
		<p>When querying the trigger queue table, the scanner may encounter a "deadlock exception". Use this option to set the maximum number of retries before failing (if the retries do not succeed). The default value is 0, which means the adapter does not retry any scans when encountering deadlock exceptions.</p>

Category	Option	Description
	Scan Retry Wait Time in Seconds	<p>The number of seconds for the scanner to wait before trying again to query the trigger queue table. A retry occurs only when you encounter a “deadlock exception”. The default value is 30 seconds.</p> <div> <b>i Note</b> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
Connection Security	Use Agent Stored Credential	Set to <i>True</i> to use credentials that are stored in the DP Agent secure storage.
Credentials	Credentials Mode	<p>Remote sources support two types of credential modes to access a remote source: technical user and secondary credentials.</p> <ul style="list-style-type: none"> <li>• <i>Technical User</i>: A valid user and password in the remote database. This valid user is used by anyone using the remote source.</li> <li>• <i>Secondary User</i>: A unique access credential on the remote source assigned to a specific user.</li> </ul>
	Username	<p>Database user name (or LDAP username/Kerberos principal name when using logon mechanisms other than TD2)</p> <div> <b>i Note</b> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>
	Password	<p>The appropriate corresponding password</p> <div> <b>i Note</b> <p>The value of this parameter can be changed when the remote source is suspended.</p> </div>

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyTeradataSource" ADAPTER "TeradataAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configuration" displayName="Configurations">
  <PropertyGroup name="connectionInfo">
    <PropertyEntry name="host" displayName="Host">myhost.sap.corp</
PropertyEntry>
```

```

        <PropertyEntry name="database" displayName="Database Name">mydb</
PropertyEntry>
        <PropertyEntry name="port" displayName="Port Number">1025</
PropertyEntry>
        <PropertyEntry name="encoding">UTF8</PropertyEntry>
        <PropertyEntry name="encrypt">ON</PropertyEntry>
        <PropertyEntry name="logmech">TD2</PropertyEntry>
        <PropertyEntry name="logdata"></PropertyEntry>
        <PropertyEntry name="fast_export">OFF</PropertyEntry>
        <PropertyEntry name="additional"></PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="cdc_properties">
        <PropertyEntry name="prefix">TADP_</PropertyEntry>
        <PropertyEntry name="conn_pool_size">10</PropertyEntry>
        <PropertyEntry name="min_scan_interval">2</PropertyEntry>
        <PropertyEntry name="max_scan_interval">10</PropertyEntry>
        <PropertyEntry name="scan_retry_max_attempts">3</PropertyEntry>
        <PropertyEntry name="scan_retry_wait_time">10</PropertyEntry>
    </PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
    '<CredentialEntry name="credential">
        <user>myuser</user>
        <password>mypassword</password>
    </CredentialEntry>';

```

## Related Information

[Using Prefix and Suffix Options to Manage System Object Name Lengths \[page 488\]](#)

[Permissions for Accessing Multiple Schemas \[page 489\]](#)

[Teradata DDL Propagation Scan Interval \[page 489\]](#)

[Store Source Database Credentials in Data Provisioning Agent \[Graphical Mode\] \[page 93\]](#)

### 6.26.3.1 Using Prefix and Suffix Options to Manage System Object Name Lengths

The Teradata adapter creates a number of system objects on the source database in order for it to manage real-time replication. These objects include shadow tables, triggers, and stored procedures. If your Teradata database has a 30-character name limit, the default remote source settings can lead to Teradata adapter system objects with names greater than 30 characters. By default, the Teradata adapter's system object prefixes and suffixes add up to 12 extra characters, which means that only tables with names of 18 characters (or less) are supported.

To maximize the number of table name characters supported, edit the four system object prefix and suffix properties to one character each (they cannot be empty). Doing so ensures that the Teradata adapter uses at most five extra characters when creating its system objects, meaning that table names of up to 25 characters can be supported when the 30-character database limit is in place. The following options are available to configure:

- System Object Prefix

- Shadow Table Prefix
- Stored Procedure Prefix
- Trigger Suffix

#### i Note

When upgrading, if the Teradata adapter tries to read those properties and they are not present (for example, they are not part of the previous remote source before the upgrade), then the adapter uses the default values. When the user edits the remote source after the upgrade, they will see those default values in the remote source description.

## Related Information

[Teradata Remote Source Configuration \[page 483\]](#)

### 6.26.3.2 Permissions for Accessing Multiple Schemas

Grant the necessary permissions before accessing multiple schemas in a Teradata source.

To access multiple schemas, you need the following permissions assigned to you. In the following example, you are USER2, and you are accessing tables, creating procedures, executing procedures, and so on, belonging to USER1.

```
GRANT CREATE TABLE ON USER1 TO USER2
GRANT DROP TABLE ON USER1 TO USER2
GRANT ALL ON USER1.<table_name> TO USER2
GRANT CREATE PROCEDURE ON USER1 TO USER2
GRANT DROP PROCEDURE ON USER1 TO USER2
GRANT CREATE TRIGGER ON USER1 TO USER2
GRANT DROP TRIGGER ON USER1 TO USER2
GRANT EXECUTE PROCEDURE ON USER2 TO USER1
```

#### i Note

The EXECUTE PROCEDURE permission allows USER1 to execute the procedures in database USER2.

### 6.26.3.3 Teradata DDL Propagation Scan Interval

The DDL Scan Interval in Minutes Adapter Preference option is important to review when setting up DDL propagation.

Enabling DDL propagation can impact the performance of the source Teradata database. Setting an appropriate value for the remote source option *DDL Scan Interval in Minutes* matters.

From the time the DDL changes occurs on the source database to the time the DDL changes are propagated to the target Teradata database, no DML changes on the tables are allowed. At configured intervals (*DDL Scan*

[Interval in Minutes](#), by default, 10 minutes), the Teradata adapter queries the metadata of all subscribed tables from the source Teradata database, and it determines if changes to the DDL have occurred. If changes are detected, it propagates the DDL changes to the target database through the Data Provisioning Server.

Because the Teradata adapter detects DDL changes by querying source Teradata system tables, the source database might be burdened if you configure a small value for the [DDL Scan Interval in Minutes](#) option. However, configuring a large value would increase the latency of DDL propagation. Therefore, you should experiment to figure out what value works best for you. If changes to the DDL are rare, you might even want to disable DDL propagation by setting the value of the [DDL Scan Interval in Minutes](#) option to zero. This prevents the Teradata adapter from querying metadata from the source database periodically.

## Related Information

[Teradata Remote Source Configuration \[page 483\]](#)

## 6.26.4 Disable Adapter Write-back Functionality

For critical scenarios determined by your business requirements, you can use the agent configuration tool to disable write-back functionality on supported adapters and run the adapters in read-only mode. Disabling write-back functionality may help to prevent unexpected modifications to source tables accessed by an adapter.

### ⚠ Caution

Setting an adapter to read-only mode affects all remote sources that use the adapter.

## Procedure

1. Start the Data Provisioning Agent configuration tool.
2. Navigate to the Agent Adapter Framework Preferences.
  - In graphical mode, choose **Config > Preferences**, and then select [Adapter Framework](#).
  - In command-line interactive mode, choose [Set Agent Preferences](#) in the [Agent Preferences](#) menu.
3. For the [Read-only Adapters](#) property, specify the list of adapters for which you want to disable write-back functionality, separating each adapter with a comma.

For example, to disable write-back on the Microsoft SQL Server Log Reader, Oracle Log Reader, and SAP HANA adapters:

```
MssqlLogReaderAdapter,OracleLogReaderAdapter,HanaAdapter
```



## Results

The specified adapters are switched to read-only mode and write-back functionality is disabled.

### → Tip

On adapters that are operating in read-only mode, attempted SQL statements other than SELECT result in adapter exceptions that are logged in the Data Provisioning Agent framework trace file.

For example:

```
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter Context:  
com.sap.hana.dp.adapter.sdk.AdapterException: Only SELECT queries are allowed  
by this data provisioning agent for adapter: MssqlLogReaderAdapter
```

## Related Information

[Start and Connect the Configuration Tool \[page 84\]](#)

[Start the Configuration Tool \[Command Line\] \[page 51\]](#)

[Agent Adapter Framework Preferences \[page 104\]](#)

## 6.27 Twitter

The Twitter adapter provides access to Twitter data via the Data Provisioning Agent.

Twitter is a social media Web site that hosts millions of tweets every day. The Twitter platform provides access to this corpus of data. Twitter has exposed all its data via RESTful API so that it can be consumed with any HTTP client. Twitter APIs allow you to consume tweets in different ways, from getting tweets from a specific user, to performing a public search, or subscribing to real-time feeds for specific users or the entire Twitter community.

### Adapter Functionality

The Twitter adapter supports the following functionality:

- Virtual table or function as a source
- Real-time change data capture (flowgraph and replication task)

In addition, this adapter supports the following capabilities:

- SELECT, WHERE

## Twitter Adapter

The Twitter adapter is a streaming data provisioning adapter written in Java, and utilizes the Adapter SDK to provide access to Twitter data via SAP HANA SQL (with or without Data Provisioning parameters) or via virtual functions.

Using the Adapter SDK and the Twitter4j library, the Twitter adapter consumes the tweets from Twitter and converts to AdapterRow objects to send to SAP HANA server. The tweet is exposed to SAP HANA server via virtual tables. Each Status table is basically a map of JSON data returned from Twitter to tabular form. Currently we expose the following columns in all Status tables.

Column name	SQL Data Type	Dimension
Id	BIGINT	
ScreenName	NVARCHAR	256
Tweet	NVARCHAR	256
Source	NVARCHAR	256
Truncated	TINYINT	
InReplyToStatusId	BIGINT	
InReplyToUserId	BIGINT	
InReplyToScreenName	NVARCHAR	256
Favorited	TINYINT	
Retweeted	TINYINT	
FavoriteCount	INTEGER	
Retweet	TINYINT	
RetweetCount	INTEGER	
RetweeByMe	TINYINT	
PossiblySensitive	TINYINT	
isoLanguageCode	NVARCHAR	256
CreatedAt	DATE	
Latitude	DOUBLE	
Longitude	DOUBLE	
Country	NVARCHAR	256
Place_name	NVARCHAR	256
Place_type	NVARCHAR	256
UserId	BIGINT	
UserName	NVARCHAR	256
UserUrl	NVARCHAR	256
CurrentUserRetweetId	BIGINT	

## Related Information

[Installation and Deployment \[page 493\]](#)

[Twitter Remote Source Configuration \[page 495\]](#)

## 6.27.1 Installation and Deployment

Configure your Data Provisioning agent and SAP HANA server to use the Twitter adapter.

Though the Twitter adapter is installed with the Data Provisioning agent, you must configure your agent to communicate with the SAP HANA server. In addition, you must configure your SAP HANA server and create a remote source.

### Configure the `dpagentconfig.ini` file

Configure proxy settings in the `dpagentconfig.ini` file by adding the following to the file:

- `proxyHost=<<proxy host name>>`
- `proxyPort=<<proxy port number>>`

## Related Information

[Set Up a Twitter Account \[page 493\]](#)


[Create a Twitter Remote Source \[page 494\]](#)

[Twitter Adapter Capabilities \[page 495\]](#)

### 6.27.1.1 Set Up a Twitter Account

Follow these steps to set up a Twitter account.

#### Procedure

1. Create a Twitter developer account at <https://dev.twitter.com/user/login?destination=home> .
2. Create an application in Twitter.
3. Obtain the following:

- API Key
- API Secret
- Access Token
- Access Token Secret

See <https://dev.twitter.com/docs/auth/oauth/faq> to get more insight on how to set up authentication.

## 6.27.1.2 Create a Twitter Remote Source

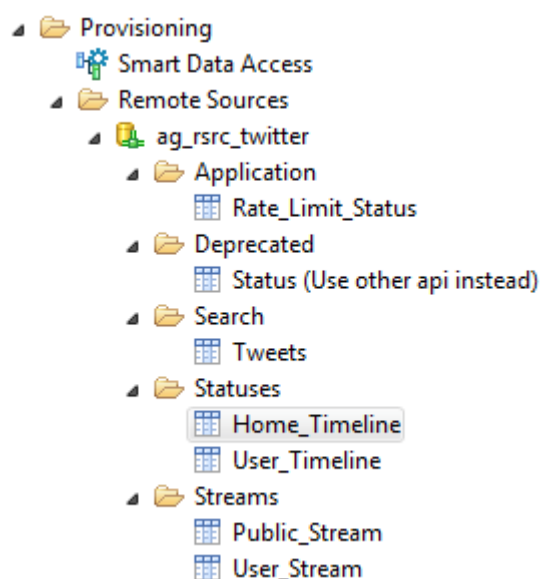
Follow these steps to create a Twitter remote source.

### Procedure

1. In the Systems view, open **Provisioning** > **Remote Sources**.
2. Select an agent under **Source Location**.
3. Right-click **Remote Sources**, and select **New Remote Source**.
4. Enter the required remote source configuration information.
5. Set the **Credentials Mode** parameter to “technical user”.
6. Click the **Save the Editor** icon in the upper right-hand corner of the screen.

### Results

The following directory structure is created, allowing you to create virtual tables or virtual functions as needed.



## Related Information

[Twitter Remote Source Configuration \[page 495\]](#)

[Create Credentials for a Secondary User](#)

### 6.27.1.3 Twitter Adapter Capabilities

The Twitter adapter supports the following capabilities.

NAME
CAP_NON_TRANSACTIONAL_CDC
CAP_WHERE
CAP_LIKE
CAP_SIMPLE_EXPR_IN_WHERE
CAP_OR
CAP_SELECT
CAP_BIGINT_BIND
CAP_TABLE_CAP
CAP_COLUMN_CAP
CAP_METADATA_ATTRIBUTE

See the description of these capabilities in the Javadoc documentation, which can be found in `<DPAgent_root>/doc/javadoc`.

### 6.27.2 Twitter Remote Source Configuration

Remote source configuration options for the Twitter adapter. Also included is sample code for creating a remote source using the SQL console.

Option	Description
API Key	Consumer Key
API Secret	Consumer Secret
Access Token	Oauth Token
Access Token Secret	Oauth Secret

## Example

### Sample Code

```
CREATE REMOTE SOURCE "MyTwitterSource" ADAPTER "TwitterAdapter" AT LOCATION
AGENT "MyAgent" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configuration">
</ConnectionProperties>'
WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="consumerKey" displayName="API Key (Consumer Key)">
<password>myapikey</password>
</CredentialEntry>
<CredentialEntry name="consumerSecret" displayName="API Secret (Consumer
Secret)">
<password>myapisecret</password>
</CredentialEntry>
<CredentialEntry name="oauthToken" displayName="Access Token (Oauth Token)">
<password>myaccesstoken</password>
</CredentialEntry>
<CredentialEntry name="oauthSecret" displayName="Access Token Secret (Oauth
Secret)">
<password>myaccesstokensecret</password>
</CredentialEntry>';
```

# 7 Security

SAP HANA smart data integration adds database objects and communication channels to the SAP HANA security landscape.

Some aspects of SAP HANA smart data integration require specific security-related considerations such as the communication channel between SAP HANA and the Data Provisioning Agent. However, in general, SAP HANA smart data integration follows standard SAP HANA security concepts. For complete information, refer to the *SAP HANA Security Guide*.

## Related Information

[Authentication \[page 497\]](#)

[Configuring SSL \[page 498\]](#)

[Update JCE Policy Files for Stronger Encryption \[page 518\]](#)

[Authorizations \[page 519\]](#)

[Communication Channel Security \[page 520\]](#)

[Auditing Activity on SAP HANA Smart Data Integration Objects \[page 521\]](#)

[Data Protection and Privacy in SAP HANA Smart Data Integration and SAP HANA Smart Data Quality \[page 522\]](#)

[SAP HANA Security Guide](#)

## 7.1 Authentication

Authentication is the process of verifying the identity of database users accessing SAP HANA. SAP HANA supports several authentication mechanisms, several of which can be used for the integration of SAP HANA into single sign-on environments (SSO).

For complete information about authentication and single sign-on within SAP HANA, refer to the *SAP HANA Security Guide*.

### Authentication with Remote Source Systems

For remote source systems accessed by Data Provisioning adapters, user name and password authentication is supported. That is, users authenticate themselves by entering their user name and password for the remote source.

For custom adapters, the developer is free to implement any type of authentication.

## Kerberos Limitation for Some Data Provisioning Adapters

Some Data Provisioning adapters, such as Hive, Teradata, and Impala, support Kerberos authentication. When using Kerberos authentication, only encryption types whose key length is fewer than 256 characters are supported.

This limitation comes from the SAP JVM packaged with the DP Agent. If you need to use strong encryption, replace the SAP JCE policy files.

## Related Information

[SAP HANA Security Guide](#)

[Update JCE Policy Files for Stronger Encryption \[page 518\]](#)

## 7.2 Configuring SSL

Learn an overview of how to configure SSL connections in SAP HANA smart data integration.

You can configure SSL connections from the Data Provisioning Agent to SAP HANA server and, depending on the adapter you are using, from Data Provisioning Agent to your remote database.

### **i** Note

To configure SSL for the Odata adapter, which does not use the Data Provisioning Agent, refer to [Consume HTTPS OData Services \[page 348\]](#)

Successful configuration of SSL in SAP HANA smart data integration requires that the following be performed:

### Connecting from Data Provisioning Agent to SAP HANA server

1. Enable and configure SAP HANA server for SSL.  
For more information, see [Secure Communication Between SAP HANA and JDBC/ODBC Clients](#) and subsequent topics.
2. Create a keystore/truststore on the SAP HANA system and the Data Provisioning Agent, and then obtain SSL certificates and import them into your SAP HANA system and the Data Provisioning Agent.  
There are different methods to accomplish these steps.
  - Command line batch  
See [Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#) for more information.
  - Command line interactive  
For more information, see [Configure SSL for SAP HANA \(CA\) \[page 500\]](#) or [Configure SSL for SAP HANA \(Self-Signed\) \[page 505\]](#).



3. Connect to SAP HANA with SSL.

Once you have configured your certificates for the Data Provisioning Agent and SAP HANA Server, you need to enable SSL on the Data Provisioning Agent, and so on. For more information, see [Connect to SAP HANA On-Premise with SSL \[page 512\]](#)

## Connecting from Data Provisioning Agent to Your Remote Source

1. Create the Data Provisioning Agent keystore and truststore to house the remote source certificates.  
For more information, see [Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#).
2. Configure your source database.  
Configure your source database for SSL. This includes creating CA certificates and importing them into Data Provisioning Agent.
3. Configure SSL on the remote source that you are creating.  
Adapters that support SSL may have different configuration requirements. At a minimum, you need to enable SSL in the remote source configuration. Other remote source parameters may also need to be configured, depending on the adapter that you are using and your preferences.

## Encryption Strength

If you require stronger encryption than 128 bit key length, update the existing JCE policy files.

## Related Information

[Configure SSL for SAP HANA \(CA\) \[page 500\]](#)

[Configure SSL for SAP HANA \(Self-Signed\) \[page 505\]](#)

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

[Connect to SAP HANA On-Premise with SSL \[page 512\]](#)

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

[Change the Agent Configuration Tool SSL Settings \[page 515\]](#)

[Reconfigure an Existing Agent for SSL \[page 516\]](#)

[Troubleshoot the SSL Configuration \[page 517\]](#)

[Configure SSL for the DB2 Log Reader Adapter \[page 278\]](#)

[Configure SSL for the Microsoft SQL Server Log Reader Adapter \[page 338\]](#)

[Configure SSL for the Oracle Log Reader Adapter \[page 391\]](#)

[Cassandra SSL Configuration \[page 172\]](#)

[Update JCE Policy Files for Stronger Encryption \[page 518\]](#)

## 7.2.1 Configure SSL for SAP HANA (CA)

Use the Data Provisioning Agent Keystore Configuration utility to configure and set up SSL for SAP HANA by getting a certificate from a certificate authority (CA). This secures connectivity from the SAP HANA database to the SAP HANA Data Provisioning Agent via SSL.

### Prerequisites

You must have the following before configuring SSL:

- Command-line access to SAP HANA Server using the HANA adm user account
- Command-line access to the Data Provisioning Agent using the DPAgent user account
- Back up the following files from the Data Provisioning Agent installation directory:
  - `sec` and `secure_storage` (encrypted files to store keystore passwords)
  - `dpagentconfig.ini` (configuration file to tell the Data Provisioning Agent to use SSL)
  - `ssl/cacerts` (Java keystore to store server and agent certificates)
- Set the `PATH` variable to include the Data Provisioning agent `sapvm/bin` subdirectory so `agentcli` can find the `keytool` executable.  
Example: `export PATH=/hana1/sapjvm/bin:$PATH`
- Set the `DPA_INSTANCE` variable to the directory where the Data Provisioning agent is installed.  
Example: `export DPA_INSTANCE=/hana1/bin/dpagent`

### Context

The Data Provisioning Agent Keystore Configuration utility is a guided interactive tool used to configure SSL for SAP HANA. Perform the following steps to get a certificate from a certificate authority (CA).

### Procedure

1. Start the Data Provisioning Agent Keystore Configuration utility from the terminal by entering `./agentcli.sh`.

#### **i** Note

Don't exit the tool when setting up SSL, even when copying certificates between agent and HANA hosts.

```
dpagent@vm:/usr/sap/dpagent/bin> ./agentcli.sh
Environment variable DPA_INSTANCE not found
Environment variable DPA_INSTANCE must point to DPAgent's installation root
directory
Example:: export DPA_INSTANCE=/usr/sap/dataprovagent/ then try again
```

2. If you get an error message stating that the environment variable isn't found, run the following command to set it up. After a successful execution, it displays a list of available commands.

```
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> export DPA_INSTANCE=/hana1/bin/dpagent
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> ./agentcli.sh
Using the following installation location
/hana1/bin/dpagent
--createFullSystemDump    Gathers all related log files and ini settings and
                           creates an archive
--setSecureProperty       Secure Storage Utility
--configAgent             DPAgent Configuration Tool
--configAgentKeystore     DPAgent Keystore Configuration Utility
<operation> --help        To print help for the given operation
```

3. To view a list of available options, enter the command `./agentcli.sh --configAgentKeystore`.

```
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> ./agentcli.sh --configAgentKeystore
*****
DPAgent Keystore Configuration Utility
*****
1. Configure SSL for TCP (HANA on-premise) (interactive only)
2. List Agent Certificate
3. List All Certificate
4. List Certificate (by alias)
5. Export Agent Certificate
6. Export Certificate (Base64-Encoded)
7. Import Certificate
8. Delete Certificate
9. Change keystore password
q. Quit
b. Back
*****
```

4. In the DPAgent Keystore Configuration Utility, use option 1 to configure SSL for TCP (HANA on-premise).

```
*****
Configure SSL for TCP (HANA on-premise) (interactive only)
*****
Enter Store Password: (*****) [The default password is changeit]
Enter Register Agent on HANA after SSL Configuration(true): Valid options:
true|false [You should always do this to ensure the setup is correct]
true
Enter Agent name to register with(ProductionAgent): [Agent name that you want
to register in HANA with]
SSLAgent
Enter Hana Server Host name(localhost): [This is hana server name and not
the dpagent server name]
mo-1a6803cc5.mo.sap.corp
Enter Hana Server Port Number(30015): [Hana port usually 3xx15 where xx is
your instance id]
30215
Enter Agent Admin HANA User: [HANA user that have AGENT ADMIN privilege]
system
Enter Password for Agent Admin HANA User:
Enter Password for Agent Admin HANA User: (confirm)
```

5. The following section defines the Data Provisioning Agent certificate and runs the following command. Use the same key\_password as the store\_password.

```
Enter The name of your organizational unit(Test Product):
SAP Tools
Enter The name of your organizational(Test Organization):
SAP
Enter The name of your City or Locality(Palo Alto):
Enter The name of your State or Province(CA):
```

```
Enter The two-letter country code for this unit(US):
```

6. Create a certificate signing request, so that the certificate can be signed by a certificate authority, by selecting *false*.

```
Enter Use self-signed certificates for DPAgent?(false): Valid options: true|
false
false
Calling Configure SSL for TCP (HANA on-premise) (interactive only)
(configureKeystore)
*** Executing configureKeystore
*****
Configuring DPAgent Keystore
*****
Checking existing cacerts for dpagent private key
Using DPAgent hostname = mo-1a6803cc5.mo.sap.corp and Alias =
dataprovisioningagent
cacerts does not have dpagent certificate
Creating a backup of existing keystore /hana1/bin/dpagent/ssl/cacerts.bak
```

7. The fully qualified domain name (FQDN) must match the Data Provisioning Agent host name and the SAP HANA Server must be able to ping this machine. The HANA Server validates the Data Provisioning Agent host name and requires it to match what is set up in the AGENTS table.

```
Server does a host-name validation. Ensure the following FQDN is correct.
Enter dpagent machine host name? (mo-1a6803cc5.mo.sap.corp)
Creating dpagent keystore with Certificate:
CN=mo-1a6803cc5.mo.sap.corp,OU=Test Product,O=Test Organization,L=Palo
Alto,S=CA,C=US
Executing ->[keytool, -genkeypair, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -alias, dataprovisioningagent, -keyalg, RSA, -keysize, 2048, -dname,
CNrganization,L=Palo Alto,S=CA,C=US, -v]
Generating 2,048 bit RSA key pair and self-signed certificate
(SHA256withRSA) with a validity of 3,650 days
for: CN=mo-1a6803cc5.mo.sap.corp, OU=Test Product, O=Test
Organization, L=Palo Alto, ST=CA, C=US
[Storing /hana1/bin/dpagent/ssl/cacerts]
DPAgent keystore created successfully.
Generating Certificate Sign Request at /hana1/bin/dpagent/ssl/
dpagent_CSR.cer
Executing ->[keytool, -certreq, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -alias, dataprovisioningagent, -file, /hana1/bin/dpagent/ssl/
dpagent_CSR.c
DPAgent CSR created at /hana1/bin/dpagent/ssl/cacerts
*) Please request the CA authority to sign the Certificate
Request.
*) Get the CA root certificate as a cer file and import it
here (ex. CA_Root.cer )
*) Get the signed DPAgent Certificate response from the CA.
(ex. CA_DPAgent_Signed.cer
Enter path to CA Root certificate? (/hana1/bin/dpagent/ssl/CA_Root.cer)
```

The utility creates a Data Provisioning Agent keystore and creates the certificate signing request, `dpagent_CSR.cer`. Provide the content of this file to your certificate authority (CA). The CA signs this certificate, and then provides a signed certificate response. In the response, some certificate authorities may provide the root, interim, and response all in one file or in multiple files.

8. The Java keystore requires the root to be imported after a response. Using the utility, you must strip the root certificate from the rest of the chain and import only the root at the first prompt. Save the root CA in the same folder.

```
Enter path to CA Root certificate? (/hana1/bin/dpagent/ssl/CA_Root.cer)
```

```

Executing ->[keytool, -importcert, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -file, /hana1/bin/dpagent/ssl/CA_Root.cer, -alias, dpagentrootca, -
v, -
Certificate was added to keystore
[Storing /hana1/bin/dpagent/ssl/cacerts]
Successfully imported certificate as dpagentrootca
Enter path to signed certificate response for DPAgent? (/hana1/bin/
dpagent/ssl/CA_DPAgent_Signed.cer)

```

9. After you import the root, you can import the remaining chain or just the agent.

```

Executing ->[keytool, -importcert, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -file, /hana1/bin/dpagent/ssl/CA_DPAgent_Signed.cer, -alias,
dataproviss
Certificate reply was installed in keystore
[Storing /hana1/bin/dpagent/ssl/cacerts]
Successfully imported certificate as dataprovisioningagent
Executing ->[keytool, -exportcert, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -file, /hana1/bin/dpagent/ssl/dpagent.cer, -alias,
dataprovisioningagen
Certificate stored in file </hana1/bin/dpagent/ssl/dpagent.cer>

```

The Data Provisioning Agent keystore now has the Data Provisioning Agent certificate and exports the certificate to the SSL folder. Now, copy the certificate to the SAP HANA machine.

10. On the SAP HANA Server, create the SAP HANA keystore, get the certificate signed, and import the signed response.

```

*****
HANA Configuration
*****
Now for the HANA side setup you need to have HANA Shell Access.
* Once you have access please navigate to
=>cd $SECUDIR
*) If sapcli.pse exists there, the server certificate is created
already. If not, create sapcli.pse via the following
=> sapgenpse get_pse -p sapcli.pse "CN=hostname.fully.qualified,
OU=Support, O=SAP, C=CA"
*) Please request the CA authority to sign the Certificate
Request.
*) Get the CA root certificate as a cer file and save it here
(ex. CA_Root.cer)
*) Get the signed DPAgent Certificate response from the CA.
(ex. CA_Signed_Server.cer)
*) Once you have all certificate import the CA Response along
with Optional Root Certificates.
=> sapgenpse import_own_cert -c CA_Signed_Server.cer -p
sapcli.pse <-r optional_CA_Root>
*) Import DPAgent Certificate /hana1/bin/dpagent/ssl/dpagent.cer,
which is required by Client Authentication.
-----BEGIN CERTIFICATE-----
MIIDqzCCApOgAwIBAgIJAODnZo6S7awNMA0GCSqGSIb3DQEBBQUAMCgx CzAJBgNV
BAYTAlVTMQswCQYDVQQLIDAJDQTEEMMAoGALUECgwDU0FQMB4XDTE3MDgyMjIwMjMx
OFoXDTE3MDgyMjIwMjMxOFowYQYwCzAJBgNVBAYTAlVTMQswCQYDVQQLIDAJDQTES
MBAGA1UEBxMjUGFsb3B5BBBHRvMRowGAYDVQQKEExFUZXN0IE9yZ2FuaXphdGlvdjEVE
MBMGA1UECzMxMjVzZCBQcm9kdWN0MSEwHwYDVQQDEXhtb3YxYTY4MDNjYzUubW8u
c2FwLmNvcnAwggEiMA0GCSqGSIb3DQEBAQUAA4IBDwAwggEKAoIBAQCRI9kfAGlq
baTSttC2I3GrbH4FF95/wJ+aMNPVe9quS3qH4cMpN+Bqh2YYqlqucRzjwOiWH8rN
t3eNd41Yw7HvDEN4u/3uhtHCle2tmoOHVdesGZ8Ui2250RXBBEhY2ug48uyFSHP2
60y0NQBLGfSDdV+8ZqGJZ0zZrxHMW9J5DsKB8Yblp5aC8TZHpU5JP6nC2rVM/BmB
LGX1YkTYmaHkzZaRnglWBwaK9l3x3qNOoiDgSFOxJGPrHBuWDM0LQJOQwibpFu6K
RlTLOV8wTYois/ETRzEQ2vcHT998uzqKRuaeKAtnMGq+CDHSRSYDb/Q152sJoMmK
GtOvoZZ2vElhAgMBAAGj ezB5MAkGALUdEwQCAAwLAYJYIZIAyB4QgENBB8WHU9w
ZW5TU0wgr2VuZXJhdGVkIENlcnRpZmljYXRlMB0GA1UdDgQWBBQ6lejPkojc4Ilr
DUmw+ade6pXewTAFBgNVHSMEGDAWgBSjkBEgkX3wJIWR8Ms1LHm+GS1swzANBgkq
hkiG9w0BAQUFAAOCAQEANv1NoddAZVWwB8H02lpT3IYb38jpPqPp7wX0x1SPfhQJ

```

```

5mg+5U4igB6qg9cIvbWxwpD2CMmQUHlJ7iuPTNdnncyvJYk5ZTQ216L90y24gRo
4khwEBLC9d3V+mF5+ZJspJJey+l76TVu9tve3/GE0sQDqQB1xQd/VJ5j53Ik4mxB
OeFp70AvFt251QSqGIU8K81A+6ocB1mYTfKmVVz1f2/5AhdHMMOeQDKEVIjWrz3J
9NtjWXezf1zRiLdT0E9yz1OLaEZ53jC/6ZJv8Ia9L8I8OfBJaumW2477nNXgnvhX
dojfRbepmPQGSj/Z2HozcCfYQCNTQ63ECNOPuf9+g==
-----END CERTIFICATE-----
*) You can save the above certificate to a file dpagent.cer in the
serverside and import it to sapcli.pse
=> sapgenpse maintain_pk -a dpagent.cer -p sapcli.pse
*) If SSO has not yet been enabled for this keystore, you can do it
with
=> sapgenpse seclogin -lps -p sapcli.pse -O <Instance_Name>adm
*) Export the HANA Server certificate and save it in dpagent machine
=> sapgenpse export_own_cert -o hana_server.cer -p sapcli.pse
Press Enter to continue...

```

11. After you create the SAP HANA keystore, add the agent certificate, and then export the SAP HANA certificate and import the SAP HANA certificate into the Data Provisioning Agent.

After exporting the HANA certificate with `sapgenpse`, copy the HANA certificate `hana_server.cer` back to the Data Provisioning Agent host, and put the certificate in the Data Provisioning Agent `/ssl` subdirectory (for example, `/usr/sap/dataprovagent/ssl`). If the Data Provisioning Agent keystore has a previous alias called `hanaserverrootca`, delete this alias, because the `agentcli` imports the HANA certificate using this alias name.

### Note

The following may not apply, depending on the root CA.

```

*****
Post HANA Configuration.
*****
Enter path to Server certificate or CA Root certificate path? ()
/hana1/bin/dpagent/ssl/hana_server.cer
Executing ->[keytool, -importcert, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -file, /hana1/bin/dpagent/ssl/hana_server.cer, -alias,
hanaserverrootca
Certificate was added to keystore
[Storing /hana1/bin/dpagent/ssl/cacerts]
Successfully imported certificate as hanaserverrootca

```

After configuration, the command-line tool updates.

1. It connects to SAP HANA to validate the connection.
  2. It registers the agent without SSL to test the SAP HANA connection to the Data Provisioning Agent.
  3. If the previous steps are successful, it updates the `dpagentconfig.ini` and `secure_storage`, and persists all of the provided information.
12. Restart the Data Provisioning Agent.
  13. Reregister the agent with the SSL flag.

```

Connecting to HANA Server at pall00553681a.amer.global.corp.sap
Registering agent as ProductionAgent with SSL=false
Enabling SSL on DPAgent TCP Sockets.
Successfully switched dpagent to use SSL.
Press Enter to continue...

```

## 7.2.2 Configure SSL for SAP HANA (Self-Signed)

Use the Data Provisioning Agent Keystore Configuration utility to configure and set up SSL for SAP HANA by creating a self-signed certificate. This secures connectivity from the SAP HANA database to the SAP HANA Data Provisioning Agent via SSL.

### Prerequisites

You must have the following before configuring SSL:

- Command-line access to SAP HANA Server using the HANA adm user account
- Command-line access to the Data Provisioning Agent using the DPAgent user account
- Back up the following files from the Data Provisioning Agent installation directory:
  - `sec` and `secure_storage` (encrypted files to store keystore passwords)
  - `dpagentconfig.ini` (configuration file to tell the Data Provisioning Agent to use SSL)
  - `ssl/cacerts` (Java keystore to store server and agent certificates)
- Set the `PATH` variable to include the Data Provisioning agent `sapvm/bin` subdirectory so `agentcli` can find the `keytool` executable.  
Example: `export PATH=/hana1/sapvm/bin:$PATH`
- Set the `DPA_INSTANCE` variable to the directory where the Data Provisioning agent is installed.  
Example: `export DPA_INSTANCE=/hana1/bin/dpagent`

### Context

The Data Provisioning Agent Keystore Configuration utility is a guided interactive tool used to configure SSL for SAP HANA. Perform the following steps to create a self-signed certificate.

### Procedure

1. To start the Data Provisioning Agent Keystore Configuration utility from the terminal, enter `./agentcli.sh`.

#### **i** Note

Don't exit the tool when setting up SSL, even when copying certificates between agent and HANA hosts.

```
dpagent@vm:/usr/sap/dataprovagent/bin> ./agentcli.sh
Environment variable DPA_INSTANCE not found
Environment variable DPA_INSTANCE must point to DPAgent's installation root
directory
Example:: export DPA_INSTANCE=/usr/sap/dataprovagent/ then try again
```

2. If you get an error message stating that the environment variable is not found, run the following command to set it up. After a successful execution, it displays a list of available commands.

```
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> export DPA_INSTANCE=/usr/sap/
dataprovagent/
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> ./agentcli.sh
Using the following installation location
/hana1/bin/dpagent
--createFullSystemDump    Gathers all related log files and ini settings and
creates an archive
--setSecureProperty       Secure Storage Utility
--configAgent             DPAgent Configuration Tool
--configAgentKeystore     DPAgent Keystore Configuration Utility
<operation> --help        To print help for the given operation
```

3. To view a list of available options, enter the command `./agentcli.sh --configAgentKeystore`.

```
kb@mo-1a6803cc5:/hana1/bin/dpagent/bin> ./agentcli.sh --configAgentKeystore
*****
DPAgent Keystore Configuration Utility
*****
1. Configure SSL for TCP (HANA on-premise) (interactive only)
2. List Agent Certificate
3. List All Certificate
4. List Certificate (by alias)
5. Export Agent Certificate
6. Export Certificate (Base64-Encoded)
7. Import Certificate
8. Delete Certificate
9. Change keystore password
q. Quit
b. Back
*****
```

4. In the DPAgent Keystore Configuration Utility, use option 1 to configure SSL for TCP (HANA on-premise).

```
*****
Configure SSL for TCP (HANA on-premise) (interactive only)
*****
Enter Store Password: (*****) [The default password is changeit]
Enter Register Agent on HANA after SSL Configuration(true): Valid options:
true|false [You should always do this to ensure the setup is correct]
true
Enter Agent name to register with(ProductionAgent): [Agent name that you want
to register in HANA with]
SSLAgent
Enter Hana Server Host name(localhost): [This is hana server name and not
the dpagent server name]
mo-1a6803cc5.mo.sap.corp
Enter Hana Server Port Number(30015): [Hana port usually 3xx15 where xx is
your instance id]
30215
Enter Agent Admin HANA User: [HANA user that have AGENT ADMIN privilege]
system
Enter Password for Agent Admin HANA User:
Enter Password for Agent Admin HANA User: (confirm)
```

5. The following section defines the Data Provisioning Agent certificate and runs the following command. Use the same key\_password as the store\_password.

```
Enter The name of your organizational unit(Test Product):
SAP Tools
Enter The name of your organizational(Test Organization):
SAP
Enter The name of your City or Locality(Palo Alto):
```



```
Enter The name of your State or Province(CA):
Enter The two-letter country code for this unit(US):
```

6. For a self-signed certificate, select true.

```
Enter Use self-signed certificates for DPAgent?(false): Valid options: true|
false [We are going to use self-signed certificate here.]
true
Calling Configure SSL for TCP (HANA on-premise) (interactive only)
(configureKeystore)
*** Executing configureKeystore
*****
                Configuring DPAgent Keystore
*****
                Checking existing cacerts for dpagent private key
                Using DPAgent hostname = mo-1a6803cc5.mo.sap.corp and Alias =
dataprovisioningagent
                cacerts does not have dpagent certificate
                Creating a backup of existing keystore /hana1/bin/dpagent/ssl/cacerts.bak
```

7. The fully qualified domain name (FQDN) must match the Data Provisioning Agent host name, and the SAP HANA Server must be able to ping this machine. The HANA Server validates the Data Provisioning Agent host name and requires it to match what is set up in the AGENTS table.

```
Server does a host-name validation. Ensure the following FQDN is correct.
Enter dpagent machine host name? (mo-1a6803cc5.mo.sap.corp)
Creating dpagent keystore with Certificate:
CN=mo-1a6803cc5.mo.sap.corp,OU=SAP Tools,O=SAP,L=Palo Alto,S=CA,C=US
Executing ->[keytool, -genkeypair, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -alias, dataprovisioningagent, -keyalg, RSA, -keysize, 2048, -dname,
CN=mo-1a6803cc5.mo.sap.corp,OU=SAP Tools,O=SAP,L=Palo Alto,S=CA,C=US, -v]
Generating 2,048 bit RSA key pair and self-signed certificate
(SHA256withRSA) with a validity of 3,650 days
for: CN=mo-1a6803cc5.mo.sap.corp, OU=SAP Tools, O=SAP, L=Palo
Alto, ST=CA, C=US
[Storing /hana1/bin/dpagent/ssl/cacerts]
DPAgent keystore created successfully.
***Using self-signed certificates for dpagent***
Executing ->[keytool, -exportcert, -keystore, /hana1/bin/dpagent/ssl/
cacerts, -file, /hana1/bin/dpagent/ssl/dpagent.cer, -alias,
dataprovisioningagent, -noprompt]
Certificate stored in file </hana1/bin/dpagent/ssl/dpagent.cer>
```

The Data Provisioning Agent keystore now has the Data Provisioning Agent certificate and exports the certificate to the SSL folder. Now, copy the certificate to the SAP HANA machine.

8. On the SAP HANA Server, because this certificate is self-signed, create the SAP HANA keystore with a [noreq](#) flag.

```
*****
                HANA Configuration
*****
Now for the HANA side setup you need to have HANA Shell Access.
* Once you have access please navigate to
=>cd $SECUDIR
*)If sapcli.pse exists there, the server certificate is created
already. If not, create sapcli.pse via the following
=> sapgenpse get_pse -p sapcli.pse -noreq
"CN=hostname.fully.qualified, OU=Support, O=SAP, C=CA"
*) Import DPAgent Certificate /hana1/bin/dpagent/ssl/dpagent.cer,
which is required by Client Authentication.
-----BEGIN CERTIFICATE-----
MIIDhTCCAm2gAwIBAgIEclVYkDANBgkqhkiG9w0BAQsFADBzMQswCQYDVQQGEwJV
UzELMAkGA1UECBMCQ0ExEjAQBgNVBAcTCVBhbG8gQWw0bzEMMAoGA1UEChMDU0FQ
MRIwEAYDVQQLEwltQVAgVG9vbHMxITAfBgNVBAMTGGl1LTFhNjgwM2NjNS5tby5z
```

```

YXAuY29ycDAeFw0xNzA4MjIxNzMDVAFw0yNzA4MjAxNzMDVAMHMxCzAJBgNV
BAYTA1VTMQswCQYDVQQLIEwJJDQTESMBAGA1UEBxMJUGFsbyBBbHRvMQwwCgYDVQQK
EwNTQVAXEjAQBgNVBAsTCVNBUCBub29sczEhMB8GA1UEAxMYbW8tMWE2ODAzY2M1
LmlvLnNhC5jb3JwMIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEApopu
2Z6700ByR5PKR8pL5C9jkrGiCDBXVdY6ZdbZPkrkchIwL3SL6OeRLzxXDeWfVZO
TA5JoIKy7BSuT1SvX/6qN9NHYSFTtEJAV5g01B2fI+mPQ1RpWp/a2IPXUW8Lm1BQ
tAiiFCBazA3nAyf7wn8NvIlM3s3anALgqLrZsZOWc2cWAKv9LZDdJjvZZtdP8zDV
65YUPYxthGOD+K/yftOSlaFmSBOLszkcUK/hCKy7mDEBjjQbviHVDV43akaRnJEd
ClCCVToJSoprdEgCLabO6vjFPiv37sID4sNhaTEcRDyDIB5eVpYTtd2ZDhEpJk5V
WsKKSmGgnLSmp9gtDQIDAQABoyEwHzAdBgNVHQ4EFgQUZfrkKpGfoggzAdknrXOEX
IGdwn3MwDQYJKoZIhvcNAQELBQADggEBADd0sLSyeXOqSuePOhdUS2CLyJkMLgrY
BQ2t6cEyGJ80Pep6qmhTshqyUZ/psgtSDO6YTkD/d0ecBokp+bXeoEJPfLRb5cLM
HePG39Meu3S1dxoo6ybNsmGWHIzZlk2MhbMB015zzc9X8FsflsGuRTHGx7Z7q61E
PwihFNImkEu8uI3Zz8lrT+ggVlJpmm5zqRyS5+ifV4kMjMoimkrqd2sBNY5wpF7O
LO6L/SIzNg9q1//9j2zp/fCSKjjyd/jn/veo10y6rUECOje8B1J5+WGeA6bDsEei
WiAMhF60A+63xXN3tdKIayRl0F8Hvz+RO081LyAX6U0m4zo4g14OuCo=
-----END CERTIFICATE-----
*) You can save the above certificate to a file dpagent.cer in the
serverside and import it to sapcli.pse
=> sapgenpse maintain_pk -a dpagent.cer -p sapcli.pse
*) If SSO has not yet been enabled for this keystore, you can do it
with
=> sapgenpse seclogin -lps -p sapcli.pse -O <Instance_Name>adm
*) Export the HANA Server certificate and save it in dpagent machine
=> sapgenpse export_own_cert -o hana_server.cer -p sapcli.pse
Press Enter to continue...

```

9. After you create the SAP HANA keystore, add the agent certificate, and then export the SAP HANA certificate and import the SAP HANA certificate into the Data Provisioning Agent.

```

*****
Post HANA Configuration.
*****
Enter path to Server certificate or CA Root certificate path? ()
/hanal/bin/dpagent/ssl/hana_server.cer
Executing ->[keytool, -importcert, -keystore, /hanal/bin/dpagent/ssl/
cacerts, -file, /hanal/bin/dpagent/ssl/hana_server.cer, -alias,
hanaserverrootca
Certificate was added to keystore
[Storing /hanal/bin/dpagent/ssl/cacerts]
Successfully imported certificate as hanaserverrootca

```

After configuration, the command-line tool updates.

1. It connects to SAP HANA to validate the connection.
  2. It registers the agent without SSL to test the SAP HANA connection to the Data Provisioning Agent.
  3. If the previous steps are successful, it updates the `dpagentconfig.ini` and `secure_storage`, and persists all of the provided information.
10. Restart the Data Provisioning Agent.
  11. Reregister the agent with the SSL flag.

```

Connecting to HANA Server at pall00553681a.amer.global.corp.sap
Registering agent as ProductionAgent with SSL=false
Enabling SSL on DPagent TCP Sockets.
Successfully switched dpagent to use SSL.
Press Enter to continue...

```

## 7.2.3 Configure SSL for SAP HANA On-Premise [Command Line Batch]

When SAP HANA is installed on-premise, you must obtain a certificate for the agent and import certificates on both the agent host machine and the SAP HANA system.

### Prerequisites

Before configuring the agent, ensure that the SAP HANA system is already configured for SSL. For more information, see the *SAP HANA Security Guide*.

You need the password for the keytool Java program to generate a keystore and import an SAP HANA certificate. You can find the password, commands, and instructions in the `keytool.txt` file at `<DPAgent_root>\ssl\keytool.txt`.

#### i Note

To safeguard your certificates, change the default password of the keystore.

Also, back up the following:

- SAP HANA `sec` directory
- Back up your `<DPAgent_root>/ssl`, `<DPAgent_root>/sec`, and `<DPAgent_root/secure_storage>` directories, if they exist.

### Procedure

1. Generate a keystore on the agent host machine.

```
<DPAgent_root>/sapjvm/bin/keytool -genkeypair -alias DPAgent -keyalg RSA -  
keysize 2048 -dname  
"CN=<agent_hostname>,OU=<organizational_unit>,O=<organization>,L=<city>,S=<sta  
te>,C=<country>" -keypass <key_password> -storepass <store_password> -  
keystore <DPAgent_root>/ssl/dpagent.jks
```

`<agent_hostname>` must be the fully qualified hostname of the machine where the agent is installed. (For example, `machine.company.com`)

#### i Note

Use the same passwords from above later in steps when accessing the `.jks` when using `-keypass` and `-storepass` options.

The alias and keystore values can be any value, but if referencing them later on, when creating the certificate request and when importing the signed agent certificate, these alias and keystore values — defined here — should be used again. So, the Data Provisioning Agent alias and keystore values should be the same.

2. Obtain a signed certificate for the agent and import the certificate into the keystore.

- a. Generate the certificate request.

```
<DPAgent_root>/sapjvm/bin/keytool -certreq -file <DPAgent_root>/ssl/Agent_Req.pem -alias Agent_Cert -keystore <DPAgent_root>/ssl/dpagent.jks -storepass <store_password>
```

- b. Verify that the alias entry is of type PrivateKeyEntry.

```
<DPAgent_root>/sapjvm/bin/keytool -keystore <DPAgent_root>/ssl/dpagent.jks -list -storepass <store_password>
```

### **i Note**

After generating the agent request, make sure that the alias entry is of type PrivateKeyEntry and not trustedCertEntry. If the alias entry isn't PrivateKeyEntry, we recommend that you delete the alias and rerun the `keytool -genkeypair ...` command to re-create the key pair, before generating a certificate request for the Data Provisioning Agent.

- c. Send the certificate request to a Certificate Authority (CA) to be signed.
- d. After receiving the signed certificate from the CA, import it into the agent keystore.

```
<DPAgent_root>/sapjvm/bin/keytool -importcert -keystore cacerts -storepass <store_password> -file <signed_agent_certificate_filename>.der -noprompt -alias DPAgent
```

3. Import the SAP HANA agent certificate into the Data Provisioning Agent keystore.

### **i Note**

If you're importing more than one type of certificate, import them in the order shown. You don't need to import a self-signed certificate.

```
<DPAgent_root>/sapjvm/bin/keytool -importcert -keystore <your_keystore> -storepass <store_password> -file <CA_certificate_filename>.der -noprompt -alias <your CA alias> -v
<DPAgent_root>/sapjvm/bin/keytool -importcert -keystore <your_keystore> -storepass <store_password> -file <intermediate_certificate_filename>.der -noprompt -alias <your intermediate alias> -v
<DPAgent_root>/sapjvm/bin/keytool -importcert -keystore <your_keystore> -storepass <store_password> -file <self_signed_certificate_filename>.der -noprompt -alias <your Agent alias> -v
```

You can obtain the certificate by exporting it with the SAP Web Dispatcher. For more information, see SAP Note [2009483](#).

4. Use either the SAP HANA command-line tool (`sapgenpse`) or the Web Dispatcher user interface to import the signed agent certificate. On SAP HANA, add the signed agent certificate to the `sapcli` Personal Security Environment (PSE).
  - a. Back up `sapcli.pse`

```
mv sapcli.pse sapcli.pse.old
```

### **i Note**

Use `sapcli.pse`, and not `sapsrv.pse` trust store, which will be used for client authentication.

- b. Generate a new PSE file. After this file (<server\_certificate\_name>.pem) is created, get it signed by the CA.

```
sapgenpse get_pse -p sapcli.pse -x <your pin> -r <server cert  
name>.pem "CN=...,OU=..., O=..., C=..."
```

- c. Import the <signed\_server\_certificate\_name>.pse file.

```
sapgenpse import_own_cert -c <signed server cert> -p sapcli.pse -x <your  
pin> -r <CA cert> -r <intermediate cert> -v
```

- d. Import the signed agent certificate into the PSE file.

```
sapgenpse maintain_pk -a <your signed agent cert> -p sapcli.pse -x <your  
pin>
```

- e. In SAP HANA, enable SSL logon for a HANA user:

```
sapgenpse seclogin -p sapcli.pse -x <your pin> -O adm <HANA ADM User>
```

5. Restart the Data Provisioning Agent.

```
<DPAgent_root>/bin/dpagent_service.sh stop  
<DPAgent_root>/bin/dpagent_service.sh start
```

## Next Steps

### Note

You can also add the certificate with the SAP Web Dispatcher. For more information, see SAP Note [2009483](#).

If you require stronger encryption than 128-bit key length, update the existing JCE policy files.

## Related Information

[Connect to SAP HANA On-Premise with SSL \[page 512\]](#)

[Start and Connect the Configuration Tool \[page 84\]](#)

[Register the Agent with SAP HANA \[page 91\]](#)

[SAP Note 2009483](#)

[Update JCE Policy Files for Stronger Encryption \[page 518\]](#)

## 7.2.4 Connect to SAP HANA On-Premise with SSL

Specify connection information, user credentials, and SSL configuration information (using the Data Provisioning Agent configuration tool) when the SAP HANA system is located on-premise and requires a secure SSL connection.

### Prerequisites

- Before you can configure the Data Provisioning Agent to use SSL with SAP HANA on-premise, you must obtain the SSL certificates and import them to both the agent host machine and the SAP HANA system. See [Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#) for more information.
- The Agent Admin HANA User must have the following privileges:

Action	Role or Privilege
Connect to SAP HANA	System privilege: AGENT ADMIN
	System privilege: ADAPTER ADMIN

### Procedure

1. Navigate to the `<DPAgent_root>/configTool` directory.
2. Start the configuration tool.
  - On Windows, run `dpagentconfigtool.exe`.
  - On Linux, run `./dpagentconfigtool`.

#### Note

Start the configuration tool using the Data Provisioning Agent installation owner. The installation owner is the same user that is used to start the agent service.

You may need to set the `DISPLAY` environment variable:

```
export DISPLAY <IP address>:0.0
```

The `<IP address>` is the IP address of the terminal where you want to send the `dpagentconfigtool` GUI.

3. In the configuration tool, choose [Configure SSL](#), enter the SSL configuration information, and select [Enable SSL for Agent to HANA communication on TCP](#).

For all "...Path" parameters, enter "`<DPAgent_root>/ssl/cacerts`", or enter the path where you will find `dpagent.jks`, if you were using the command line batch process.

For all "...Type" parameters, enter "JKS"

### **i** Note

If you don't specify a distinct [Key Password](#), the value for [Keystore Password](#) is used for both the keystore and individual keys. This value is checked only if a key password was specified during key generation in the `keytool` utility.

4. Click [Connect to the SAP HANA server](#).
  - a. Return to the configuration tool, or restart it if needed.
  - b. Click [Connect to HANA](#).
  - c. Specify the hostname, port, and Agent Admin HANA User credentials for the SAP HANA server.

### **→** Tip

To determine the correct port number when SAP HANA is deployed in a multi-database configuration, execute the following SQL statement:

```
SELECT DATABASE_NAME, SERVICE_NAME, PORT, SQL_PORT, (PORT + 2) HTTP_PORT
FROM SYS_DATABASES.M_SERVICES WHERE DATABASE_NAME='<DBNAME>' and
((SERVICE_NAME='indexserver' and COORDINATOR_TYPE= 'MASTER') or
(SERVICE_NAME='xsengine'))
```

5. Click [Register Agent](#), enter the Agent name, and click the [Register](#) button.

## Next Steps

You can test your connections in the following ways:

- In the [Adapters](#) section, select HANAAdapter to perform a test, and click [Register Adapter](#).
- In SAP HANA studio, run `SELECT * FROM AGENTS`, and check column `IS_SSL_ENABLED = true`.

## Related Information

[Default Installation Paths \[page 47\]](#)

[Assign Roles and Privileges \[page 25\]](#)

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

[Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool \[page 513\]](#)

## 7.2.5 Configure the Adapter Truststore and Keystore Using the Data Provisioning Agent Configuration Tool

The Data Provisioning Agent uses certificates stored in the adapter truststore and adapter keystore to manage SSL connections to adapter-based remote sources. The adapter truststore contains the public keys and

Certificate Authority (CA) certificates for the remote sources, while the adapter keystore contains private keys used for client authentication.

## Context

Configure the location, type, and password for both the adapter truststore and the adapter keystore with the Data Provisioning Agent configuration tool.

## Procedure

1. Navigate to the `<DPAgent_root>/configTool` directory.
2. Start the configuration tool using the Data Provisioning Agent installation owner.
  - On Windows, run `dpagentconfigtool.exe`.
  - On Linux, run `./dpagentconfigtool`.

### i Note

The installation owner is the same user that is used to start the agent service.

3. In the configuration tool, choose [Configure SSL](#).
4. Enter the path, type, and password for both the adapter truststore and the adapter keystore.

### i Note

By default, both the adapter truststore and the adapter keystore use the same settings:

- Location: `<DPAgent_root>/ssl/cacerts`
- Type: `jks`

### → Tip

Use the Java keytool to change the default password to safeguard your certificates.

5. Click [Save](#).

## Next Steps

Use the Java keytool to import remote source CA certificates into the adapter truststore.

For example:

```
keytool -importcert -alias <source_name> -keystore <path_to_truststore> -  
storepass <password> -file <path_to_certificate>
```

By default, `keytool` is located in `<DPAgent_root>/sapjvm/bin`.



## 7.2.6 Change the Agent Configuration Tool SSL Settings

You can change the connection settings or certificates used by the Data Provisioning Agent Configuration tool to connect to the SAP HANA server.

### Context

By default, the Data Provisioning Agent Configuration tool does not validate the SAP HANA server against a certificate stored in the agent truststore when connecting with SSL.

If you want to change the default behavior, advanced properties can be added to the `dpagentconfig.ini` file for your agent:

Table 54: JDBC SSL properties for `dpagentconfig.ini`

Property	Type	Default	Description
<code>jdbc.encrypt</code>	boolean	false (when <code>sslEnforce</code> is turned off)  true (when <code>sslEnforce</code> is turned on)	Enables or disables TLS/SSL encryption
<code>jdbc.validateCertificate</code>	boolean	false	Specifies whether to validate the server certificate
<code>jdbc.hostNameInCertificate</code>	string	*	Host name used to verify the server identity (CN value in certificate)  The specified host name is used to verify the identity of the server instead of the host name with which the connection was established.  For example, in a single-host system, if a connection is established from a client on the same host as the server, a mismatch would arise between the host named in the certificate (actual host name) and the host used to establish the connection (localhost).

#### i Note

If you specify \* as the host name, this parameter has no effect. Other wildcards are not permitted.

For example, to validate against a trusted certificate:

## Procedure

1. Add the advanced properties to the `dpagentconfig.ini` file for your agent.

```
jdbc.encrypt=true  
jdbc.hostNameInCertificate=*  
jdbc.validateCertificate=true
```

2. From the SAP HANA server, export the public certificate.  
`sapgenpse export_own_cert -p sapsrv.pse -o server_jdbc_pubkey.cer`
3. Copy the certificate to a location that can be reached from the agent host machine.
4. Use the command-line agent configuration tool to import the server certificate into the agent truststore.

On Windows: `agentcli.bat --configAgentKeystore`

On Linux: `agentcli.sh --configAgentKeystore`

5. Restart the Data Provisioning Agent.

## 7.2.7 Reconfigure an Existing Agent for SSL

When you create and register a Data Provisioning Agent, you can choose to use SSL communication. If you do not configure SSL during agent creation, you can enable it later.

## Prerequisites

Before configuring the agent for SSL, ensure that the SAP HANA system is already configured for SSL. For more information, see the *SAP HANA Security Guide*.

### Note

You need the password for the `keytool` Java program to generate a keystore and import a HANA certificate. You can find the password, commands, and the instructions in the `keytool.txt` file at `<DPAgent_root>\ssl\keytool.txt`.

Change the default password of the keystore to safeguard your certificates.

## Procedure

1. Suspend any active remote source subscriptions on the agent.

You can suspend remote source subscriptions from the [Data Provisioning Remote Subscription Monitor](#).

Alternatively, you can use the `ALTER REMOTE SOURCE` command:

```
ALTER REMOTE SOURCE <remote_source_name> SUSPEND CAPTURE;
```

2. Stop the SAP HANA Data Provisioning Agent service.
  - On Windows, use the Services manager in Control Panel.
  - On Linux, run `./dpagent_service.sh stop`.
3. Prepare the agent host system by generating a keystore and importing certificates.

For more information, see “Prepare SSL when SAP HANA is On-premise”.

4. Restart the SAP HANA Data Provisioning Agent service.
  - On Windows, use the Services manager in Control Panel.
  - On Linux, run `./dpagent_service.sh start`.
5. Alter the agent registration to enable SSL.

You can alter the agent registration from the [Data Provisioning Agent Monitor](#).

Alternatively, you can use the `ALTER AGENT` command:

```
ALTER AGENT <agent_name> ENABLE SSL;
```

6. Resume capture for any remote source subscriptions on the agent.

You can resume remote source subscriptions from the [Data Provisioning Remote Subscription Monitor](#).

Alternatively, you can use the `ALTER REMOTE SOURCE` command:

```
ALTER REMOTE SOURCE <remote_source_name> RESUME CAPTURE;
```

## Related Information

[Suspend and Resume Remote Sources](#)

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

[Manage Agents from the Data Provisioning Agent Monitor \[page 103\]](#)

## 7.2.8 Troubleshoot the SSL Configuration

If the configuration process does not succeed due to misconfiguration, unopen ports, or other settings, you can try these troubleshooting steps.

- View the errors in the `log/framework_alert.trc` files.
- Verify that in the `dpagentconfig.ini` file, the `framework.enableSSL` parameter is set to true.
- Restart the Data Provisioning Agent and run the following command from SAP HANA: `ALTER AGENT "" ENABLE SSL`.
- Disable the SSL by setting `framework.enableSSL=false`. Restart the agent, then run `ALTER AGENT "" DISABLE SSL`. Check whether the communication is working. If it is working, then the input might not have been correct.

- To restart from the beginning, remove the `ssl/cacerts` and rename `cacerts.bak` to `cacerts`. Remove all `*.cer` and `*.pem` files. Similarly, on the SAP HANA side, remove the `sapcli.pse` file and all `*.cer` and `*.pem` files and perform the setup again.
- If you get a “Cipher suite not found” error, or something similar, be sure to update the JCE policy files. See [Update JCE Policy Files for Stronger Encryption \[page 518\]](#) for more information.

## 7.3 Update JCE Policy Files for Stronger Encryption

If you require stronger encryption for Kerberos or TLS/SSL implementations, you may need to update the existing Java Cryptography Extension (JCE) policy files.

### Context

Some TLS/SSL implementations, such as the connections between the Data Provisioning Agent and SAP HANA and other remote sources, and Kerberos implementations require stronger encryption than what the SAP JVM provides. If you require more than 128-bit key length encryption, update your JCE policy files to the latest Oracle JCE policy files, which you can find on the Oracle download Web site.

### Procedure

1. Navigate to `<DPAgent_root>/sapjvm/lib/security`, and backup the `local_policy.jar` and `US_export_policy.jar` files before you update the files, in case you need to restore the Data Provisioning Agent to its original state.
2. Download the latest Oracle JCE library ZIP file.
3. Unzip the downloaded ZIP file, and copy the `local_policy.jar` and `US_export_policy.jar` files to `<DPAgent_root>/sapjvm/lib/security`.
4. Restart the Data Provisioning Agent.

### Related Information

[Authentication \[page 497\]](#)

## 7.4 Authorizations

SAP HANA smart data integration adds entities that are stored as catalog objects in the SAP HANA database.

Catalog objects such as adapters and remote subscriptions follow standard SAP HANA database security concepts. That is, they follow standard processes for metadata management, system views, public views, authorizations, and so on.

In addition to the privileges supported by the GRANT statement in the *SAP HANA SQL and System Views Reference*, the following privileges are relevant to SAP HANA smart data integration and its associated catalog objects:

### System Privileges

System Privilege	Privilege Purpose
ADAPTER ADMIN	Controls the execution of the following adapter-related commands: CREATE ADAPTER, DROP ADAPTER and ALTER ADAPTER. Also allows access to ADAPTERS and ADAPTER_LOCATIONS system views.
AGENT ADMIN	Controls the execution of the following agent-related commands: CREATE AGENT, DROP AGENT and ALTER AGENT. Also allows access to AGENTS and ADAPTER_LOCATIONS system views.

### Source Privileges

Source Privilege	Privilege Purpose
CREATE REMOTE SUBSCRIPTION	This privilege allows the creation of remote subscriptions executed on this source entry. Remote subscriptions are created in a schema and point to a virtual table or SQL on tables to capture change data.
PROCESS REMOTE SUBSCRIPTION EXCEPTION	This privilege allows processing exceptions on this source entry. Exceptions that are relevant for all remote subscriptions are created for a remote source entry.

### Object Privileges

Object Privilege	Privilege Purpose	Command Types
AGENT MESSAGING	Authorizes the user with which the agent communicates with the data provisioning server using HTTP protocol.	DDL
PROCESS REMOTE SUBSCRIPTION EXCEPTION	Authorizes processing exceptions of a remote subscription.	DDL

## Related Information

[Activating and Executing Task Flowgraphs and Replication Tasks \[page 520\]](#)

[SAP HANA Security Guide](#)

[SAP HANA SQL and System Views Reference](#)

### 7.4.1 Activating and Executing Task Flowgraphs and Replication Tasks

\_SYS\_REPO requires additional object or schema authorizations to activate and execute objects such as task flowgraphs and replication tasks.

To activate and execute these objects, \_SYS\_REPO requires the following authorizations:

- For any input sources: `SELECT`
- For any output sources: `INSERT`, `UPDATE`, and `DELETE`
- For any stored procedures or Application Function Library: `EXECUTE`
- For any sequences: `SELECT`

For example, the following statement grants all necessary authorizations to \_SYS\_REPO on a specific schema:

```
GRANT SELECT, INSERT, UPDATE, DELETE, EXECUTE  
ON SCHEMA "<schema_name>" TO _SYS_REPO WITH GRANT OPTION;
```

## Related Information

[Assign Roles and Privileges \[page 25\]](#)

## 7.5 Communication Channel Security

Communication channel security between SAP HANA and adapters hosted by the Data Provisioning Agent depends on the SAP HANA deployment.

Additional components added to SAP HANA landscape by SAP HANA Smart Data Integration and SAP HANA smart data quality require security considerations in addition to the information described in the *SAP HANA Security Guide*.

## SAP HANA On-Premise

When SAP HANA and the Data Provisioning Agent are both installed on-premise, or locally in relation to each other, communication is performed using TCP/IP encrypted with SSL.

The Data Provisioning Server connects to a port listened to by the agent. The agent generates a key pair and stores its public certificate in SAP HANA. The Data Provisioning Server then uses this public certificate to perform SSL server authentication when connecting to the agent.

### ⚠ Caution

Passwords for remote systems accessed by adapters are sent in plain text over this communication channel. Therefore, encryption is mandatory.

## SAP HANA in the Cloud

When SAP HANA is in the cloud, or a firewall exists between SAP HANA and the Data Provisioning Agent, the agent connects to SAP HANA using a proxy XS application. The proxy performs authentication and authorization before passing messages to or from the Data Provisioning Server.

The agent can connect using the user name and password scheme supported by SAP HANA XS applications.

## Related Information

[SAP HANA Security Guide](#)

[Architecture \[page 12\]](#)

[Configure SSL for SAP HANA On-Premise \[Command Line Batch\] \[page 509\]](#)

## 7.6 Auditing Activity on SAP HANA Smart Data Integration Objects

Auditing provides you with visibility on who did what in the SAP HANA database (or tried to do what) and when.

Actions performed on SAP HANA smart data integration objects can be audited using the standard auditing tools and processes described in the *SAP HANA Security Guide*.

In addition to the audit actions listed in the *SAP HANA SQL and System Views Reference*, the following audit actions are available:

Audit Action Name	Group Number	Audit Operation
CREATE AGENT	17	Registering a Data Provisioning Agent

Audit Action Name	Group Number	Audit Operation
ALTER AGENT	17	Altering a Data Provisioning Agent's registration
DROP AGENT	17	Dropping a Data Provisioning Agent registration
CREATE ADAPTER	17	Registering a Data Provisioning Adapter
ALTER ADAPTER	17	Altering the registration of a Data Provisioning Adapter
DROP ADAPTER	17	Dropping the registration of a Data Provisioning Adapter
CREATE REMOTE SUBSCRIPTION	17	Creating a subscription to a remote source
ALTER REMOTE SUBSCRIPTION	17	Altering a subscription to a remote source
DROP REMOTE SUBSCRIPTION	17	Dropping a subscription to a remote source
PROCESS REMOTE SUBSCRIPTION EXCEPTION	17	Processing exceptions raised by a subscribed remote source

## Related Information

[SAP HANA Security Guide](#)

[SAP HANA SQL and System Views Reference](#)

## 7.7 Data Protection and Privacy in SAP HANA Smart Data Integration and SAP HANA Smart Data Quality

SAP HANA provides the technical enablement and infrastructure to allow you to run applications on SAP HANA to conform to the legal requirements of data protection in the different scenarios in which SAP HANA is used.

SAP HANA smart data integration and SAP HANA smart data quality are applications based on SAP HANA, and they rely on SAP HANA as the platform for security and data protection. For information about how SAP HANA provides and enables data protection, see the *SAP HANA Security Guide*.

## Related Information

[Data Protection and Privacy in SAP HANA](#)



## 8 SQL and System Views Reference for Smart Data Integration and Smart Data Quality

This section contains information about SQL syntax and system views that can be used in SAP HANA smart data integration and SAP HANA smart data quality.

For complete information about all SQL statements and system views for SAP HANA and other SAP HANA contexts, see the *SAP HANA SQL and System Views Reference*.

For information about the capabilities available for your license and installation scenario, refer to the Feature Scope Description (FSD) for your specific SAP HANA version on the [SAP HANA Platform](#) page.

### [SQL Statements \[page 523\]](#)

SAP HANA smart data integration and SAP HANA smart data quality support many SQL statements to allow you to do such tasks as create agents and adapters, administer your system, and so on.

### [System Views \[page 561\]](#)

System views allow you to query for various information about the system state using SQL commands. The results appear as tables.

## Related Information

[SAP HANA SQL and System Views Reference](#)

## 8.1 SQL Statements

SAP HANA smart data integration and SAP HANA smart data quality support many SQL statements to allow you to do such tasks as create agents and adapters, administer your system, and so on.

### [ALTER ADAPTER Statement \[Smart Data Integration\] \[page 525\]](#)

The ALTER ADAPTER statement alters an adapter. Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

### [ALTER AGENT Statement \[Smart Data Integration\] \[page 527\]](#)

The ALTER AGENT statement changes an agent's host name and/or port and SSL property if it uses the TCP protocol. It can also assign an agent to an agent group.

### [ALTER REMOTE SOURCE Statement \[Smart Data Integration\] \[page 528\]](#)

The ALTER REMOTE SOURCE statement modifies the configuration of an external data source connected to the SAP HANA database.

### [ALTER REMOTE SUBSCRIPTION Statement \[Smart Data Integration\] \[page 532\]](#)

The ALTER REMOTE SUBSCRIPTION statement allows the QUEUE command to initiate real-time data processing, and the DISTRIBUTE command applies the changes.

[CANCEL TASK Statement \[Smart Data Integration\] \[page 533\]](#)

Cancels a task that was started with START TASK.

[CREATE ADAPTER Statement \[Smart Data Integration\] \[page 535\]](#)

The CREATE ADAPTER statement creates an adapter that is deployed at the specified location.

[CREATE AGENT Statement \[Smart Data Integration\] \[page 537\]](#)

The CREATE AGENT statement registers connection properties of an agent that is installed on another host.

[CREATE AGENT GROUP Statement \[Smart Data Integration\] \[page 539\]](#)

The CREATE AGENT GROUP statement creates an agent clustering group to which individual agents can be assigned.

[CREATE AUDIT POLICY Statement \[Smart Data Integration\] \[page 540\]](#)

The CREATE AUDIT POLICY statement creates a new audit policy, which can then be enabled and cause the specified audit actions to occur.

[CREATE REMOTE SOURCE Statement \[Smart Data Integration\] \[page 542\]](#)

The CREATE REMOTE SOURCE statement defines an external data source connected to SAP HANA database.

[CREATE REMOTE SUBSCRIPTION Statement \[Smart Data Integration\] \[page 543\]](#)

The CREATE REMOTE SUBSCRIPTION statement creates a remote subscription in SAP HANA to capture changes specified on the entire virtual table or part of a virtual table using a subquery.

[CREATE VIRTUAL PROCEDURE Statement \[Smart Data Integration\] \[page 548\]](#)

Creates a virtual procedure using the specified programming language that allows execution of the procedure body at the specified remote source.

[DROP ADAPTER Statement \[Smart Data Integration\] \[page 550\]](#)

The DROP ADAPTER statement removes an adapter from all locations.

[DROP AGENT Statement \[Smart Data Integration\] \[page 551\]](#)

The DROP AGENT statement removes an agent.

[DROP AGENT GROUP Statement \[Smart Data Integration\] \[page 552\]](#)

The DROP AGENT GROUP statement removes an agent clustering group.

[DROP REMOTE SUBSCRIPTION Statement \[Smart Data Integration\] \[page 553\]](#)

The DROP REMOTE SUBSCRIPTION statement drops an existing remote subscription.

[GRANT Statement \[Smart Data Integration\] \[page 554\]](#)

GRANT is used to grant privileges and structured privileges to users and roles. GRANT is also used to grant roles to users and other roles.

[PROCESS REMOTE SUBSCRIPTION EXCEPTION Statement \[Smart Data Integration\] \[page 556\]](#)

The PROCESS REMOTE SUBSCRIPTION EXCEPTION statement allows the user to indicate how an exception should be processed.

[SESSION\\_CONTEXT Function \[Smart Data Integration\] \[page 557\]](#)

Returns the value of session\_variable assigned to the current user.

[START TASK Statement \[Smart Data Integration\] \[page 558\]](#)

Starts a task.

## Related Information

[SQL Reference for Additional SAP HANA Contexts \(SAP HANA SQL and System Views Reference\)](#)

### 8.1.1 ALTER ADAPTER Statement [Smart Data Integration]

The ALTER ADAPTER statement alters an adapter. Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

## Syntax

```
ALTER ADAPTER <adapter_name> [PROPERTIES <properties>]  
| {ADD | REMOVE} LOCATION {DPSEVER | AGENT <agent_name>}  
| REFRESH AT LOCATION {DPSEVER | AGENT <agent_name>}
```

## Syntax Elements

### <adapter\_name>

The name of the adapter to be altered.

```
<adapter_name> ::= <identifier>
```

### <agent\_name>

The agent name if the adapter is set up on the agent.

```
<agent_name> ::= <identifier>
```

### <properties>

The optional properties of the adapter, such as display\_name. If display\_name is not specified, then adapter\_name appears in the user interface.

```
<properties> ::= <string_literal>
```

## Description

The ALTER ADAPTER statement alters an adapter. Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

## Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

System privilege: ADAPTER ADMIN

## Examples

**Add or remove an existing adapter at agent or Data Provisioning Server**

Create two agents and an adapter at the first agent:

```
CREATE AGENT TEST_AGENT_1 PROTOCOL 'TCP' HOST 'test_host1'
PORT 5050;
CREATE AGENT TEST_AGENT_2 PROTOCOL 'HTTP';
CREATE ADAPTER TEST_ADAPTER AT LOCATION AGENT TEST_AGENT_1;
```

Add an existing adapter TEST\_ADAPTER to agent TEST\_AGENT\_2:

```
ALTER ADAPTER TEST_ADAPTER ADD LOCATION AGENT TEST_AGENT_2;
```

Remove an existing adapter TEST\_ADAPTER from agent TEST\_AGENT\_2:

```
ALTER ADAPTER TEST_ADAPTER REMOVE LOCATION AGENT
TEST_AGENT_2;
```

Add an existing adapter TEST\_ADAPTER at the Data Provisioning Server:

```
ALTER ADAPTER TEST_ADAPTER ADD LOCATION DPSEVER;
```

Remove an existing adapter TEST\_ADAPTER at Data Provisioning Server:

```
ALTER ADAPTER TEST_ADAPTER REMOVE LOCATION DPSEVER;
```

**Refresh configuration and query optimization capabilities of an adapter**

Read configuration and query optimization capabilities of an adapter from the adapter setup at the agent or Data Provisioning Server:

```
ALTER ADAPTER TEST_ADAPTER REFRESH AT LOCATION DPSEVER;
ALTER ADAPTER TEST_ADAPTER REFRESH AT LOCATION AGENT
TEST_AGENT_2;
```

**Update display name property of an adapter**

Change display name for an adapter to 'My Custom Adapter':

```
ALTER ADAPTER TEST_ADAPTER PROPERTIES 'display_name=My
Custom Adapter';
```

## 8.1.2 ALTER AGENT Statement [Smart Data Integration]

The ALTER AGENT statement changes an agent's host name and/or port and SSL property if it uses the TCP protocol. It can also assign an agent to an agent group.

### Syntax

```
ALTER AGENT <agent_name>  
HOST <agent_hostname> [ PORT <agent_port_number> ] [ { ENABLE | DISABLE } SSL ]  
| PORT <agent_port_number> [ {ENABLE | DISABLE} SSL ]  
| [ {ENABLE | DISABLE} SSL ]  
| { SET | UNSET } AGENT GROUP <agent_group_name>
```

### Syntax Elements

#### <agent\_name>

The name of the agent to be altered.

```
<agent_name> ::= <identifier>
```

#### <agent\_hostname>

The name of the agent host.

```
<agent_hostname> ::= <string_literal>
```

#### <agent\_port\_number>

Specifies whether the agent's TCP listener on the specified port uses SSL.

```
<agent_port_number> ::= <integer_literal> {ENABLE | DISABLE}  
SSL
```

#### <agent\_group\_name>

The name of the agent clustering group to which the agent should be attached.

```
<agent_group_name> ::= <identifier>
```

### Description

The ALTER AGENT statement changes an agent's host name and/or port if it uses the TCP protocol. It can also assign an agent to an agent group.

## Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::AlterAgent

System privilege: AGENT ADMIN

## Examples

- Alter TEST\_AGENT's hostname test\_host and port to 5051, if it uses 'TCP' protocol

```
ALTER AGENT TEST_AGENT HOST 'test_host' PORT 5051;
```

- Alter TEST\_AGENT's hostname test\_host, if it uses 'TCP' protocol

```
ALTER AGENT TEST_AGENT HOST 'test_host';
```

- Alter TEST\_AGENT's port to 5051, if it uses 'TCP' protocol

```
ALTER AGENT TEST_AGENT PORT 5051;
```

- Assign TEST\_AGENT to agent group TEST\_GROUP

```
ALTER AGENT TEST_AGENT SET AGENT GROUP TEST_GROUP;
```

- Remove TEST\_AGENT from agent group TEST\_GROUP

```
ALTER AGENT TEST_AGENT UNSET AGENT GROUP TEST_GROUP;
```

## 8.1.3 ALTER REMOTE SOURCE Statement [Smart Data Integration]

The ALTER REMOTE SOURCE statement modifies the configuration of an external data source connected to the SAP HANA database.

The ALTER REMOTE SOURCE SQL statement is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the ALTER REMOTE SOURCE topic for complete information. This information is specific to smart data integration functionality.

## Syntax

```
ALTER REMOTE SOURCE <remote_source_name> <adapter_clause> [<credential_clause>]  
| { SUSPEND | RESUME } { CAPTURE | DISTRIBUTION }  
| { CLEAR OBJECTS | REFRESH OBJECTS | CANCEL REFRESH OBJECTS }  
| START LATENCY MONITORING <latency_ticket_name> [ INTERVAL  
<interval_in_seconds> ]
```

```
| STOP LATENCY MONITORING <latency_ticket_name>
| CLEAR LATENCY HISTORY [ <latency_ticket_name> ]
```

## Syntax Elements

Syntax elements specific to smart data integration are described as follows. For information about syntax elements that aren't specific to smart data integration, refer to the ALTER REMOTE SOURCE topic.

### <adapter\_clause>

Adapter configuration.

```
<adapter_clause> ::= [ADAPTER <adapter_name>
[AT LOCATION { DPSEVER | AGENT <agent_name> | AGENT GROUP
<agent_group_name>}] <configuration_clause>]
```

```
<agent_name> ::= <identifier>
<agent_group_name> ::= <identifier>
```

```
<configuration_clause> ::= CONFIGURATION
'<configuration_xml_string>'
```

The <configuration\_xml\_string> is the XML-formatted configuration string for the remote source.

Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

### { SUSPEND | RESUME } { CAPTURE | DISTRIBUTION }

ALTER REMOTE SOURCE SUSPEND CAPTURE	Suspends the adapter and agent from reading any more changes from source system. This is helpful when the source system or SAP HANA is preparing for planned maintenance or an upgrade.
ALTER REMOTE SOURCE <remote_source_name> RESUME CAPTURE	Resumes the suspended adapter to read changed data from source system.
ALTER REMOTE SOURCE <remote_source_name> SUSPEND DISTRIBUTION	Suspends the application of real-time changes in SAP HANA tables but collects changed data from the source system.
ALTER REMOTE SOURCE <remote_source_name> RESUME DISTRIBUTION	Resumes applying real-time changes in SAP HANA tables.

### { CLEAR OBJECTS | REFRESH OBJECTS | CANCEL REFRESH OBJECTS }

ALTER REMOTE SOURCE <remote_source_name> CLEAR OBJECTS	Clears all the data received from the adapter for this remote source from HANA tables.
--	--

ALTER REMOTE SOURCE  
<remote\_source\_name> REFRESH  
OBJECTS

Starts building HANA dictionary tables that contain remote source objects.

ALTER REMOTE SOURCE  
<remote\_source\_name> CANCEL  
REFRESH OBJECTS

Cancels the long-running REFRESH background operation. This stops fetching records from the adapter but keeps the data received so far from the remote source on HANA tables.

ALTER REMOTE SOURCE <remote\_source\_name> START LATENCY MONITORING <ticket\_name>

Starts the collection of latency statistics one time or at regular intervals. The user specifies a target latency ticket in the monitoring view.

ALTER REMOTE SOURCE <remote\_source\_name> STOP LATENCY MONITORING <ticket\_name>

Stops the collection of latency statistics into the given latency ticket.

ALTER REMOTE SOURCE <remote\_source\_name> CLEAR LATENCY HISTORY

Clears the latency statistics (for either one latency ticket, or for the whole remote source, from the monitoring view.

## Description

The ALTER REMOTE SOURCE statement modifies the configuration of an external data source connected to the SAP HANA database. Only database users with the object privilege ALTER for remote sources may alter remote sources.

### Note

You may not change a user name while a remote source is suspended.

## Permissions

This statement requires the ALTER object privilege on the remote source.

## Examples

```
ALTER REMOTE SOURCE "odata_nw" ADAPTER "ODataAdapter"  
AT LOCATION DPSEVER  
CONFIGURATION '<?xml version="1.0" encoding="UTF-8" standalone="yes"?>  
<ConnectionProperties name="connection_properties">  
<PropertyEntry name="URL">http://services.odata.org/Northwind/Northwind.svc/</  
PropertyEntry>  
<PropertyEntry name="proxyserver">proxy</PropertyEntry>
```



```
<PropertyEntry name="proxyport">8080</PropertyEntry> <PropertyEntry
name="truststore"></PropertyEntry>
<PropertyEntry name="supportformatquery"></PropertyEntry>
</ConnectionProperties>' WITH CREDENTIAL TYPE 'PASSWORD'
USING '<CredentialEntry name="password"><user></user><password></password></
CredentialEntry>';
```

The configuration clause must be a structured XML string that defines the settings for the remote source. For example, the CONFIGURATION string in the following example configures a remote source for an Oracle database.

```
CONFIGURATION '<?xml version="1.0" encoding="UTF-8"?>
  <ConnectionProperties name="configurations">
    <PropertyGroup name="generic">
      <PropertyEntry name="instance_name">ora_inst</PropertyEntry>
      <PropertyEntry name="admin_port">12345</PropertyEntry>
      <PropertyEntry name="map_char_types_to_unicode">>false</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="database">
      <PropertyEntry name="cdb_enabled">>false</PropertyEntry>
      <PropertyEntry name="pds_use_tnsnames">>false</PropertyEntry>
      <PropertyEntry name="pds_host_name"><db_hostname></PropertyEntry>
      <PropertyEntry name="pds_port_number">1521</PropertyEntry>
      <PropertyEntry name="pds_database_name">ORCL</PropertyEntry>
      <PropertyEntry name="cdb_service_name"></PropertyEntry>
      <PropertyEntry name="pds_service_name"></PropertyEntry>
      <PropertyEntry name="pds_tns_filename"></PropertyEntry>
      <PropertyEntry name="pds_tns_connection"></PropertyEntry>
      <PropertyEntry name="cdb_tns_connection"></PropertyEntry>
      <PropertyEntry name="_pds_tns_connection_with_cdb_enabled"></
PropertyEntry>
      <PropertyEntry name="pds_byte_order"></PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="schema_alias_replacements">
      <PropertyEntry name="schema_alias"></PropertyEntry>
      <PropertyEntry name="schema_alias_replacement"></PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="security">
      <PropertyEntry name="pds_use_ssl">>false</PropertyEntry>
      <PropertyEntry name="pds_ssl_sc_dn"></PropertyEntry>
      <PropertyEntry name="_enable_ssl_client_auth">>false</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="jdbc_flags">
      <PropertyEntry name="remarksReporting">>false</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="cdc">
      <PropertyGroup name="databaseconf">
        <PropertyEntry name="pdb_timezone_file"><timezone_file></
PropertyEntry>
        <PropertyEntry name="pdb_archive_path"></PropertyEntry>
        <PropertyEntry name="pdb_supplemental_logging_level">table</
PropertyEntry>
      </PropertyGroup>
      <PropertyGroup name="parallelscale">
        <PropertyEntry name="lr_parallel_scan">>false</PropertyEntry>
        <PropertyEntry name="lr_parallel_scanner_count"></PropertyEntry>
        <PropertyEntry name="lr_parallel_scan_queue_size"></
PropertyEntry>
        <PropertyEntry name="lr_parallel_scan_range"></PropertyEntry>
      </PropertyGroup>
      <PropertyGroup name="logreader">
        <PropertyEntry name="skip_lr_errors">>false</PropertyEntry>
        <PropertyEntry name="lr_max_op_queue_size">1000</PropertyEntry>
        <PropertyEntry name="lr_max_scan_queue_size">1000</PropertyEntry>
        <PropertyEntry name="lr_max_session_cache_size">1000</
PropertyEntry>
        <PropertyEntry name="scan_fetch_size">10</PropertyEntry>
```

```

PropertyEntry>      <PropertyEntry name="pdb_dflt_column_repl">true</PropertyEntry>
                    <PropertyEntry name="pdb_ignore_unsupported_anydata">>false</
PropertyEntry>      <PropertyEntry name="pds_sql_connection_pool_size">15</
PropertyEntry>      <PropertyEntry name="pds_retry_count">5</PropertyEntry>
                    <PropertyEntry name="pds_retry_timeout">10</PropertyEntry>
                    </PropertyGroup>
                </PropertyGroup>
            </ConnectionProperties>'

```

## Related Information

[ALTER REMOTE SOURCE Statement \(Access Control\) \(SAP HANA SQL and System Views Reference\)](#)

### 8.1.4 ALTER REMOTE SUBSCRIPTION Statement [Smart Data Integration]

The ALTER REMOTE SUBSCRIPTION statement allows the QUEUE command to initiate real-time data processing, and the DISTRIBUTE command applies the changes.

## Syntax

```

ALTER REMOTE SUBSCRIPTION [<schema_name>.]<subscription_name>
{ QUEUE | DISTRIBUTE | RESET }

```

## Syntax Elements

**<subscription\_name>**

The name of the remote subscription.

```
<subscription_name> ::= <identifier>
```

## Description

The ALTER REMOTE SUBSCRIPTION statement allows the QUEUE command to initiate real-time data processing, and the DISTRIBUTE command applies the changes. Typically, the initial load of data is preceded by QUEUE command. The DISTRIBUTE command is used when initial load completes. The RESET command can be used to reset the real-time process to start from the initial load again.

## Permissions

This statement requires the ALTER object privilege on the remote source.

## Example

Capture changes from a virtual table to an SAP HANA table.

```
CREATE AGENT TEST_AGENT PROTOCOL 'TCP' HOST 'test_host1' PORT 5050;
CREATE ADAPTER 'DB2ECCAdapter' AT LOCATION AGENT TEST_AGENT;
CREATE REMOTE SOURCE MYECC ADAPTER 'DB2ECCAdapter' CONFIGURATION
'<configuration_xml>' AT LOCATION AGENT TEST_AGENT;
CREATE VIRTUAL TABLE MARA_VT AT MYECC."<NULL>". "<NULL>".MARA;
CREATE COLUMN TABLE TGT_MARA LIKE MARA_VT;
CREATE REMOTE SUBSCRIPTION TEST_SUB ON MARA_VT TARGET TABLE TGT_MARA;
ALTER REMOTE SUBSCRIPTION TEST_SUB QUEUE;
```

Perform initial load of data using INSERT-SELECT or a TASK.

```
INSERT INTO TGT_MARA SELECT * FROM MARA_VT;
ALTER REMOTE SUBSCRIPTION TEST_SUB DISTRIBUTE;
```

Now insert or update a material record in ECC system and see it updated to TGT\_MARA table in SAP HANA. Reset the real-time process and restart the load.

```
ALTER REMOTE SUBSCRIPTION TEST_SUB RESET;
ALTER REMOTE SUBSCRIPTION TEST_SUB QUEUE;
```

Perform initial load of data using INSERT-SELECT or a TASK.

```
INSERT INTO TGT_MARA SELECT * FROM MARA_VT;
ALTER REMOTE SUBSCRIPTION TEST_SUB DISTRIBUTE;
```

## 8.1.5 CANCEL TASK Statement [Smart Data Integration]

Cancels a task that was started with START TASK.

## Syntax

```
CANCEL TASK <task_execution_id> [WAIT <wait_time_in_seconds>]
```

## Syntax Elements

```
<task_execution_id> ::= <unsigned_integer>
```

Specifies the task execution ID to cancel. See the START TASK topic for more information about TASK\_EXECUTION\_ID.

```
<wait_time_in_seconds> ::= <identifier>
```

Number of seconds to wait for the task to cancel before returning from the command.

## Description

Cancels a task that was started with START TASK.

The default behavior is for the CANCEL TASK command to return after sending the cancel request. Optionally, a WAIT value can be specified where the command will wait for the task to actually cancel before returning. If the command has waited the specified amount of time, then the CANCEL TASK will error out with the error code 526 (request to cancel task was sent but task did not cancel before timeout was reached).

### Note

If the WAIT value is 0, the command returns immediately after sending the cancel request, as it would if no WAIT value were entered.

## Permissions

The user that called START TASK can implicitly CANCEL; otherwise, the CATALOG READ and SESSION ADMIN roles are required.

## Examples

Assuming that a TASK performTranslation was already started using START TASK and has a task execution ID of 255, it would be cancelled using the following commands. The behavior is the same for the following two cases:

```
CANCEL TASK 255;
```

```
CANCEL TASK 255 WAIT 0;
```

Assuming that a TASK performTranslation was already started using START TASK and has a task execution id of 256 and the user wants to wait up to 5 seconds for the command to cancel, it would be cancelled using the following command:

```
CANCEL TASK 256 WAIT 5;
```

If the task was able to cancel within 5 seconds, the CANCEL TASK will return as a success. If it didn't cancel within 5 seconds, then the return will be the error code 526.

## SQL Script

You can call CANCEL TASK within the SQL Script CREATE PROCEDURE. Refer to the [SAP HANA SQL Script Reference](#) for complete details about CREATE PROCEDURE.

```
CREATE PROCEDURE "CANCEL_TASK"."CANCEL_MY_TASK"(in exec_id INT)
LANGUAGE SQLSCRIPT AS
BEGIN
    CANCEL TASK :exec_id;
END;
```

CANCEL TASK is not supported in:

- Table UDF
- Scalar UDF
- Trigger
- Read-only procedures

## Related Information

[START TASK Statement \[Smart Data Integration\] \[page 558\]](#)

## 8.1.6 CREATE ADAPTER Statement [Smart Data Integration]

The CREATE ADAPTER statement creates an adapter that is deployed at the specified location.

## Syntax

```
CREATE ADAPTER <adapter_name> [PROPERTIES <properties>] AT LOCATION
{DPSEVER | AGENT <agent_name>}
```

## Syntax Elements

### <adapter\_name>

The name of the adapter to be created.

```
<adapter_name> ::= <identifier>
```

### <agent\_name>

The agent name if the adapter is set up on the agent.

```
<agent_name> ::= <identifier>
```

### <properties>

The optional properties of the adapter, such as display\_name. When display\_name is not specified, then adapter\_name displays in the user interface.

```
<properties> ::= <string_literal>
```

### AT LOCATION DPSEVER

The adapter runs inside the Data Provisioning Server process in SAP HANA.

### AT LOCATION

Specify an agent that is set up outside of SAP HANA for the adapter to run inside.

```
AT LOCATION AGENT <agent_name>
```

## Description

The CREATE ADAPTER statement creates an adapter that is deployed at the specified location. The adapter must be set up on the location prior to running this statement. When the statement is executed, the Data Provisioning Server contacts the adapter to retrieve its configuration details such as connection properties and query optimization capabilities.

## Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::AddLocationToAdapter

System privilege: ADAPTER ADMIN

## Examples

Create an adapter at the Data Provisioning Server

Create an adapter TEST\_ADAPTER running in the Data Provisioning Server.

```
CREATE ADAPTER TEST_ADAPTER AT LOCATION DPSEVER;
```

Create an adapter at a specified agent

Create an agent with name TEST\_AGENT.

```
CREATE AGENT TEST_AGENT PROTOCOL 'TCP' HOST  
'test_host' PORT 5050;
```

Create an adapter TEST\_ADAPTER on agent TEST\_AGENT.

```
CREATE ADAPTER TEST_ADAPTER AT LOCATION AGENT  
TEST_AGENT;
```

## 8.1.7 CREATE AGENT Statement [Smart Data Integration]

The CREATE AGENT statement registers connection properties of an agent that is installed on another host.

### Syntax

```
CREATE AGENT <agent_name> PROTOCOL { 'HTTP' | 'TCP' HOST <agent_hostname> PORT  
<agent_port_number> [{ENABLE | DISABLE} SSL]} [AGENT GROUP <agent_group_name>]
```

### Syntax Elements

**<agent\_name>**

The name of the agent to be created and its protocol.

```
<agent_name> ::= <identifier>
```

**PROTOCOL**

The protocol for the agent.

**HTTP**

Agent uses HTTP protocol for communication with DP server. Use this protocol when the SAP HANA database is on the cloud.

```
PROTOCOL 'HTTP'
```

## TCP

Agent uses TCP protocol and listens on the specified port to receive requests from DP server. Use this protocol when the SAP HANA database can connect to agent's TCP port.

```
PROTOCOL 'TCP' HOST <agent_hostname> PORT  
<agent_port_number>
```

```
<agent_hostname> ::= <string_literal>  
<agent_port_number> ::= <integer_literal>
```

DP server connects to the agent listening on the specified hostname and port. Use this protocol when the SAP HANA database is on-premise.

## {ENABLE | DISABLE} SSL

Specifies if agent's TCP listener on the specified port uses SSL.

## <agent\_group\_name>

The name of the agent clustering group to which the agent should belong.

```
<agent_group_name> ::= <identifier>
```

## Description

The CREATE AGENT statement registers connection properties of an agent that is installed on another host. The DP server and agent use these connection properties when establishing communication channel.

## Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::CreateAgent

System privilege: ADAPTER ADMIN

## Examples

### Create an agent with TCP protocol

Create an agent TEST\_AGENT running on test\_host and port 5050.

```
CREATE AGENT TEST_AGENT PROTOCOL 'TCP' HOST  
'test_host' PORT 5050;
```



Create an agent with HTTP protocol

Create an agent TEST\_AGENT that uses HTTP.

```
CREATE AGENT TEST_AGENT PROTOCOL 'HTTP';
```

Create an agent with HTTP protocol in an agent group

Create an agent TEST\_AGENT that uses HTTP and belongs to agent clustering group TEST\_GROUP.

```
CREATE AGENT TEST_AGENT PROTOCOL 'HTTP' AGENT GROUP TEST_GROUP;
```

## 8.1.8 CREATE AGENT GROUP Statement [Smart Data Integration]

The CREATE AGENT GROUP statement creates an agent clustering group to which individual agents can be assigned.

### Syntax

```
CREATE AGENT GROUP <agent_group_name>
```

### Syntax Elements

<agent\_group\_name>

The name of the agent group to create.

```
<agent_group_name> ::= <identifier>
```

### Description

The CREATE AGENT GROUP statement creates an agent clustering group to which individual agents can be assigned. An agent group can be used instead of a single agent to provide fail-over capabilities.

### Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::CreateAgent

System privilege: ADAPTER ADMIN

## Examples

Create an agent group named TEST\_GROUP.

```
CREATE AGENT GROUP TEST_GROUP;
```

## Related Information

[ALTER AGENT Statement \[Smart Data Integration\] \[page 527\]](#)

[CREATE AGENT Statement \[Smart Data Integration\] \[page 537\]](#)

## 8.1.9 CREATE AUDIT POLICY Statement [Smart Data Integration]

The CREATE AUDIT POLICY statement creates a new audit policy, which can then be enabled and cause the specified audit actions to occur.

The CREATE AUDIT POLICY SQL statement is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the CREATE AUDIT POLICY topic for complete information. The information below is specific to smart data integration functionality.

## Syntax

Refer to the *SAP HANA SQL and System Views Reference* for complete information about CREATE AUDIT POLICY syntax.

## Syntax Elements

Syntax elements specific to smart data integration are described below. For information about syntax elements that are not specific to smart data integration, refer to the *SAP HANA SQL and System Views Reference*.

```
<audit_action_name> ::= CREATE AGENT  
| ALTER AGENT  
| DROP AGENT  
| CREATE AGENT GROUP  
| DROP AGENT GROUP  
| CREATE ADAPTER  
| ALTER ADAPTER
```

```
| DROP ADAPTER
| CREATE REMOTE SUBSCRIPTION
| ALTER REMOTE SUBSCRIPTION
| DROP REMOTE SUBSCRIPTION
| PROCESS REMOTE SUBSCRIPTION EXCEPTION
```

Audit Action Name	Group Number	Audit Operation
CREATE AGENT	17	Registering a Data Provisioning Agent
ALTER AGENT	17	Altering a Data Provisioning Agent's registration
DROP AGENT	17	Dropping a Data Provisioning Agent registration
CREATE ADAPTER	17	Registering a Data Provisioning Adapter
ALTER ADAPTER	17	Altering the registration of a Data Provisioning Adapter
DROP ADAPTER	17	Dropping the registration of a Data Provisioning Adapter
CREATE REMOTE SUBSCRIPTION	17	Creating a subscription to a remote source
ALTER REMOTE SUBSCRIPTION	17	Altering a subscription to a remote source
DROP REMOTE SUBSCRIPTION	17	Dropping a subscription to a remote source
PROCESS REMOTE SUBSCRIPTION EXCEPTION	17	Processing exceptions raised by a subscribed remote source

## Description

The CREATE AUDIT POLICY statement creates a new audit policy. This audit policy can then be enabled and cause the auditing of the specified audit actions to occur.

## Permissions

Only database users with the CATALOG READ or INIFILE ADMIN system privilege can view information in the M\_INIFILE\_CONTENTS view. For other database users, this view is empty. Users with the AUDIT ADMIN privilege can see audit-relevant parameters.

## Related Information

[CREATE AUDIT POLICY Statement \(Access Control\) \(SAP HANA SQL and System Views Reference\)](#)

## 8.1.10 CREATE REMOTE SOURCE Statement [Smart Data Integration]

The CREATE REMOTE SOURCE statement defines an external data source connected to SAP HANA database.

The CREATE REMOTE SOURCE SQL statement is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the CREATE REMOTE SOURCE topic for complete information. The information below is specific to smart data integration functionality.

### Syntax

Refer to the *SAP HANA SQL and System Views Reference* for complete information about CREATE REMOTE SOURCE syntax.

### Syntax Elements

Syntax elements specific to smart data integration are described below. For information about syntax elements that are not specific to smart data integration, refer to the *SAP HANA SQL and System Views Reference*.

#### <adapter\_clause>

Configures the adapter.

```
<adapter_clause> ::= ADAPTER <adapter_name>
                    [AT LOCATION {DPSEVER | AGENT <agent_name> | AGENT GROUP
                    <agent_group_name>} ]
                    CONFIGURATION <connection_info_string>
```

```
<agent_name> ::= <identifier>
<agent_group_name> ::= <identifier>
```

Refer to CREATE ADAPTER for description of AT LOCATION.

### Description

The CREATE REMOTE SOURCE statement defines an external data source connected to SAP HANA database. Only database users having the system privilege CREATE SOURCE or DATA ADMIN are allowed to add a new remote source.

### Permissions

This statement requires the CREATE SOURCE system privilege.

## Related Information

[CREATE REMOTE SOURCE Statement \(Access Control\) \(SAP HANA SQL and System Views Reference\)](#)

### 8.1.11 CREATE REMOTE SUBSCRIPTION Statement [Smart Data Integration]

The CREATE REMOTE SUBSCRIPTION statement creates a remote subscription in SAP HANA to capture changes specified on the entire virtual table or part of a virtual table using a subquery.

## Syntax

```
CREATE REMOTE SUBSCRIPTION [<schema_name>.]<subscription_name>
{
  {ON [<schema_name>.]<virtual_table_name> } |
  {AS (<subquery>)}
}
[ WITH [ RESTRICTED ] SCHEMA CHANGES ]
{ TARGET TABLE <table_spec> <load_behavior> } |
{ TARGET TASK <task_spec> } |
{ PROCEDURE <proc_spec> }
```

## Syntax Elements

### <subscription\_name>

The name of the remote subscription.

```
<subscription_name> ::= <identifier>
```

### ON [<schema\_name>.]<virtual\_table\_name>

See "Remote subscription for TARGET TASK or TARGET TABLE using ON Clause" below.

### AS (<subquery>)

See "Remote subscription for TARGET TASK or TARGET TABLE using AS Clause" below.

### [WITH [RESTRICTED] SCHEMA CHANGES]

Include this clause to propagate source schema changes to the SAP HANA virtual table and remote subscription target table.

WITH SCHEMA CHANGES corresponds to the replication task options *Initial + realtime with structure* or *Realtime only with structure* and the flowgraph options *Real-time* and *with Schema Change*.

With the optional RESTRICTED clause, WITH RESTRICTED SCHEMA CHANGES propagates source schema changes only to the SAP HANA virtual table, and not the remote subscription target table.

#### <table\_spec>

The table definition.

```
<table_spec> ::= [<schema_name>].<table_name>
```

#### <load\_behavior>

```
[ CHANGE TYPE COLUMN <column_name> CHANGE TIME COLUMN  
<column_name> CHANGE SEQUENCE COLUMN <column_name> { INSERT |  
UPSERT } ]
```

CHANGE { TYPE | TIME | SEQUENCE } COLUMN <column\_name>

For a target table that logs the loading history, these parameters specify the target column names that will show the change type and corresponding timestamp for each operation. The CHANGE TYPE COLUMN <column\_name> displays I, U, or D for INSERT, UPSERT, or DELETE. In the case when multiple operations of the same type occur on the same source row with the same timestamp (because the operations are in the same transaction), use the CHANGE SEQUENCE COLUMN <column\_name>, which adds an incremental digit to distinguish the operations.

The load behavior options are:

**UPSERT:** INSERT and UPDATE apply as is, DELETE converts to UPDATE

**INSERT:** INSERT applies as is, UPDATE and DELETE convert to INSERT

The following example is for UPSERT for a remote subscription called user.subscription on a source table called SQLServer\_dbo.table. The target table user.table includes a column called CHANGE\_TYPE (with a data type of VARCHAR or NVARCHAR) and a column CHANGE\_TIME (with a data type of TIMESTAMP).

```
CREATE REMOTE SUBSCRIPTION user.subscription  
ON "user"."SQLServer_dbo.table"  
TARGET TABLE user.table  
CHANGE TYPE COLUMN "CHANGE_TYPE"  
CHANGE TIME COLUMN "CHANGE_TIME"  
UPSERT;
```

The following example for INSERT is for the same remote subscription and includes the CHANGE\_TIME column.

```
CREATE REMOTE SUBSCRIPTION user.subscription  
ON "user"."SQLServer_dbo.table"  
TARGET TABLE user.table  
CHANGE TYPE COLUMN "CHANGE_TYPE"  
CHANGE TIME COLUMN "CHANGE_TIME"  
CHANGE SEQUENCE COLUMN "CHANGE_SEQUENCE"  
INSERT;
```

#### <task\_spec>

The task definition.

```
<task_spec> ::= TARGET TASK[ <schema_name>].<task_name>
[ (<var_list>)]
[PROCEDURE PARAMETERS{<param_list>}]
```

<var\_list> specifies one or more start task variables.

```
<var_list> ::= <start_task_var> [{, <start_task_var>}...]
```

<start\_task\_var> specifies the name and value for a start task variable.

```
<start_task_var> ::= <var_name> => <var_value>
```

<var\_name> is the name of variable that was defined within the task plan.

Variable values provided in this section will be used at runtime (for example, when executing the task using START TASK).

```
<var_name> ::= <identifier>
```

<var\_value> is the value that should be used in place of the variable name specified when executing the task.

```
<var_value> ::= <string_literal>
```

<param\_list> specifies one or more start task parameters.

```
<param_list> ::= <start_task_param> [{, <start_task_param>}...]
```

```
<start_task_param> ::= <identifier>
```

If the task uses table types for input and/or output, then the task expects actual table, virtual table, or view names at runtime. These actual tables, virtual tables, or view names are specified as task parameters. Depending on the type of remote subscription being created, the task parameters may or may not need actual table, virtual table, or view names for specific parameters (see below for more details).

#### <proc\_spec>

```
{ PROCEDURE [<schema_name>].<proc_name> [<param_list>] }
```

## Description

The CREATE REMOTE SUBSCRIPTION statement creates a remote subscription in SAP HANA to capture changes specified on the entire virtual table or part of a virtual table using a subquery. The changed data can be applied to an SAP HANA target table or passed to a TASK or PROCEDURE if the changes require transformation. The owner of the remote subscription must have the following privileges:

- SELECT privilege on tables specified in the ON or AS <subquery> clauses
- INSERT, UPDATE, DELETE privileges on the target table

- EXECUTE privilege on the stored procedure
- START TASK privilege on the task

### Note

If you create a remote subscription using the CREATE REMOTE SUBSCRIPTION SQL statement, use **technical user** for the *Credentials Mode* parameter when creating a remote source.

## Permissions

This statement requires the CREATE REMOTE SUBSCRIPTION object privilege on the remote source.

## Remote subscription for TARGET TASK or TARGET TABLE using ON Clause

```
CREATE REMOTE SUBSCRIPTION [<schema_name>.]<subscription_name>
ON [<schema_name>.]<virtual_table_name>
TARGET TASK [<schema_name>].<task_name>[ (<var_list>)] [PROCEDURE
PARAMETERS (<param_list>)]
```

<param\_list> must contain one of the parameters as [<schema\_name>.]<virtual\_table\_name>. This parameter must be the same schema and virtual table name as specified in the ON clause. Only one parameter in <param\_list> can be a virtual table.

Each parameter in <param\_list> is used in comparing its columns with columns for the corresponding table type defined in the task plan. Hence, the order of parameters in <param\_list> must match the order of table types defined in the task plan for input and output sources.

The task plan table type corresponding to the procedure parameter [<schema\_name>.]<virtual\_table\_name> must have the same columns (excluding \_OP\_CODE and \_COMMIT\_TIMESTAMP). This table type must have \_OP\_CODE as the last but one column and \_COMMIT\_TIMESTAMP as the last column.

## Remote subscription for TARGET TASK or TARGET TABLE using AS Clause

```
CREATE REMOTE SUBSCRIPTION [<schema_name>.]<subscription_name>
AS <subquery>
TARGET TASK [<schema_name>].<task_name>[ (<var_list>)] [PROCEDURE
PARAMETERS (<param_list>)]
```

The AS (<subquery>) part of the syntax lets you define the SQL and the columns to use for the subscription. The subquery should be a simple SELECT <column\_list> from <virtual\_table> and should not contain a WHERE clause. The <column\_list> should match the target table schema in column order and name.

<param\_list> must contain one of the parameters as table type and this table type (schema and name) must be the same as the one defined in the task plan. This table type must also have the same columns as being



output by the subquery (excluding `_OP_CODE` and `_COMMIT_TIMESTAMP`). This table type must have `_OP_CODE` as the last but one column and `_COMMIT_TIMESTAMP` as the last column. Only one parameter in `<param_list>` can be a table type.

Each parameter in `<param_list>` is used in comparing its columns with columns for the corresponding table type defined in the task plan. Hence the order of parameters in `<param_list>` must match the order of table types defined in task plan for input and output sources.

## Example

Create a remote subscription on a virtual table and apply changes using a real-time task.

```
CREATE SCHEMA "IM SERVICES";
DROP REMOTE SOURCE "OracleAdapter" CASCADE;
CREATE REMOTE SOURCE "OracleAdapter" ADAPTER "OracleAdapter" AT LOCATION
dpserver CONFIGURATION '' WITH CREDENTIAL TYPE 'PASSWORD' USING '';
DROP TABLE "SYSTEM"."VT_EMPLOYEE_PK_TABLE";
CREATE VIRTUAL TABLE "SYSTEM"."VT_EMPLOYEE_PK_TABLE" AT
"OracleAdapter"."<NULL>".<NULL>".employee_pk_table";
DROP TYPE "IM SERVICES"."TT_PARAM_IN";
DROP TYPE "IM SERVICES"."TT_PARAM_OUT";
CREATE TYPE "IM SERVICES"."TT_PARAM_IN" AS TABLE ("empno" integer, "deptid"
integer, "empname" VARCHAR(200), "salary" decimal(28,7), "bonus" double,
"OP_CODE" VARCHAR(1), "COMMIT_TIMESTAMP" SECONDDATE);
CREATE TYPE "IM SERVICES"."TT_PARAM_OUT" AS TABLE ("empno" integer, "deptid"
integer, "empname" VARCHAR(200), "salary" decimal(28,7), "bonus" double);
DROP TABLE "IM SERVICES"."T_OUT";
CREATE COLUMN TABLE "IM SERVICES"."T_OUT" LIKE "IM SERVICES"."TT_PARAM_OUT" ;
DROP TASK "IM SERVICES"."TSKM_RT_VAR";
DROP REMOTE SUBSCRIPTION "IM SERVICES"."RSUB_VAR";
CREATE REMOTE SUBSCRIPTION "IM SERVICES"."RSUB_VAR"
AS (SELECT "empno","deptid","empname","salary","bonus" FROM
"SYSTEM"."VT_EMPLOYEE_PK_TABLE")
TARGET TASK "IM SERVICES"."TSKM_RT_VAR" ("expr_var01_in1" => '100',
"expr_var02_in2" => 'upper('walkerIN')')
PROCEDURE PARAMETERS ( "IM SERVICES"."TT_PARAM_IN", "IM SERVICES"."T_OUT");
DROP REMOTE SUBSCRIPTION "IM SERVICES"."RSUB_VAR";
CREATE REMOTE SUBSCRIPTION "IM SERVICES"."RSUB_VAR"
ON "SYSTEM"."VT_EMPLOYEE_PK_TABLE"
TARGET TASK "IM SERVICES"."TSKM_RT_VAR" ("expr_var01_in1" => '100',
"expr_var02_in2" => 'upper('walkerIN')')
PROCEDURE PARAMETERS ( "SYSTEM"."VT_EMPLOYEE_PK_TABLE", "IM SERVICES"."T_OUT");
SELECT * FROM "SYS"."REMOTE SUBSCRIPTIONS_";
TRUNCATE TABLE "IM SERVICES"."T_OUT";
ALTER REMOTE SUBSCRIPTION "IM SERVICES"."RSUB_VAR" QUEUE;
ALTER REMOTE SUBSCRIPTION "IM SERVICES"."RSUB_VAR" DISTRIBUTE;
```

## Related Information

[SQL Notation Conventions \(SAP HANA SQL and System Views Reference\)](#)

[Data Types \(SAP HANA SQL and System Views Reference\)](#)

## 8.1.12 CREATE VIRTUAL PROCEDURE Statement [Smart Data Integration]

Creates a virtual procedure using the specified programming language that allows execution of the procedure body at the specified remote source.

The CREATE VIRTUAL PROCEDURE SQL statement is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the CREATE VIRTUAL PROCEDURE Statement (Procedural) topic for complete information. The information below is specific to smart data integration functionality.

### Syntax

```
CONFIGURATION <configuration_json_string>
```

### Syntax Elements

<configuration\_json\_string>

A JSON string that includes required source procedure parameters.

### Description

The CREATE VIRTUAL PROCEDURE statement creates a new virtual procedure from a remote source procedure. When creating a virtual procedure using the SQL Console:

1. Return the metadata of the source procedure [number, types, and configuration (JSON) string] by invoking the built-in SAP HANA procedure:

```
"PUBLIC"."GET_REMOTE_SOURCE_FUNCTION_DEFINITION"  
( '<remote_source_name>', '<remote_object_unique_name>', ?, ?, ? );
```

2. Edit the CONFIGURATION JSON string to include the appropriate parameter values.

### Permissions

This statement requires the CREATE VIRTUAL PROCEDURE object privilege on the remote source.

## Example

If you use the SQL Console to create a virtual procedure, the following example illustrates an ABAP adapter.

```
CREATE VIRTUAL PROCEDURE BAPI_BANK_GETLIST (
  IN BANK_CTRY NVARCHAR(6) ,
  IN MAX_ROWS INT,
  OUT RETURN_TYPE NVARCHAR (2),
  OUT RETURN_ID NVARCHAR (40),
  OUT RETURN_NUMBER VARCHAR (6) ,
  OUT RETURN_MESSAGE NVARCHAR (440) ,
  OUT RETURN_LOG_NO NVARCHAR (40),
  OUT RETURN_LOG_MSG NO VARCHAR (12),
  OUT RETURN_MESSAGE_V1 NVARCHAR (100) ,
  OUT RETURN_MESSAGE_V2 NVARCHAR (100),
  OUT RETURN_MESSAGE_V3 NVARCHAR (100) ,
  OUT RETURN_MESSAGE_V4 NVARCHAR (100),
  OUT RETURN_PARAMETER NVARCHAR (64),
  OUT RETURN_ROW INTEGER,
  OUT RETURN_FIELD NVARCHAR (60),
  OUT RETURN_SYSTEM NVARCHAR (20),
  IN BANK_LIST_IN TABLE (
    BANK_CTRY NVARCHAR (6),
    BANK_KEY NVARCHAR (30),
    BANK_NAME NVARCHAR (120) ,
    CITY NVARCHAR (70)
  ),
  OUT BANK_LIST TABLE (
    BANK_CTRY NVARCHAR (6) ,
    BANK_KEY NVARCHAR (30) ,
    BANK_NAME NVARCHAR (120) ,
    CITY NVARCHAR (70)
  )
) CONFIGURATION '
{
  "__DP_UNIQUE_NAME__": "BAPI_BANK_GETLIST",
  "__DP_VIRTUAL_PROCEDURE__": true
}' AT "QA1";
```

Then call the procedure as follows:

```
CALL bapi_bank_getlist('DE', 1000, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?,
bank_list, ?);

[where "bank_list" is a table of type

TABLE (
    BANK_CTRY NVARCHAR (6),
    BANK_KEY NVARCHAR (30),
    BANK_NAME NVARCHAR (120) ,
    CITY NVARCHAR (70)
)

]
```

For more information about using the SQL Console, see the *SAP HANA Administration Guide*.

## 8.1.13 DROP ADAPTER Statement [Smart Data Integration]

The DROP ADAPTER statement removes an adapter from all locations.

### Syntax

```
DROP ADAPTER <adapter_name> [<drop_option>]
```

### Syntax Elements

**<adapter\_name>**

The name of the adapter to be dropped.

```
<adapter_name> ::= <identifier>
```

**<drop\_option>**

When <drop\_option> is not specified, a restrict drop will be performed.

```
<drop_option> ::= CASCADE | RESTRICT
```

CASCADE drops the adapter and dependent objects.

### Description

The DROP ADAPTER statement removes an adapter from all locations.

### Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::RemoveLocationFromAdapter

System privilege: ADAPTER ADMIN

## Example

Create two agents and an adapter at both the agents.

```
CREATE AGENT TEST_AGENT_1 PROTOCOL 'TCP' HOST 'test_host1' PORT 5050;  
CREATE AGENT TEST_AGENT_2 PROTOCOL 'HTTP';  
CREATE ADAPTER TEST_ADAPTER AT LOCATION AGENT TEST_AGENT_1;  
ALTER ADAPTER TEST_ADAPTER ADD LOCATION AGENT TEST_AGENT_2;  
--Drop adapter TEST_ADAPTER.  
DROP ADAPTER TEST_ADAPTER;
```

## 8.1.14 DROP AGENT Statement [Smart Data Integration]

The DROP AGENT statement removes an agent.

### Syntax

```
DROP AGENT <agent_name> [<drop_option>]
```

### Syntax Elements

#### <agent\_name>

The name of the agent to be dropped.

```
<agent_name> ::= <identifier>
```

#### <drop\_option>

When <drop\_option> is not specified, a restrict drop is performed.

```
<drop_option> ::= CASCADE | RESTRICT
```

CASCADE drops the agent and its dependent objects.

RESTRICT drops the agent only if it does not have any dependent objects.

### Description

The DROP AGENT statement removes an agent.

## Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::DropAgent

System privilege: AGENT ADMIN

## Example

Create an agent TEST\_AGENT and adapter CUSTOM\_ADAPTER on the agent. Make sure that the custom adapter is setup on the agent.

```
CREATE AGENT TEST_AGENT PROTOCOL 'TCP' HOST 'test_host' PORT 5050;  
CREATE ADAPTER CUSTOM_ADAPTER AT LOCATION AGENT TEST_AGENT;
```

Drop the agent called TEST\_AGENT.

```
DROP AGENT TEST_AGENT;
```

## 8.1.15 DROP AGENT GROUP Statement [Smart Data Integration]

The DROP AGENT GROUP statement removes an agent clustering group.

## Syntax

```
DROP AGENT GROUP <agent_group_name>
```

## Syntax Elements

<agent\_group\_name>

The name of the agent group to be dropped.

```
<agent_group_name> ::= <identifier>
```

## Description

The DROP AGENT GROUP statement removes an agent clustering group. All dependent objects must be removed before an agent clustering group can be dropped.

## Permissions

Role: sap.hana.im.dp.monitor.roles::Operations

Application privilege: sap.hana.im.dp.monitor::DropAgent

System privilege: AGENT ADMIN

## Example

Create an agent group TEST\_GROUP.

```
CREATE AGENT GROUP TEST_GROUP;
```

Drop the agent called TEST\_GROUP.

```
DROP AGENT GROUP TEST_GROUP;
```

## 8.1.16 DROP REMOTE SUBSCRIPTION Statement [Smart Data Integration]

The DROP REMOTE SUBSCRIPTION statement drops an existing remote subscription.

## Syntax

```
DROP REMOTE SUBSCRIPTION [<schema_name>.]<subscription_name>
```

## Syntax Elements

<subscription\_name>

The name of the remote subscription.

```
<subscription_name> ::= <identifier>
```

## Description

The DROP REMOTE SUBSCRIPTION statement drops an existing remote subscription. If the remote subscription is actively receiving changes from source table, then a RESET command is automatically called before dropping it.

## Permissions

This statement requires the DROP object privilege on the remote source.

## Example

Drop the remote subscription TEST\_SUB.

```
DROP REMOTE SUBSCRIPTION TEST_SUB;
```

## 8.1.17 GRANT Statement [Smart Data Integration]

GRANT is used to grant privileges and structured privileges to users and roles. GRANT is also used to grant roles to users and other roles.

The GRANT SQL statement is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the GRANT topic for complete information. The information below is specific to smart data integration functionality.

## Syntax

Refer to the GRANT topic for complete information about GRANT syntax.



## Syntax Elements

Syntax elements specific to smart data integration are described below. For information about syntax elements that are not specific to smart data integration, refer to the GRANT topic.

### <system\_privilege>

System privileges are used to restrict administrative tasks.

```
<system_privilege> ::= ADAPTER ADMIN | AGENT ADMIN
```

The table below describes the supported system privileges.

System Privilege	Privilege Purpose
ADAPTER ADMIN	Controls the execution of the following adapter-related commands: CREATE ADAPTER, DROP ADAPTER and ALTER ADAPTER. Also allows access to ADAPTERS and ADAPTER_LOCATIONS system views.
AGENT ADMIN	Controls the execution of the following agent-related commands: CREATE AGENT, DROP AGENT and ALTER AGENT. Also allows access to AGENTS and ADAPTER_LOCATIONS system views.

### <source\_privilege>

Source privileges are used to restrict the access and modifications of a source entry.

```
<source_privilege> ::= CREATE REMOTE SUBSCRIPTION | PROCESS  
REMOTE SUBSCRIPTION EXCEPTION
```

Source Privilege	Privilege Purpose
CREATE REMOTE SUBSCRIPTION	This privilege allows the creation of remote subscriptions executed on this source entry. Remote subscriptions are created in a schema and point to a virtual table or SQL on tables to capture change data.
PROCESS REMOTE SUBSCRIPTION EXCEPTION	This privilege allows processing exceptions on this source entry. Exceptions that are relevant for all remote subscriptions are created for a remote source entry.

### <object\_privilege>

Object privileges are used to restrict the access and modifications on database objects. Database objects are tables, views, sequences, procedures, and so on.

```
<object_privilege> ::= AGENT MESSAGING | PROCESS REMOTE  
SUBSCRIPTION EXCEPTION
```

The table below describes the supported object privileges.

Object Privilege	Privilege Purpose	Command Types
AGENT MESSAGING	Authorizes the user with which the agent communicates with the data provisioning server using HTTP protocol.	DDL

Object Privilege	Privilege Purpose	Command Types
PROCESS REMOTE SUBSCRIPTION EX- CEPTION	Authorizes processing exceptions of a remote subscription.	DDL

Not all object privileges are applicable to all kinds of database objects. To learn which object types allow which privilege to be used, see the table below.

Privilege	Schem a	Table	View	Sequence	Function / Procedure	Remote Subscrip- tion	Agent
AGENT MESSAGING	--	--	--	--	--	--	YES
PROCESS REMOTE SUBSCRIPTION EX- CEPTION	--	--	--	--	--	YES	--

## Related Information

[GRANT Statement \(Access Control\) \(SAP HANA SQL and System Views Reference\)](#)

### 8.1.18 PROCESS REMOTE SUBSCRIPTION EXCEPTION Statement [Smart Data Integration]

The PROCESS REMOTE SUBSCRIPTION EXCEPTION statement allows the user to indicate how an exception should be processed.

## Syntax

```
PROCESS REMOTE SUBSCRIPTION EXCEPTION <exception_id> { RETRY | IGNORE }
```

## Syntax Elements

### <exception\_id>

The exception ID for remote subscription or remote source.

```
<exception_id> ::= <integer_literal>
```

RETRY Indicates to retry the current failed operation. If the failure is due to opening a connection to a remote source, then the connection is established. If the failure

happens when applying changed data to a target table, then the RETRY operation retries the transaction again on the target table.

IGNORE Indicates to ignore the current failure. If the failure happens when applying changed data to a target table, then the IGNORE operation skips the current transaction and proceeds with the next transaction. The exception is cleared.

## Description

The PROCESS REMOTE SUBSCRIPTION EXCEPTION statement allows the user to indicate how an exception should be processed.

## Permissions

This statement requires the PROCESS REMOTE SUBSCRIPTION EXCEPTION object privilege on the remote source.

## Example

Ignore exception 101.

```
PROCESS REMOTE SUBSCRIPTION EXCEPTION 101 IGNORE;
```

## 8.1.19 SESSION\_CONTEXT Function [Smart Data Integration]

Returns the value of session\_variable assigned to the current user.

SESSION\_CONTEXT is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the SESSION\_CONTEXT topic for complete information. The information below is specific to smart data integration functionality.

## Syntax

```
SESSION_CONTEXT(<session_variable>)
```

## Description

A predefined session variables that is set by the server and is read-only (cannot be SET or UNSET) is 'TASK\_EXECUTION\_ID'.

## Related Information

[SESSION\\_CONTEXT Function \(Miscellaneous\) \(SAP HANA SQL and System Views Reference\)](#)

## 8.1.20 START TASK Statement [Smart Data Integration]

Starts a task.

## Syntax

```
START TASK <task_name> [ASYNC] [( <var_list> )] [PROCEDURE  
PARAMETERS ( <param_list> )]
```

## Syntax Elements

### <task\_name>

The identifier of the task to be called, with optional schema name.

```
<task_name> ::= [ <schema_name> . ] <identifier>  
<schema_name> ::= <identifier>
```

### <var\_list>

Specifies one or more start task variables. Variables passed to a task are scalar constants. Scalar parameters are assumed to be NOT NULL.

```
<var_list> ::= <start_task_var> [{ , <start_task_var> } ...]
```

**<start\_task\_var>** Specifies the name and value for a start task variable. A task can contain variables that allow for dynamic replacement of task plan parameters. This section is where, at run time during

START TASK, the values that should be used for those variables can be provided.

```
<start_task_var> ::= <var_name> =>  
<var_value>
```

**<var\_name>**

Name of variable that was defined.

```
<var_name> ::= <identifier>
```

**<var\_value>**

Value that should be used in place of the variable name specified when executing the task.

```
<var_value> ::= <string_literal>
```

**<param\_list>**

Specifies one or more start task parameters.

```
<param_list> ::= <start_task_param> [{, <start_task_param>}...]
```

```
<start_task_param> ::= <identifier>
```

Task parameters. If the task uses table types for input and/or output, then those need to be specified within this section. For more information about these data types, see BNF Lowest Terms Representations and Data Types in the Notation topic.

Parameters are implicitly defined as either IN or OUT, as inferred from the task plan. Arguments for IN parameters could be anything that satisfies the schema of the input table type (for example, a table variable internal to the procedure, or a temporary table). The actual value passed for tabular OUT parameters can be, for example, '?', a physical table name, or a table variable defined inside the procedure.

## Description

Starts a task.

START TASK when executed by the client the syntax behaves in a way consistent with the SQL standard semantics, e.g. Java clients can call a procedure using a JDBC CallableStatement. Scalar output variables are a scalar value that can be retrieved from the callable statement directly.

### i Note

Unquoted identifiers are implicitly treated as uppercase. Quoting identifiers will respect capitalization and allow for using white spaces which are normally not allowed in SQL identifiers.

## Permissions

This statement requires the EXECUTE privilege on the schema in which the task was created.

## Examples

The TASK performTranslation was already created, and the task plan has two table type input parameters and a single table type output parameter. You call the performTranslation task passing in the table types to use for execution.

```
START TASK performTranslation PROCEDURE PARAMETERS (in1, in2, out1);
```

## SQL Script

You can call START TASK within the SQL Script CREATE PROCEDURE. Refer to the [SAP HANA SQL Script Reference](#) for complete details about CREATE PROCEDURE.

<proc\_sql> now includes <start\_task>:

```
<proc_sql> ::= <subquery>
| <select_into_stmt>
| <insert_stmt>
| <delete_stmt>
| <update_stmt>
| <replace_stmt>
| <call_stmt>
| <create_table>
| <drop_table>
| <start_task>
```

START TASK is not supported in:

- Table UDF
- Scalar UDF
- Trigger
- Read-only procedures

## TASK\_EXECUTION\_ID session variable

The TASK\_EXECUTION\_ID session variable provides a unique task execution ID. Knowing the proper task execution ID is critical for various pieces of task functionality including querying for side-effect information and task processing status, and canceling a task.

TASK\_EXECUTION\_ID is a read-only session variable. Only the internal start task code updates the value.

The value of TASK\_EXECUTION\_ID will be set during the START TASK command execution. In the case of asynchronous execution (START TASK ASYNC), the value is updated before the command returns so it is

available before the actual task has finished asynchronously running. If the execution of START TASK was successful, then the value is updated to the unique execution ID for that START TASK execution. If the execution of START TASK was unsuccessful, then the TASK\_EXECUTION\_ID variable will be set back to the state as if no START TASK was run.

The users can obtain the value of TASK\_EXECUTION\_ID by using either of the following:

- The already existing SESSION\_CONTEXT() function. If this function is used and if no tasks have been run or a task was run and it was unsuccessful, then a NULL value will be returned.
- The M\_SESSION\_CONTEXT monitoring view. This would need to be queried using a KEY value of "TASK\_EXECUTION\_ID". If no row exists with that key, then that means that the session variable hasn't been set (no tasks run or last task execution was unsuccessful).

### Note

Session variables are string values. The user needs to cast appropriately based on how they want to use the value.

Table 55: Examples

Action	SQL
Obtain the last task execution ID	<pre>SELECT SESSION_CONTEXT('TASK_EXECUTION_ID') FROM dummy;</pre>
See monitoring information for the last task that was executed (with type casting)	<pre>SELECT * FROM M_TASKS WHERE TASK_EXECUTION_ID = CAST(SESSION_CONTEXT('TASK_EXECUTION_ID') AS BIGINT);</pre>
Cancel the last task that was executed (with type casting)	<pre>CANCEL TASK CAST(SESSION_CONTEXT('TASK_EXECUTION_ID') AS BIGINT);</pre>

## Related Information

[SQL Notation Conventions \(SAP HANA SQL and System Views Reference\)](#)

## 8.2 System Views

System views allow you to query for various information about the system state using SQL commands. The results appear as tables.

System views are located in the SYS schema. In a system with tenant databases, every database has a SYS schema with system views that contain information about that database only. In addition, the system database has a further schema, SYS\_DATABASES, which contains views for monitoring the system as a whole. The views in the SYS\_DATABASES schema provide aggregated information from a subset of the views available in the SYS schema of all tenant databases in the system. These union views have the additional column DATABASE\_NAME to allow you to identify to which database the information refers. To be able to view information in these views, you need the system privilege CATALOG READ or DATABASE ADMIN.

SAP HANA system views are separated into two categories: **metadata** views and **runtime** views. Metadata views provide metadata about objects in the database, including options or settings that were set using a DDL statement. Runtime views provide actual HANA runtime data, including statistics and status information related to the execution of DML statements. Runtime views start with M\_ for monitoring.

[ADAPTER\\_CAPABILITIES System View \[Smart Data Integration\] \[page 564\]](#)

Specifies the SQL capabilities of the adapters stored in the system.

[ADAPTER\\_LOCATIONS System View \[Smart Data Integration\] \[page 565\]](#)

Specifies the location of adapters.

[ADAPTERS System View \[Smart Data Integration\] \[page 565\]](#)

Stores adapters available in the SAP HANA system.

[AGENT\\_CONFIGURATION System View \[Smart Data Integration\] \[page 566\]](#)

Agent configuration

[AGENT\\_GROUPS System View \[Smart Data Integration\] \[page 566\]](#)

Lists active data provisioning agent groups in the system.

[AGENTS System View \[Smart Data Integration\] \[page 566\]](#)

Lists active data provisioning agents in the system.

[M\\_AGENTS System View \[Smart Data Integration\] \[page 567\]](#)

Provides the status of all agents registered in the SAP HANA database.

[M\\_REMOTE\\_SOURCES System View \[Smart Data Integration\] \[page 568\]](#)

Stores dictionary status information, remote source owner information, and the status of data collection.

[M\\_REMOTE\\_SUBSCRIPTION\\_COMPONENTS System View \[Smart Data Integration\] \[page 568\]](#)

Provides the status of a remote subscription for each internal component.

[M\\_REMOTE\\_SUBSCRIPTION\\_STATISTICS System View \[Smart Data Integration\] \[page 569\]](#)

Provides details of current processing details of a remote subscription (e.g. number of messages or transactions received, applied since the start of the SAP HANA database).

[M\\_REMOTE\\_SUBSCRIPTIONS System View \[Smart Data Integration\] \[page 570\]](#)

Provides the status and run-time information of a remote subscription.

[M\\_SESSION\\_CONTEXT System View \[Smart Data Integration\] \[page 571\]](#)

Session variables for each connection

[REMOTE\\_SOURCE\\_OBJECT\\_COLUMNS System View \[Smart Data Integration\] \[page 572\]](#)

If the adapter can provide column-level information for each table in the remote system, once this dictionary is built you can search for relationships between tables. This table is useful for analyzing relationships between tables in the remote source.

[REMOTE\\_SOURCE\\_OBJECT\\_DESCRIPTIONS System View \[Smart Data Integration\] \[page 572\]](#)

Stores description of browsable node in different languages.

[REMOTE\\_SOURCE\\_OBJECTS System View \[Smart Data Integration\] \[page 573\]](#)

Stores browsable nodes as well as importable objects (virtual tables). This view is built from remote source metadata dictionaries.

[REMOTE\\_SOURCES System View \[Smart Data Integration\] \[page 573\]](#)

Remote sources

[REMOTE\\_SUBSCRIPTION\\_EXCEPTIONS System View \[Smart Data Integration\] \[page 574\]](#)



Provides details about an exception that occurred during the execution of a remote subscription. The exceptions can be processed using the PROCESS REMOTE SUBSCRIPTION EXCEPTION SQL statement.

[REMOTE\\_SUBSCRIPTIONS System View \[Smart Data Integration\] \[page 575\]](#)

Lists all the remote subscriptions created for a remote source.

[TASK\\_CLIENT\\_MAPPING System View \[Smart Data Integration\] \[page 575\]](#)

Provides the client mapping when a task is created by the ABAP API.

[TASK\\_COLUMN\\_DEFINITIONS System View \[Smart Data Integration\] \[page 576\]](#)

Defines the columns present in a particular table.

[TASK\\_EXECUTIONS System View \[Smart Data Integration\] \[page 576\]](#)

Task-level run-time statistics generated when START TASK is run.

[TASK\\_LOCALIZATION System View \[Smart Data Integration\] \[page 577\]](#)

Contains localized values for the task framework tables.

[TASK\\_OPERATIONS System View \[Smart Data Integration\] \[page 578\]](#)

Contains all operations that exist for a given task, as well as details about those operations.

[TASK\\_OPERATIONS\\_EXECUTIONS System View \[Smart Data Integration\] \[page 578\]](#)

Operations-level task statistics generated when START TASK is run.

[TASK\\_PARAMETERS System View \[Smart Data Integration\] \[page 579\]](#)

Details about the task parameters view

[TASK\\_TABLE\\_DEFINITIONS System View \[Smart Data Integration\] \[page 580\]](#)

Contains all of the tables used by the various side-effect producing operation.

[TASK\\_TABLE\\_RELATIONSHIPS System View \[Smart Data Integration\] \[page 581\]](#)

Defines the relationships, if any, between tables within an operation.

[TASKS System View \[Smart Data Integration\] \[page 581\]](#)

Details about tasks.

[VIRTUAL\\_COLUMN\\_PROPERTIES System View \[Smart Data Integration\] \[page 582\]](#)

Lists the properties of the columns in a virtual table sent by the adapter via CREATE VIRTUAL TABLE SQL statement.

[VIRTUAL\\_TABLE\\_PROPERTIES System View \[Smart Data Integration\] \[page 583\]](#)

Lists the properties of a virtual table sent by the adapter via the CREATE VIRTUAL TABLE SQL statement.

[BEST\\_RECORD\\_GROUP\\_MASTER\\_STATISTICS System View \[Smart Data Quality\] \[page 583\]](#)

Contains a summary of Best Record group master statistics.

[BEST\\_RECORD\\_RESULTS System View \[Smart Data Quality\] \[page 584\]](#)

Contains governance information for every column in every record that is updated in the best record process.

[BEST\\_RECORD\\_STRATEGIES System View \[Smart Data Quality\] \[page 585\]](#)

Contains information on which strategies are used in each strategy group and in which order.

[CLEANSE\\_ADDRESS\\_RECORD\\_INFO System View \[Smart Data Quality\] \[page 586\]](#)

Describes how well an address was assigned as well as the type of address.

[CLEANSE\\_CHANGE\\_INFO System View \[Smart Data Quality\] \[page 587\]](#)

Describes the changes made during the cleansing process.

[CLEANSE\\_COMPONENT\\_INFO System View \[Smart Data Quality\] \[page 588\]](#)

Identifies the location of parsed data elements in the input and output.

[CLEANSE\\_INFO\\_CODES System View \[Smart Data Quality\] \[page 589\]](#)

Contains one row per info code generated by the cleansing process.

[CLEANSE\\_STATISTICS System View \[Smart Data Quality\] \[page 590\]](#)

Contains a summary of Cleanse statistics.

[GEOCODE\\_INFO\\_CODES System View \[Smart Data Quality\] \[page 591\]](#)

Contains one row per info code generated by the geocode transformation process.

[GEOCODE\\_STATISTICS System View \[Smart Data Quality\] \[page 592\]](#)

Contains a summary of Geocode statistics.

[MATCH\\_GROUP\\_INFO System View \[Smart Data Quality\] \[page 592\]](#)

Contains one row for each match group.

[MATCH\\_RECORD\\_INFO System View \[Smart Data Quality\] \[page 593\]](#)

Contains one row for each matching record per level.

[MATCH\\_SOURCE\\_STATISTICS System View \[Smart Data Quality\] \[page 594\]](#)

Contains counts of matches within and between data sources.

[MATCH\\_STATISTICS System View \[Smart Data Quality\] \[page 594\]](#)

Contains statistics regarding the run of the transformation operation.

[MATCH\\_TRACING System View \[Smart Data Quality\] \[page 595\]](#)

Contains one row for each match decision made during the matching process.

## Related Information

[System Views Reference for Additional SAP HANA Contexts \(SAP HANA SQL and System Views Reference\)](#)

### 8.2.1 ADAPTER\_CAPABILITIES System View [Smart Data Integration]

Specifies the SQL capabilities of the adapters stored in the system.

#### Structure

Column	Data type	Description
ADAPTER_NAME	NVARCHAR(64)	Adapter name
SOURCE_VERSION	NVARCHAR(64)	Source versions supported by the adapter

## 8.2.2 ADAPTER\_LOCATIONS System View [Smart Data Integration]

Specifies the location of adapters.

### Structure

Column	Data type	Description
ADAPTER_NAME	NVARCHAR(64)	Adapter name
LOCATION	VARCHAR(11)	Location of the adapter: 'indexserver', 'dpserver', 'agent'
AGENT_NAME	NVARCHAR(256)	Agent name

## 8.2.3 ADAPTERS System View [Smart Data Integration]

Stores adapters available in the SAP HANA system.

### Structure

Column	Data type	Description
ADAPTER_NAME	NVARCHAR(64)	Adapter name
PROPERTIES	NVARCHAR(1000)	Optional properties of the adapter such as display_name and description
CONFIGURATION	NCLOB	UI properties that must be displayed when configuring remote data source
IS_SYSTEM_ADAPTER	VARCHAR(5)	Specifies whether the adapter is a system adapter: 'TRUE'/'FALSE'
IS_ESS_DEFINITION_SUPPORTED	VARCHAR(5)	Specifies if the procedure GET_REMOTE_SOURCE_TABLE_ESS_DEFINITIONS is enabled for remote sources created using this adapter: 'TRUE'/'FALSE'

## 8.2.4 AGENT\_CONFIGURATION System View [Smart Data Integration]

Agent configuration

### Structure

Column name	Data type	Description
AGENT_NAME	NVARCHAR(256)	Agent name
KEY	VARCHAR(128)	Agent property key
VALUE	NCLOB	Agent property value

## 8.2.5 AGENT\_GROUPS System View [Smart Data Integration]

Lists active data provisioning agent groups in the system.

### Structure

Column	Data type	Description
AGENT_GROUP_NAME	NVARCHAR(256)	Name of the agent group.

## 8.2.6 AGENTS System View [Smart Data Integration]

Lists active data provisioning agents in the system.

## Structure

Column	Data type	Description
AGENT_NAME	NVARCHAR(256)	Agent name
PROTOCOL	VARCHAR(4)	Protocol for communication with SAP HANA database: 'TCP', 'HTTP'
AGENT_HOST	NVARCHAR (64)	Agent host specified when using TCP
AGENT_PORT	INTEGER	Agent port specified when using TCP
IS_SSL_ENABLED	VARCHAR(5)	Specifies whether the agent listening on TCP port uses SSL
AGENT_GROUP_NAME	NVARCHAR(256)	Agent clustering group to which the agent belongs.

## 8.2.7 M\_AGENTS System View [Smart Data Integration]

Provides the status of all agents registered in the SAP HANA database.

## Structure

Column	Data type	Description
AGENT_NAME	NVARCHAR(256)	Agent name
FREE_PHYSICAL_MEMORY	BIGINT	Free physical memory on the host
FREE_SWAP_SPACE	BIGINT	Free swap memory on the host
LAST_CONNECT_TIME	TIMESTAMP	The last time the session cookie was used for successful re-connection
SYS_TIMESTAMP	TIMESTAMP	Host timestamp in local time zone
USED_PHYSICAL_MEMORY	BIGINT	Used physical memory on the host
USED_SWAP_SPACE	BIGINT	Used swap memory on the host
UTC_TIMESTAMP	TIMESTAMP	Host timestamp in UTC
AGENT_VERSION	VARCHAR(32)	Agent version
AGENT_STATUS	VARCHAR(16)	Agent status

## 8.2.8 M\_REMOTE\_SOURCES System View [Smart Data Integration]

Stores dictionary status information, remote source owner information, and the status of data collection.

### **i** Note

This system view is for keeping track of the status of metadata dictionaries for remote sources. If there is no dictionary for a given remote source, it will not appear in the view.

For basic remote source information you can select from REMOTE\_SOURCES. It includes the following.

- REMOTE\_SOURCE\_NAME
- ADAPTER\_NAME
- CONNECTION\_INFO
- AGENT\_GROUP\_NAME

### Structure

Column	Data type	Description
USER_NAME	NVARCHAR(256)	User name
REMOTE_SOURCE_NAME	NVARCHAR(256)	Remote source name
LAST_REFRESH_TIME	TIMESTAMP	The successful completion timestamp of the refresh operation
REFRESH_START_TIME	TIMESTAMP	The timestamp of when the refresh operation was executed
REFRESH_STATUS	VARCHAR(32)	Refresh operation status: <ul style="list-style-type: none"><li>• STARTED</li><li>• COMPLETED</li><li>• RUNNING (GET OBJECTS)</li><li>• RUNNING (GET OBJECT DETAILS)</li><li>• FAILED</li><li>• CANCELLED</li><li>• CLEARED</li></ul>
REFRESH_ERROR_MESSAGE	NVARCHAR(2000)	Exception message that occurred during refresh operation

## 8.2.9 M\_REMOTE\_SUBSCRIPTION\_COMPONENTS System View [Smart Data Integration]

Provides the status of a remote subscription for each internal component.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Remote subscription schema name
SUBSCRIPTION_NAME	NVARCHAR(256)	Remote subscription name
COMPONENT	VARCHAR(10)	<ul style="list-style-type: none"><li>• DPSEVER</li><li>• ADAPTER</li><li>• RECEIVER</li><li>• APPLIER</li></ul>
STATUS	VARCHAR	Component status
MESSAGE	VARCHAR	Additional information

### 8.2.10 M\_REMOTE\_SUBSCRIPTION\_STATISTICS System View [Smart Data Integration]

Provides details of current processing details of a remote subscription (e.g. number of messages or transactions received, applied since the start of the SAP HANA database).

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Remote subscription schema name
SUBSCRIPTION_NAME	NVARCHAR(256)	Remote subscription name
RECEIVED_MESSAGE_COUNT	BIGINT	Total message/transaction count received by the current connection
RECEIVED_MESSAGE_SIZE	BIGINT	Total size of messages/transactions received by the current connection
APPLIED_MESSAGE_COUNT	BIGINT	Total number of messages/transactions applied
APPLIED_MESSAGE_SIZE	BIGINT	Total size of messages/records applied
REJECTED_MESSAGE_COUNT	BIGINT	Total number of messages/records rejected
LAST_MESSAGE_RECEIVED	TIMESTAMP	Time at which the last message/transaction is received
LAST_MESSAGE_APPLIED	TIMESTAMP	Time at which the last message/transaction is applied
RECEIVER_LATENCY	BIGINT	Receiver latency in microseconds
APPLIER_LATENCY	BIGINT	Applier latency in microseconds

## 8.2.11 M\_REMOTE\_SUBSCRIPTIONS System View [Smart Data Integration]

Provides the status and run-time information of a remote subscription.

### Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Remote subscription schema name
SUBSCRIPTION_NAME	NVARCHAR(256)	Remote subscription name
STATE	VARCHAR(256)	State of event
OPTIMIZED_QUERY_STRING	NCLOB	This is generated and saved so that if there are multiple subscriptions interested in same query result, and the same internal_distribution_id, both the subscriptions can use the same result.
OPTIMIZED_QUERY_HASH	VARCHAR(128)	Hash is used to query the match for optimized query string
INTERNAL_DISTRIBUTION_ID	BIGINT	Generated integer to identify if multiple target tables are interested in the changes from same source SQL or virtual table
OPTIMIZED_QUERY_RESULTSET_TYPE	TINYINT	0 - REGULAR 1 - CLUSTER 2 - POOL
REMOTE_SUBSCRIPTION	NVARCHAR(256)	An optional subscription name registered by the adapter in the remote source system
VOLUME_ID	INTEGER	Persistence Volume ID
BEGIN_MARKER	VARCHAR(64)	Generated begin marker in the format B<remote_source_oid>_<remote_subscription_oid>_<YYYYMMDDHH24MMSSFF7> when QUEUE command is called.
END_MARKER	VARCHAR(64)	Generated end marker in the format E<remote_source_oid>_<remote_subscription_oid>_<YYYYMMDDHH24MMSSFF7> when DISTRIBUTE command is called.
BEGIN_MARKER_TIME	TIMESTAMP	Timestamp when QUEUE request is received.
END_MARKER_TIME	TIMESTAMP	Timestamp when DISTRIBUTE command is called.



Column	Data type	Description
LAST_PROCESSED_TRANSACTION_ID	VARBINARY(128)	Transaction ID of the last processed transaction.
LAST_PROCESSED_TRANSACTION_TIME	TIMESTAMP	Time when the last transaction was applied.
LAST_PROCESSED_BEGIN_SEQUENCE_ID	VARBINARY(68)	Last processed transaction's begin record sequence ID
LAST_PROCESSED_COMMIT_SEQUENCE_ID	VARBINARY(68)	Last processed transaction's commit record sequence ID
LAST_RECEIVED_SEQUENCE_ID	VARBINARY(68)	Last received sequence ID
LAST_RECEIVED_CUSTOM_ID	NVARCHAR(64)	Last received custom ID. Custom IDs may be used by adapters with every changed-data row of a transaction.
LAST_PROCESSED_CUSTOM_ID	NVARCHAR(64)	Last processed custom ID. Custom IDs may be used by adapters with every changed-data row of a transaction.

## 8.2.12 M\_SESSION\_CONTEXT System View [Smart Data Integration]

Session variables for each connection

### Note

The M\_SESSION\_CONTEXT view is available for use in other areas of SAP HANA, not only SAP HANA smart data integration. Refer to the M\_SESSION\_CONTEXT topic for complete information. The information below is specific to smart data integration functionality.

This view shows session variables of all open connections.

Each variable is categorized in SECTION column to USER (user defined variable using SET command or client API call) or SYSTEM (predefined variable or system property).

Table 56: Predefined variables

Variable Name (M_SESSION_CONTEXT.KEY)	Value Constraint	Set by Client or Server	Shown in M_SESSION_CONTEXT TEXT	Server Usage	Description
TASK_EXECUTION_ID	bigint	server	yes	START TASK	Shows unique task execution ID

## Related Information

[M\\_SESSION\\_CONTEXT System View \(SAP HANA SQL and System Views Reference\)](#)

## 8.2.13 REMOTE\_SOURCE\_OBJECT\_COLUMNS System View [Smart Data Integration]

If the adapter can provide column-level information for each table in the remote system, once this dictionary is built you can search for relationships between tables. This table is useful for analyzing relationships between tables in the remote source.

### Structure

Column	Data type	Description
USER_NAME	NVARCHAR(256)	For secondary credentials, need to know the owner name
REMOTE_SOURCE_NAME	NVARCHAR(256)	To uniquely identify a remote source
OBJECT_NAME	NVARCHAR(5000)	Unique name to identify remote source object
COLUMN_NAME	NVARCHAR(256)	Column name
DATA_TYPE_NAME	VARCHAR(16)	SAP HANA data type
REMOTE_DATA_TYPE_NAME	VARCHAR(32)	Remote source data type
REMOTE_CONTENT_TYPE	NVARCHAR(256)	Examples include address, unit of measure, user-defined types, ZIP code, and so on
LENGTH	INTEGER	Length/precision of the column
SCALE	INTEGER	Scale of the column
IS_NULLABLE	VARCHAR(5)	Various column properties
IS_AUTOINCREMENT		

## 8.2.14 REMOTE\_SOURCE\_OBJECT\_DESCRIPTIONS System View [Smart Data Integration]

Stores description of browsable node in different languages.

### Structure

Column	Data type	Description
USER_NAME	NVARCHAR(256)	User name

Column	Data type	Description
REMOTE_SOURCE_NAME	NVARCHAR(256)	Remote source name
OBJECT_NAME	NVARCHAR(5000)	Unique name to identify remote source object
LANGUAGE_CODE	VARCHAR(2)	Language code
DESCRIPTION	NVARCHAR(5000)	Description of this object

## 8.2.15 REMOTE\_SOURCE\_OBJECTS System View [Smart Data Integration]

Stores browsable nodes as well as importable objects (virtual tables). This view is built from remote source metadata dictionaries.

### Structure

Column	Data type	Description
USER_NAME	NVARCHAR(256)	User name
REMOTE_SOURCE_NAME	NVARCHAR(256)	Remote source name
OBJECT_NAME	NVARCHAR(5000)	Unique name to identify remote source object
DISPLAY_NAME	NVARCHAR(256)	Display name for this object
IS_IMPORTABLE	VARCHAR(5)	If the object is importable as a virtual table: 'TRUE'/'FALSE'
IS_EXPANDABLE	VARCHAR(5)	If the object can be expanded or browsed to get inner objects: 'TRUE'/'FALSE'
PARENT_OBJECT_NAME	NVARCHAR(5000)	The parent object name for this object
DEFINITION_TYPE	VARCHAR(32)	Object definition type
DEFINITION	NCLOB	Object definition

## 8.2.16 REMOTE\_SOURCES System View [Smart Data Integration]

Remote sources

## Structure

Column name	Data type	Description
REMOTE_SOURCE_NAME	NVARCHAR(256)	Remote source name
ADAPTER_NAME	NVARCHAR(256)	Adapter name
CONNECTION_INFO	NVARCHAR(256)	Connection information
AGENT_GROUP_NAME	NVARCHAR(256)	Name of the agent group name

## Related Information

[REMOTE\\_SOURCES System View \(SAP HANA SQL and System Views Reference\)](#)

## 8.2.17 REMOTE\_SUBSCRIPTION\_EXCEPTIONS System View [Smart Data Integration]

Provides details about an exception that occurred during the execution of a remote subscription. The exceptions can be processed using the PROCESS REMOTE SUBSCRIPTION EXCEPTION SQL statement.

## Structure

Column	Data type	Description
EXCEPTION_OID	BIGINT	Exception ID
OBJECT_TYPE	VARCHAR(19)	'REMOTE SOURCE', 'REMOTE SUBSCRIPTION'
OBJECT_SCHEMA_NAME	NVARCHAR(256)	Schema name of remote source or remote subscription based on OBJECT_TYPE
OBJECT_NAME	NVARCHAR(256)	Object name of remote source or remote subscription based on OBJECT_TYPE
EXCEPTION_TIME	TIMESTAMP	Time at which the exception was raised
ERROR_NUMBER	INTEGER	Error number
ERROR_MESSAGE	NVARCHAR(2000)	Error message
COMPONENT	VARCHAR(8)	Component that raised the exception

## 8.2.18 REMOTE\_SUBSCRIPTIONS System View [Smart Data Integration]

Lists all the remote subscriptions created for a remote source.

### Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Remote subscription schema name
SUBSCRIPTION_NAME	NVARCHAR(256)	Remote subscription name
OWNER_NAME	NVARCHAR(256)	Owner name
REMOTE_SOURCE_NAME	NVARCHAR(256)	Remote source name
IS_VALID	VARCHAR(5)	Specifies whether the remote subscription is valid or not. This becomes FALSE when its source or target objects are changed or dropped.
SUBSCRIPTION_TYPE	VARCHAR(13)	Remote subscription type
VIRTUAL_TABLE_SCHEMA_NAME	NVARCHAR(256)	Virtual table schema name
VIRTUAL_TABLE_NAME	NVARCHAR(256)	Virtual table name
SUBSCRIPTION_QUERY_STRING	NCLOB	Select statement specified in the subscription when subscription type is SQL
TARGET_OBJECT_TYPE	VARCHAR(9)	Remote subscription target object type: 'TABLE', 'PROCEDURE', 'TASK'
TARGET_OBJECT_SCHEMA_NAME	NVARCHAR(256)	Target object schema name
TARGET_OBJECT_NAME	NVARCHAR(256)	Target object name
TARGET_OTHER_PARAM_STRING	NVARCHAR(4000)	Constant parameter string to pass at execution when target object type is PROCEDURE or TASK
TASK_PROCEDURE_PARAMETERS	NVARCHAR(5000)	A comma-separated list of task parameters.

## 8.2.19 TASK\_CLIENT\_MAPPING System View [Smart Data Integration]

Provides the client mapping when a task is created by the ABAP API.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
CLIENT	NVARCHAR(128)	Name of the client that created the task with the ABAP API

### 8.2.20 TASK\_COLUMN\_DEFINITIONS System View [Smart Data Integration]

Defines the columns present in a particular table.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
TABLE_NAME	NVARCHAR(128)	Name of the table defined in the task plan for the operation
COLUMN_NAME	NVARCHAR(128)	Name of the column used in the task plan within a table
MAPPED_NAME	NVARCHAR(128)	Mapped name of the column used in a task plan within a table

### 8.2.21 TASK\_EXECUTIONS System View [Smart Data Integration]

Task-level run-time statistics generated when START TASK is run.

TASK\_EXECUTIONS shows one record per task plan execution.

Data in this view is updated while the task is in progress. For example, STATUS, PROCESSED\_RECORDS, and TOTAL\_PROGRESS\_PERCENT are continuously updated until the task is complete.

Users may view information only for tasks that they ran themselves or were granted permissions to view.

## Structure

Column	Data type	Description
HOST	VARCHAR(64)	Host name
PORT	INTEGER	Internal port
SCHEMA_NAME	NVARCHAR(256)	Schema name used in the task
TASK_NAME	NVARCHAR(256)	Name of the task
CONNECTION_ID	INTEGER	Connection identifier
TRANSACTION_ID	INTEGER	Transaction identifier used for the task execution
TASK_EXECUTION_ID	BIGINT	Task execution unique identifier
PARENT_TASK_EXECUTION_ID	BIGINT	Parent task identifier
IS_ASYNC	VARCHAR(5)	TRUE if the task is asynchronous, else FALSE
PARAMETERS	NVARCHAR(5000)	Input parameters for the task
PROCEDURE_PARAMETERS	NVARCHAR(5000)	Displays the input <param-list> values that were specified in the START TASK SQL command
START_TIME	TIMESTAMP	Start time of the task
END_TIME	TIMESTAMP	End time of the task
DURATION	BIGINT	Execution time of the task (microseconds)
STATUS	VARCHAR(16)	Status of the task: STARTING, RUNNING, FAILED, COMPLETED, CANCELLING, or CANCELLED
CURRENT_OPERATION	NVARCHAR(128)	Current operation of the task
PROCESSED_RECORDS	BIGINT	Total number of records processed
TOTAL_PROGRESS_PERCENT	BIGINT	Total task progress (percent)
USER_NAME	NVARCHAR(256)	User name
APPLICATION_USER_NAME	NVARCHAR(256)	Application user name
HAS_SIDE_EFFECTS	VARCHAR(5)	'TRUE' if the task produces side effect data, else 'FALSE'

### 8.2.22 TASK\_LOCALIZATION System View [Smart Data Integration]

Contains localized values for the task framework tables.

## Structure

Column	Data type	Description
LOC_TYPE_ID	INTEGER	Identifier of the type of the entity being localized
LOC_ID	NVARCHAR(64)	Identifier of the entity being localized
LANGUAGE	NVARCHAR(1)	One-character code of the localized language
DESCRIPTION	NVARCHAR(1024)	Localized description

### 8.2.23 TASK\_OPERATIONS System View [Smart Data Integration]

Contains all operations that exist for a given task, as well as details about those operations.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
COMMENTS	NVARCHAR(512)	Comments made on the operation
HAS_SIDE_EFFECTS	TINYINT	Specifies whether the operation has side-effect data
OPERATION_TYPE	NVARCHAR(128)	Type of operation in the task plan

### 8.2.24 TASK\_OPERATIONS\_EXECUTIONS System View [Smart Data Integration]

Operations-level task statistics generated when START TASK is run.

TASK\_OPERATIONS\_EXECUTIONS shows one record per operation.

Data in this view is updated while the task is in progress. For example, STATUS, PROCESSED\_RECORDS, and OPERATIONS\_PROGRESS\_PERCENT are continuously updated until the task is complete.



Users may view information only for tasks that they ran themselves or were granted permissions to view.

## Structure

Column	Data type	Description
HOST	VARCHAR(64)	Host name
PORT	INTEGER	Internal port
TASK_EXECUTION_ID	BIGINT	Task identifier
CONNECTION_ID	INTEGER	Connection identifier
TRANSACTION_ID	INTEGER	Transaction identifier used for the task execution
CURRENT_OPERATION	NVARCHAR	Name of operation
OPERATION_TYPE	NVARCHAR(128)	Type of operation
OPERATION_NAME	NVARCHAR(128)	Internal name of operation
START_TIME	TIMESTAMP	Start time of the task
END_TIME	TIMESTAMP	End time of the task
DURATION	BIGINT	Execution time of the task (microseconds)
STATUS	VARCHAR(16)	Status of the task: <ul style="list-style-type: none"><li>• STARTING</li><li>• RUNNING</li><li>• FAILED</li><li>• COMPLETED</li><li>• CANCELLING</li><li>• CANCELLED</li></ul>
PROCESSED_RECORDS	BIGINT	Total number of records processed
OPERATION_PROGRESS_PERCENT	DOUBLE	Operation progress (percent)
HAS_SIDE_EFFECTS	VARCHAR(5)	'TRUE' if the task produces side effect data, else 'FALSE'

### 8.2.25 TASK\_PARAMETERS System View [Smart Data Integration]

Details about the task parameters view

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Schema in which the task was created
TASK_NAME	NVARCHAR(256)	Name of task
PARAMETER_NAME	NVARCHAR(256)	Name of parameter
POSITION	INTEGER	Position of parameter
TABLE_TYPE_SCHEMA	NVARCHAR(256)	Schema in which the TableType was created
TABLE_TYPE_NAME	NVARCHAR(256)	Name of TableType
PARAMETER_TYPE	VARCHAR(7)	Parameter type: IN or OUT

## 8.2.26 TASK\_TABLE\_DEFINITIONS System View [Smart Data Integration]

Contains all of the tables used by the various side-effect producing operation.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
TABLE_ID	INTEGER	Unique identifier for the table
TABLE_NAME	NVARCHAR(128)	Name of the table defined in the task plan for an operation
SIDE_EFFECT_SCHEMA	NVARCHAR(128)	Schema where the generated side-effect table is located
SIDE_EFFECT_NAME	NVARCHAR(128)	Name of the generated side-effect table
IS_PRIMARY_TABLE	TINYINT	Specifies whether this table is the primary table in a relationship
OPERATION_TABLE_TYPE	NVARCHAR(20)	Type of operation that the table is used within

## 8.2.27 TASK\_TABLE\_RELATIONSHIPS System View [Smart Data Integration]

Defines the relationships, if any, between tables within an operation.

### Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
TABLE_NAME	NVARCHAR(128)	Name of the table defined in the task plan for an operation
RELATED_TABLE_NAME	NVARCHAR(128)	Name of the table to which the table specified in TABLE_NAME is related
FROM_ATTRIBUTE	NVARCHAR(128)	Name of the column in the TABLE_NAME table that relates to the TO_ATTRIBUTE
TO_ATTRIBUTE	NVARCHAR(128)	Name of the column in the RELATED_TABLE_NAME table that relates to the FROM_ATTRIBUTE

## 8.2.28 TASKS System View [Smart Data Integration]

Details about tasks.

### Structure

Column	Data type	Description
TASK_OID	BIGINT	Unique identifier for a task
TASK_NAME	NVARCHAR(256)	Name of task
SCHEMA_NAME	NVARCHAR(256)	Schema the task was created in
OWNER_NAME	NVARCHAR(256)	Owner of the task
CREATE_TIME	TIMESTAMP	Creation time

Column	Data type	Description
MEMORY_SIZE	BIGINT	Memory size of loaded task
TASK_TYPE	NVARCHAR(64)	Type of task ('PLAN' or 'PROCEDURE'), based on how the task was created
PLAN_VERSION	NVARCHAR(32)	Version of the task plan
PLAN	NCLOB	Task plan used to define the task, or task plan generated to call the procedure
COMMENTS	NVARCHAR(256)	Description of the task, from the task plan
HAS_TABLE_TYPE_INPUT	VARCHAR(5)	'TRUE' if the task is modeled with a table type as input, meaning data would need to be passed at execution time
HAS_SDQ	VARCHAR(5)	'TRUE' if the task contains SDQ (smart data quality) functionality
IS_REALTIME_TASK	VARCHAR(5)	'TRUE' if the task is a realtime task, else 'FALSE'
IS_VALID	VARCHAR(5)	'TRUE' if the task is in a valid state; 'FALSE' if it has been invalidated by a dependency
IS_READ_ONLY	VARCHAR(5)	'TRUE' if the task is read only (has only table type outputs), 'FALSE' if it writes to non-table-type outputs
PROCEDURE_SCHEMA	NVARCHAR(256)	If the task was created with a procedure instead of a plan, this attribute will contain the schema name of the stored procedure
PROCEDURE_NAME	NVARCHAR(256)	If the task was created with a procedure instead of a plan, this attribute will contain the name of the name of the stored procedure
INPUT_PARAMETER_COUNT	SMALLINT	Number of input (tableType) parameters
OUTPUT_PARAMETER	SMALLINT	Number of output (tableType) parameters
SQL_SECURITY	VARCHAR(7)	Security model for the task, either 'DEFINER' or 'INVOKER'

## 8.2.29 VIRTUAL\_COLUMN\_PROPERTIES System View [Smart Data Integration]

Lists the properties of the columns in a virtual table sent by the adapter via CREATE VIRTUAL TABLE SQL statement.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Schema name of virtual table
TABLE_NAME	NVARCHAR(256)	Virtual table name
COLUMN_NAME	NVARCHAR(256)	Virtual table column name
PROPERTY	NVARCHAR(256)	Property name
VALUE	NVARCHAR(512)	Property value

### 8.2.30 VIRTUAL\_TABLE\_PROPERTIES System View [Smart Data Integration]

Lists the properties of a virtual table sent by the adapter via the CREATE VIRTUAL TABLE SQL statement.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Schema name of virtual table
TABLE_NAME	NVARCHAR(256)	Virtual table name
PROPERTY	NVARCHAR(256)	Property name
VALUE	NCLOB	Property value. For example: <ul style="list-style-type: none"><li>Large XSD of size 1M</li></ul>

### 8.2.31 BEST\_RECORD\_GROUP\_MASTER\_STATISTICS System View [Smart Data Quality]

Contains a summary of Best Record group master statistics.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
NUM_RECORDS	BIGINT	Total number of records processed
NUM_GROUP_MASTERS	BIGINT	Number of group master records processed
NUM_DUPLICATES	BIGINT	Number of duplicate records processed
NUM_SURVIVORS	BIGINT	Number of surviving records processed
NUM_NON_MATCH_RECORDS	BIGINT	Number of non-matching records processed

### 8.2.32 BEST\_RECORD\_RESULTS System View [Smart Data Quality]

Contains governance information for every column in every record that is updated in the best record process.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
DST_TABLE_NAME	NVARCHAR(128)	Name of the destination table for the operation

Column	Data type	Description
DST_ROW_ID	BIGINT	Unique identifier for the destination row
DST_COLUMN_NAME	NVARCHAR(128)	Name of the destination column in the destination table
DST_ROW_TYPE	NVARCHAR(1)	Identifies how the record was updated or if it was newly created
SRC_TABLE_NAME	NVARCHAR(128)	Name of the source table for the operation
SRC_ROW_ID	BIGINT	Unique identifier for the source row
SRC_COLUMN_NAME	NVARCHAR(128)	Name of the source column in the source table
STRATEGY_GROUP_ID	INTEGER	Identification number that identifies the best record strategy group
STRATEGY_ID	INTEGER	Identification number that identifies each strategy listed in the strategy group
BEST_RECORD_RULE	NVARCHAR(256)	Name of the rule that updates one or more columns as it is defined in the best record configuration
ACTION_NAME	NVARCHAR(256)	Name of the action that updates a column as it is defined in the best record configuration
UPDATE_NUM	INTEGER	Number of times the column was updated in the best record process
OPERATION_TYPE	NVARCHAR(1)	Identifies how the record was updated in the best record process

## 8.2.33 BEST\_RECORD\_STRATEGIES System View [Smart Data Quality]

Contains information on which strategies are used in each strategy group and in which order.

### Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located

Column	Data type	Description
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
STRATEGY_GROUP_NAME	NVARCHAR(256)	Name of the strategy group as defined in the best record configuration
STRATEGY_ID	INTEGER	Identification number that identifies each strategy listed in the strategy group
STRATEGY_ORDER	INTEGER)	Order of the strategy as defined in the list of strategies
STRATEGY_NAME	NVARCHAR(256)	Name of the strategy as defined in the best record configuration

## 8.2.34 CLEANSE\_ADDRESS\_RECORD\_INFO System View [Smart Data Quality]

Describes how well an address was assigned as well as the type of address.

### Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
TABLE_NAME	NVARCHAR(128)	Name of the table defined in the task plan for the operation
ROW_ID	BIGINT	Unique identifier of the row processed for this execution of the task plan



Column	Data type	Description
ENTITY_INSTANCE	INTEGER	Identifier to differentiate between multiple entities processed in a row
ENTITY_INSTANCE_OCCURRENCE	INTEGER	Unique identifier to identify the occurrence of an entity
DATA_SOURCE	NVARCHAR(256)	Source where the data was produced
ISO_COUNTRY_2CHAR	NVARCHAR(4)	Two-character country code
ASSIGNMENT_TYPE	NVARCHAR(4)	Code that represents the type of an address
ASSIGNMENT_INFORMATION	NVARCHAR(4)	Code that specifies the validity of an address
ASSIGNMENT_LEVEL	NVARCHAR(4)	Code that represents the level to which the address matched data in the address reference data

## 8.2.35 CLEANSE\_CHANGE\_INFO System View [Smart Data Quality]

Describes the changes made during the cleansing process.

### Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
TABLE_NAME	NVARCHAR(128)	Name of the table defined in the task plan for the operation
ROW_ID	BIGINT	Unique identifier of the row processed for this execution of the task plan
ENTITY_ID	NVARCHAR(12)	Identifier describing the type of record that was processed

Column	Data type	Description
ENTITY_INSTANCE	INTEGER	Identifier to differentiate between multiple entities processed in a row
ENTITY_INSTANCE_OCCURRENCE	INTEGER	Unique identifier to identify the occurrence of an entity
COMPONENT_ID	NVARCHAR(12)	Identification number that refers to data components
COMPONENT_ELEMENT_ID	NVARCHAR(12)	Identification number that refers to more granular elements within a component
DATA_SOURCE	NVARCHAR(256)	Source where the data was produced
CHANGE_SIGNIFICANCE_ID	NVARCHAR(12)	Identification number that refers to the significance of the change

## 8.2.36 CLEANSE\_COMPONENT\_INFO System View [Smart Data Quality]

Identifies the location of parsed data elements in the input and output.

### Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
ENTITY_ID	NVARCHAR(12)	Identifier describing a data attribute such as a person name, organization name, address and so on.
ENTITY_INSTANCE	INTEGER	Identifier to differentiate between multiple entities processed in a row
ENTITY_INSTANCE_OCCURRENCE	INTEGER	Unique identifier to identify the occurrence of an entity

Column	Data type	Description
DATA_SOURCE	NVARCHAR(256)	Source where the data originated
COMPONENT_ID	NVARCHAR(12)	Identification number that refers to data components
COMPONENT_ELEMENT_ID	NVARCHAR(12)	Identification number that refers to more granular elements within a component
TABLE_NAME	NVARCHAR(128)	Name of the input table where the component element was found
ROW_ID	BIGINT	Unique identifier of the row processed for this execution of the task plan
COLUMN_NAME	NVARCHAR(128)	Name of the column in the input table where the component element was found
COLUMN_START_POSITION	INTEGER	Starting character of the component element in the input column
COLUMN_DATA_LENGTH	INTEGER	Number of characters of the component element in the input column
OUTPUT_TABLE_NAME	NVARCHAR(128)	Name of the output table where the component element was written
OUTPUT_COLUMN_NAME	NVARCHAR(128)	Name of the column in the output table where the component element was written
OUTPUT_COLUMN_START_POSITION	INTEGER	Starting character of the component element in the output column
OUTPUT_COLUMN_DATA_LENGTH	INTEGER	Number of characters of the component element in the output column

## 8.2.37 CLEANSE\_INFO\_CODES System View [Smart Data Quality]

Contains one row per info code generated by the cleansing process.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
TABLE_NAME	NVARCHAR(128)	Name of the table defined in the task plan for the operation
ROW_ID	BIGINT	Unique identifier of the row processed for this execution of the task plan
ENTITY_ID	NVARCHAR(12)	Identifier describing the type of record that was processed
ENTITY_INSTANCE	INTEGER	Identifier to differentiate between multiple entities processed in a row
ENTITY_INSTANCE_OCCURRENCE	INTEGER	Unique identifier to identify the occurrence of an entity
DATA_SOURCE	NVARCHAR(256)	Source where the data was produced
INFO_CODE	NVARCHAR(10)	Information code that gives information about the processing of the record

## 8.2.38 CLEANSE\_STATISTICS System View [Smart Data Quality]

Contains a summary of Cleanse statistics.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task

Column	Data type	Description
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
ENTITY_ID	NVARCHAR(12)	Identifier describing the type of record that was processed
ENTITY_INSTANCE	INTEGER	Identifier to differentiate between multiple entities processed in a row
NUM_RECORDS	BIGINT	Total number of records processed for the entity instance
NUM_VALIDS	BIGINT	Number of valid records processed for the entity instance
NUM_SUSPECTS	BIGINT	Number of suspect records processed for the entity instance
NUM_BLANKS	BIGINT	Number of blank records processed for the entity instance
NUM_HIGH_SIGNIFICANT_CHANGES	BIGINT	Number of records with high significance changes for the entity instance

## 8.2.39 GEOCODE\_INFO\_CODES System View [Smart Data Quality]

Contains one row per info code generated by the geocode transformation process.

### Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
TABLE_NAME	NVARCHAR(128)	Name of the table defined in the task plan for the operation

Column	Data type	Description
ROW_ID	BIGINT	Unique identifier of the row processed for this execution of the task plan
DATA_SOURCE	NVARCHAR(256)	Source where the data was produced
INFO_CODE	NVARCHAR(10)	Information code generated by the geocode transformation operation

## 8.2.40 GEOCODE\_STATISTICS System View [Smart Data Quality]

Contains a summary of Geocode statistics.

### Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
NUM_RECORDS	BIGINT	Total number of records processed
NUM_ASSIGNED	BIGINT	Number of assigned records processed
NUM_UNASSIGNED	BIGINT	Number of unassigned records processed

## 8.2.41 MATCH\_GROUP\_INFO System View [Smart Data Quality]

Contains one row for each match group.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
GROUP_ID	INTEGER	Group identification number
GROUP_COUNT	INTEGER	Number of records in the match group
SOURCE_COUNT	INTEGER	Number of sources represented in the match group
REVIEW_GROUP	NVARCHAR(1)	Indicates whether the group is flagged for review
CONFLICT_GROUP	NVARCHAR(1)	Indicates whether the group is flagged for conflict

## 8.2.42 MATCH\_RECORD\_INFO System View [Smart Data Quality]

Contains one row for each matching record per level.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
TABLE_NAME	NVARCHAR(128)	Name of the table defined in the task plan for the operation

Column	Data type	Description
ROW_ID	BIGINT	Unique identifier of the row processed for this execution of the task plan
GROUP_ID	INTEGER	Group identification number

### 8.2.43 MATCH\_SOURCE\_STATISTICS System View [Smart Data Quality]

Contains counts of matches within and between data sources.

#### Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
SOURCE_NAME	NVARCHAR(256)	Data source name
RELATED_SOURCE_NAME	NVARCHAR(256)	Related data source name
NUM_MATCH_DECISIONS	INTEGER	Number of comparisons resulting in a match decision between records in each SOURCE_ID/RELATED_SOURCE_ID pair

### 8.2.44 MATCH\_STATISTICS System View [Smart Data Quality]

Contains statistics regarding the run of the transformation operation.



## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
NUM_RECORDS	BIGINT	Total number of records processed by the transformation operation
NUM_MATCH_RECORDS	BIGINT	Number of records that reside in match groups
NUM_NON_MATCH_RECORDS	BIGINT	Number of non-matching records that do not reside in match groups
NUM_MATCH_GROUPS	BIGINT	Number of match groups identified
NUM_REVIEW_GROUPS	BIGINT	Number of match groups flagged for review
NUM_NON_REVIEW_GROUPS	BIGINT	Number of match groups not flagged for review
NUM_CONFLICT_GROUPS	BIGINT	Number of match groups flagged with conflicts
NUM_COMPARISONS_PERFORMED	BIGINT	Number of comparisons performed by the transformation operation
NUM_MATCH_DECISIONS	BIGINT	Number of comparisons resulting in a match decision

## 8.2.45 MATCH\_TRACING System View [Smart Data Quality]

Contains one row for each match decision made during the matching process.

## Structure

Column	Data type	Description
SCHEMA_NAME	NVARCHAR(256)	Name of the schema where the task is located



Column	Data type	Description
TASK_NAME	NVARCHAR(256)	Name of the task
TASK_EXECUTION_ID	BIGINT	Unique identifier for a particular run of a task plan created when START TASK is called
OPERATION_NAME	NVARCHAR(128)	Name of the operation in the task plan
TABLE_NAME	NVARCHAR(128)	Name of the table defined in the task plan for the operation
ROW_ID	BIGINT	Unique identifier of the row processed for this execution of the task plan
RELATED_TABLE_NAME	NVARCHAR(128)	Name of the table defined in the task plan for an operation
RELATED_ROW_ID	BIGINT	Unique identifier of the row processed for this execution of the task plan
POLICY_NAME	NVARCHAR(256)	Name of the match policy that processed the related rows
RULE_NAME	NVARCHAR(256)	Name of the match rule that processed the related rows
SCORE	INTEGER	Similarity score of the related rows

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