Installation and Configuration Guide
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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.

The following areas are covered:

- Architecture
- Administrator tasks to enable functionality
- Data Provisioning Agent installation and configuration
- Security
- Data Provisioning adapters

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 9]
Architecture [page 10]
Components [page 13]
Deployment Options [page 14]
Administration Tools [page 16]

1.1 Overview

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

The smart data integration and smart data quality options let you enhance, cleanse, and transform data to make it more accurate and useful. These options let you 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, write 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.

<table>
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<th>Description</th>
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<td>SAP HANA smart data integration</td>
<td>Real-time, high-speed data provisioning, bulk data movement, and federation. Provides built-in adapters plus an SDK so you can build your own.</td>
</tr>
<tr>
<td></td>
<td>Includes the following features and tools:</td>
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<td></td>
<td>* Replication Editor in the SAP HANA Web-based Development Workbench, which lets you set up batch or real-time data replication scenarios in an easy-to-use web application</td>
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<td></td>
<td>* Transformations presented as nodes in the application function modeler delivered with SAP HANA studio and SAP HANA Web-based Development Workbench, which lets you set up batch or real-time data transformation scenarios</td>
</tr>
<tr>
<td></td>
<td>* 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</td>
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<td></td>
<td>* Data Provisioning adapters for connectivity to remote sources</td>
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<tr>
<td></td>
<td>* Adapter SDK to create custom adapters</td>
</tr>
<tr>
<td></td>
<td>* SAP HANA Cockpit integration for monitoring Data Provisioning Agents, remote subscriptions, and data loads</td>
</tr>
<tr>
<td>SAP HANA smart data quality</td>
<td>Real-time, high-performance data cleansing, address cleansing, and geospatial data enrichment. Provides an intuitive interface to define data transformation flowgraphs in SAP HANA Web-based Development Workbench and SAP HANA studio.</td>
</tr>
</tbody>
</table>

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

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<th>Protocol and additional information</th>
<th>Default Port</th>
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<tr>
<td>Data Provisioning Agent</td>
<td>When SAP HANA is deployed on premise, the Data Provisioning Server within SAP HANA connects to the agent using the TCP/IP protocol. To manage the listening port used by the agent, edit the adapter framework preferences with the Data Provisioning Agent Configuration tool.</td>
<td>5050</td>
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Sources
Examples: Data Provisioning Adapters

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<th>Sources</th>
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<td></td>
<td>The connections to external data sources depend on the type of adapter used to access the source. C++ adapters running in the Data Provisioning Server connect to the source using a source-defined protocol.</td>
<td>Varies by source</td>
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<tr>
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<td>Java adapters deployed on the Data Provisioning Agent connect to the source using a source-defined protocol.</td>
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Inbound Connections

<table>
<thead>
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<th>Client</th>
<th>Protocol and additional information</th>
<th>Default Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Provisioning Agent</td>
<td>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.</td>
<td>80xx</td>
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**Note**
When the agent connects to SAP HANA in the cloud over HTTP/S, data is automatically gzip compressed to minimize the required network bandwidth.

For information about configuring the port used by the SAP HANA XS engine, see the *SAP HANA Administration Guide*.

Related Information

Configuring the Agent in Graphical Mode [page 39]
1.3 Components

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

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<td>Data Provisioning Server</td>
<td>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. The Data Provisioning Server is installed with, but must be enabled in, the SAP HANA Server.</td>
</tr>
<tr>
<td>Data Provisioning Agent</td>
<td>The Data Provisioning Agent is a container running outside the SAP HANA environment, but 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 Data Provisioning Server for connectivity, metadata browsing, and data access. The Data Provisioning Agent also hosts custom adapters created using the Adapter SDK. The Data Provisioning Agent is installed separately from SAP HANA server or client.</td>
</tr>
<tr>
<td>HANA_IM_DP delivery unit</td>
<td>The HANA_IM_DP delivery unit bundles monitoring and administration capabilities and the Data Provisioning Proxy for when connecting to SAP HANA in the cloud. The delivery unit includes the Data Provisioning administration application, the Data Provisioning Proxy, and the Data Provisioning monitor.</td>
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<tr>
<td>Data Provisioning admin application</td>
<td>The Data Provisioning administration application is an XS application that manages the administration functions of the Data Provisioning Agent with SAP HANA in the cloud. This component is delivered via the HANA_IM_DP delivery unit.</td>
</tr>
<tr>
<td>Data Provisioning Proxy</td>
<td>The Data Provisioning Proxy is an XS application that acts as a proxy to provide communication between the Data Provisioning Agent and 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 Data Provisioning Proxy in the XS Engine, which eliminates the need to open additional ports in corporate IT firewalls. This component is delivered via the HANA_IM_DP delivery unit.</td>
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<tr>
<td>Data Provisioning monitor</td>
<td>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 directly entering the URL of each monitor into a web browser or by accessing the Data Provisioning tiles in the SAP HANA cockpit, a web-based launchpad that is installed with SAP HANA Server. 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.</td>
</tr>
<tr>
<td>SAP HANA Web-based Development Workbench Replication Editor</td>
<td>The SAP HANA Web-based Development Workbench, which includes the Replication Editor to set up replication tasks, is installed with SAP HANA Server.</td>
</tr>
<tr>
<td>SAP HANA Web-based Development Workbench Flowgraph Editor</td>
<td>The SAP HANA Web-based Development Workbench Flowgraph Editor provides an interface to create data provisioning and data quality transformation flowgraphs.</td>
</tr>
</tbody>
</table>
### Application function modeler

The application function modeler provides an interface to create data provisioning and data quality transformation flowgraphs. 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:

<table>
<thead>
<tr>
<th>Landscape</th>
<th>Description</th>
</tr>
</thead>
</table>
| Distributed landscape | ● System 1: SAP HANA Server  
                      | ● System 2: Data Provisioning Agent  
                      | ● System 3: Source system |
| Combined landscape  | ● System 1: SAP HANA Server  
                      | ● System 2: Data Provisioning Agent and the source system |

### SAP HANA on premise vs. SAP HANA in the cloud

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. This is done by downloading and deploying the HANA_IM_DP delivery unit.
- The Data Provisioning Agent must be configured to communicate with SAP HANA using HTTP. This is done using Data Provisioning Agent Configuration tool.

### 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 15]

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.

Note

Load-balancing is not supported by the Data Provisioning Server.

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 inaccessible for a time longer than the configured heartbeat time limit, the Data Provisioning Server chooses a new active agent within the group and 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 accessible agent in the group.

Restriction

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

Note

Load-balancing is not supported by the Data Provisioning Agent.
Related Information

Managing Agent Groups [page 70]

1.5 Administration Tools

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

<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP HANA studio</td>
<td>The SAP HANA Administration Console perspective of the SAP HANA studio is the main tool for general system administration and monitoring tasks.</td>
</tr>
<tr>
<td>Data Provisioning Agent Configuration tool</td>
<td>This tool manages Data Provisioning Agents and adapters, and connections to SAP HANA.</td>
</tr>
<tr>
<td>SAP HANA cockpit</td>
<td>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. Through the SAP HANA cockpit, you can monitor Data Provisioning Agents, tasks, and remote subscriptions.</td>
</tr>
<tr>
<td>SAP HANA Enterprise Semantic Services Admin-</td>
<td>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: http://&lt;your_HANA_instance:port&gt;/sap/hana/im/ess/ui</td>
</tr>
</tbody>
</table>

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

Below is a list of high level tasks needed to set up SAP HANA smart data integration.

1. **Assign Roles and Privileges [page 17]**
   Add roles and privileges for users to perform various tasks.

2. **Enable the Data Provisioning Server [page 22]**
   Enabling the Data Provisioning Server gives you the ability to use SAP HANA smart data integration.

3. **Download and Deploy the Data Provisioning Delivery Unit [page 23]**
   Download and import the Data Provisioning delivery unit using SAP HANA studio or SAP HANA Application Lifecycle Management.

4. **Install the Data Provisioning Agent [page 27]**
   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 38]**
   You must 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 85]**
   After configuring the Data Provisioning Agent, deploy and register adapters.

7. **Create a Remote Source [page 90]**
   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 94]**
   After you install the SAP HANA smart data integration option for SAP HANA, 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 97]**
   (Optional) 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 108]**
    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.

## 2.1 Assign Roles and Privileges

Add roles and privileges for users to perform various tasks.

The following is a list of common tasks and roles or privileges that an administrator needs to assign to complete those tasks.
Data Provisioning Agent and Data Provisioning Adapter Tasks

A user may need to be assigned specific roles and privileges to accomplish tasks when installing and configuring the Data Provisioning Agent and Data Provisioning Adapters.

**Note**
Permissions may also be required for accessing a particular database through a data provisioning adapter. See the “Data Provisioning Adapters” section for more information.

<table>
<thead>
<tr>
<th>Task</th>
<th>Roles and Privileges</th>
<th>Description</th>
</tr>
</thead>
</table>
| Register a DP Agent                       | System privilege:  
  ● AGENT ADMIN                               |                                                                             |
| Register an adapter                       | System privilege:  
  ● ADAPTER ADMIN                               |                                                                             |
| Configure DP Agent to use HTTP (cloud)    | Role:  
  ● sap.hana.im.dp.proxy::Agent-Messaging       | Whoever sets the DP Agent to use HTTP (cloud) in the DP Agent Configuration  |
| Configure DP Agent to use HTTP (cloud)    | Role:  
  ● sap.hana.im.dp.proxy::Agent-Messaging       | tool needs to be assigned this role.                                      |
| Create an Agent or adapter when SAP HANA | Application privilege:  
  ● sap.hana.im.dp.admin::Administrator         | Needed when administrator want to create adapters/agent from agent config   |
| Create an Agent or adapter when SAP HANA | Role:  
  ● sap.hana.im.dp.admin::Administrator         | tool when SAP HANA is on the cloud (or Agent uses HTTP protocol).         |
| Create an Agent or adapter when SAP HANA | Application privilege:  
  ● sap.hana.im.dp.admin::Administrator         |                                                                             |
| Import a delivery unit using SAP HANA     | Role:  
  ● sap.hana.xs.lm.roles::Administrator         | This role is necessary if you are using SAP HANA Application Lifecycle    |
| Import a delivery unit using SAP HANA     | Role:  
  ● sap.hana.xs.lm.roles::Administrator         | Management to import the data provisioning delivery unit.                  |
| Import a delivery unit using SAP HANA     | Role:  
  ● sap.hana.xs.lm.roles::Transport             |                                                                             |

Monitoring Tasks

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

<table>
<thead>
<tr>
<th>Task</th>
<th>Roles and Privileges</th>
<th>Description</th>
</tr>
</thead>
</table>
| Monitoring                                | Role:  
  ● sap.hana.im.dp.monitor.roles::Monitoring  | The Monitoring role includes the following application privileges          |
| Monitoring                                | Application privilege:  
  ● sap.hana.im.dp.monitor::Monitoring          |                                                                             |
  ● sap.hana.ide::LandingPage                |                                                                             |
  ● sap.hana.im.dp.monitor::Monitoring        |                                                                             |
<table>
<thead>
<tr>
<th>Task</th>
<th>Roles and Privileges</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Role:</td>
<td>The Operations role includes the following application privileges (sap.hana.im.dp.monitor::*):</td>
</tr>
<tr>
<td></td>
<td>● sap.hana.im.dp.monitor::Operations</td>
<td>● AddLocationToAdapter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● AlterAgent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● AlterRemoteSource</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● AlterRemoteSubscription</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● CreateAgent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● DeleteSchedule</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● DropAgent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● DropRemoteSubscription</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● ExecuteDesignTimeObject</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● NotificationAdministration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● ProcessRemoteException (This includes both remote source and remote subscription exceptions)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● RemoveLocationFromAdapter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● ScheduleDesignTimeObject</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● ScheduleTask</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● StartTask</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● StopTask</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● UpdateAdapter</td>
</tr>
<tr>
<td>Enable users to schedule a task</td>
<td>Role:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● sap.hana.xs.admin::JobSchedulerAdministrator</td>
<td></td>
</tr>
<tr>
<td>Schedule a task</td>
<td>Role:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● sap.hana.im.dp.monitor::Operations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Application privilege:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● sap.hana.im.dp.monitor::ScheduleTask</td>
<td></td>
</tr>
<tr>
<td>Start a task</td>
<td>Application privilege:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● sap.hana.im.dp.monitor::StartTask</td>
<td></td>
</tr>
<tr>
<td>Stop a task</td>
<td>Application privilege:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● sap.hana.im.dp.monitor::StopTask</td>
<td></td>
</tr>
<tr>
<td>Process remote subscription exceptions</td>
<td>Object privilege:</td>
<td>Must be explicitly granted for a remote source created by another user.</td>
</tr>
<tr>
<td></td>
<td>● PROCESS REMOTE SUBSCRIPTION EXCEPTION</td>
<td></td>
</tr>
</tbody>
</table>
Remote Source and Remote Subscription Tasks

A user may need to be assigned specific roles or privileges to create and manage remote sources and remote subscriptions.

<table>
<thead>
<tr>
<th>Task</th>
<th>Roles and Privileges</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a remote source</td>
<td>System privilege:</td>
<td>If 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; they don’t need to be assigned to the user. However, this only applies to remote sources that the user creates themselves. If a remote source is created by someone else, then those privileges must be assigned, for each remote source, in order to perform those tasks.</td>
</tr>
<tr>
<td>Alter a remote source</td>
<td>Object privilege:</td>
<td>In order to alter a remote source, the user must have the ALTER object privilege on the remote source. Examples of altering a remote source include:</td>
</tr>
<tr>
<td></td>
<td>● ALTER</td>
<td>● ALTER REMOTE SOURCE &lt;remote_source_name&gt; SUSPEND CAPTURE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● ALTER REMOTE SOURCE &lt;remote_source_name&gt; RESUME CAPTURE</td>
</tr>
<tr>
<td>Drop a remote source</td>
<td>Object privilege:</td>
<td>Must be explicitly granted for a remote source created by another user.</td>
</tr>
<tr>
<td></td>
<td>● DROP</td>
<td></td>
</tr>
<tr>
<td>Search for an object in</td>
<td>Object privilege:</td>
<td>In order to search for remote objects (e.g. tables) in a remote source, the user must have the ALTER object privilege on the remote source, so that a dictionary can be created.</td>
</tr>
<tr>
<td>a remote source</td>
<td>● ALTER on the remote source to be searched.</td>
<td></td>
</tr>
<tr>
<td>Add a virtual table</td>
<td>Object privilege</td>
<td>Must be explicitly granted for a remote source created by another user.</td>
</tr>
<tr>
<td></td>
<td>● CREATE VIRTUAL TABLE</td>
<td></td>
</tr>
<tr>
<td>Create a remote subscription</td>
<td>Object privilege</td>
<td>Must be explicitly granted for a remote source created by another user.</td>
</tr>
<tr>
<td></td>
<td>● CREATE REMOTE SUBSCRIPTION</td>
<td></td>
</tr>
</tbody>
</table>

Replication Task and Flowgraph Tasks

A user may need to be assigned specific roles and privileges to create and run flowgraphs and replication tasks from the SAP HANA Web-based Development Workbench or the SAP HANA studio.
<table>
<thead>
<tr>
<th>Task</th>
<th>Roles and Privileges</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a flowgraph</td>
<td>Role:</td>
<td>Allows creation of .hdbflowgraph.</td>
</tr>
<tr>
<td></td>
<td>• sap.hana.xs.ide.roles::EditorDeveloper</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Object privilege:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• EXECUTE on &quot;_SYS_REPO&quot;.&quot;TEXT_ACCESSOR&quot; and &quot;_SYS_REPO&quot;.&quot;MULTI_TEXT_ACCESSOR&quot;</td>
<td></td>
</tr>
<tr>
<td>Create a flowgraph of type Task</td>
<td>Object privilege:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• SELECT (for input/output schema)</td>
<td></td>
</tr>
<tr>
<td>Create a replication task</td>
<td>Role:</td>
<td>Allows creation of .hdbreptask.</td>
</tr>
<tr>
<td></td>
<td>• sap.hana.xs.ide.roles::EditorDeveloper</td>
<td></td>
</tr>
<tr>
<td>Activate replication task (.hdbreptask)</td>
<td>Object privileges:</td>
<td>Must be granted to _SYS_REPO.</td>
</tr>
<tr>
<td></td>
<td>• SELECT on the source schema</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• CREATE VIRTUAL TABLE on REMOTE SOURCE (Initial Load Only)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• CREATE REMOTE SUBSCRIPTION on REMOTE SOURCE (for real time scenarios)</td>
<td></td>
</tr>
<tr>
<td>Activate flowgraph (.hdbflowgraph)</td>
<td>Object privileges:</td>
<td>Must be granted to _SYS_REPO.</td>
</tr>
<tr>
<td></td>
<td>• SELECT on the source table</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• INSERT, UPDATE, and DELETE on the target table</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• SELECT on the target schema</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(only when using a Template Table as a target)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• If sequence is used, then GRANT SELECT on sequence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• History Table:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ GRANT INSERT on History Table</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ GRANT SELECT on Target Table</td>
<td></td>
</tr>
<tr>
<td>Execute a stored procedure</td>
<td>Object privilege:</td>
<td>Needed on the schema where the stored procedure is located.</td>
</tr>
<tr>
<td></td>
<td>• EXECUTE</td>
<td></td>
</tr>
</tbody>
</table>
### Task

<table>
<thead>
<tr>
<th>Task</th>
<th>Roles and Privileges</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Execute a task</td>
<td>Object privilege: ● EXECUTE ● INSERT ● UPDATE ● SELECT ● DELETE</td>
<td>Needed on the schema where the task is located.</td>
</tr>
<tr>
<td>Use the JIT (just-in-time) Data Preview option</td>
<td>Object privilege: ● SELECT and EXECUTE with GRANT OPTION</td>
<td>Must be granted to _SYS_REPO user. Needed on the schema where the task or stored procedure is located.</td>
</tr>
</tbody>
</table>

**Parent topic:** Configure Smart Data Integration [page 17]

**Next task:** Enable the Data Provisioning Server [page 22]

### Related Information

Grant Roles to Users [page 95]

### 2.2 Enable the Data Provisioning Server

When SAP HANA is first installed, the Data Provisioning Server is disabled. Enabling the Data Provisioning Server gives you the ability to use SAP HANA smart data integration.

**Context**

In a single-container SAP HANA database, you can enable the Data Provisioning Server by setting the `dpserver` instances to 1.

**Procedure**

1. In the Administration editor, choose the Configuration tab.
2. Expand the `daemon.ini` configuration file.
3. Select and expand `dpserver`, select `Instances`, right click, and choose `Change`. 
4. Set *Instances* to 1.

**Results**

The Data Provisioning Server is enabled.

**Task overview:** Configure Smart Data Integration [page 17]

**Previous:** Assign Roles and Privileges [page 17]

**Next:** Download and Deploy the Data Provisioning Delivery Unit [page 23]

### 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>]'.`

### 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.

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

### 2.3 Download and Deploy the Data Provisioning Delivery Unit

Download and import the Data Provisioning delivery unit using SAP HANA studio or SAP HANA Application Lifecycle Management.

You will need to 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

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring</td>
<td>The monitoring application provides a browser based interface to monitor agents, tasks and remote subscriptions created in the SAP HANA system. The monitor application needs to be configured in the SAP HANA Cockpit.</td>
</tr>
<tr>
<td>Proxy</td>
<td>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.</td>
</tr>
<tr>
<td>Admin</td>
<td>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.</td>
</tr>
</tbody>
</table>

**Parent topic:** [Configure Smart Data Integration](#) [page 17]

**Previous task:** [Enable the Data Provisioning Server](#) [page 22]

**Next:** [Install the Data Provisioning Agent](#) [page 27]

### Related Information

- [Download the Data Provisioning Delivery Unit](#) [page 24]
- [Deploy the Delivery Unit from SAP HANA Studio](#) [page 25]
- [Deploy the Delivery Unit from SAP HANA Application Lifecycle Management](#) [page 26]

### 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 1.0.
2. Click COMPRISED SOFTWARE COMPONENT VERSIONS.
3. Click HANA DP 1.0.
4. Click the ZIP file that you need, and save it to the preferred location.
5. In the HANAIMDP<version number>.ZIP file, find and extract the HANA_IM_DP<version number>.tgz file.
   This is the delivery unit file that needs to be imported into SAP HANA.

Related Information

SAP Software Download Center

2.3.2 Deploy the Delivery Unit from SAP HANA Studio

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

**Note**

When SAP HANA is deployed in a multitenant 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 DU.

Procedure

1. Log in to SAP HANA studio as user SYSTEM.
2. In the upper left corner, click File ➤ Import ➤ 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 the Client or Server radio button, 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, select HANAIMDP.tgz, and click Open.
   b. If you select Server, then select the DU 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 import the Data Provisioning delivery unit through SAP HANA Application Lifecycle Management.

**Note**

When SAP HANA is deployed in a multitenant 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 will use to login to ALM.
   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. Access ALM by typing the following URL in a web browser:
   `<host name>:80<2-digit instance number>/sap/hana/xs/1m`
3. Log in to ALM as the user name you authorized in step 1.
   The first time you log in, a pop-up window appears 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, 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. Data Provisioning Agent Planning and Preparation [page 27]
   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 34]
   You can install the Data Provisioning Agent on a Windows or Linux host.

Parent topic: Configure Smart Data Integration [page 17]

Previous: Download and Deploy the Data Provisioning Delivery Unit [page 23]

Next: Configure the Data Provisioning Agent [page 38]

2.4.1 Data Provisioning Agent 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 want to access, meets the minimum system requirements, and has any middleware required for source access installed. The agent should be installed on a host that you have full control to view logs and restart, if necessary. In many cases, it is not practical to install the Data Provisioning Agent on the same host machine as the source database. The Data Provisioning Agent host may need to be restarted when troubleshooting, and can consume a significant amount of memory. For best performance, we recommend that you 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.

ℹ️ Note

For information about Data Provisioning Agent, operating system, and DBMS compatibility, refer to the Product Availability Matrix.

- How many Data Provisioning Agents should be installed?
  You can install one or many agents depending on your landscape requirements.
Note

On Linux, you can install multiple agents on a single host machine. On Windows, only a single Data Provisioning Agent installation is supported per host.

- 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 correctly enable SSL for 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 will vary depending on the type and number of adapters deployed.

Parent topic: Install the Data Provisioning Agent [page 27]

Next task: Install the Data Provisioning Agent [page 34]

Related Information

Supported Platforms and System Requirements [page 28]
Software Download [page 29]
Prepare the Amazon Web Services (AWS) Environment [page 30]
Prepare SSL when SAP HANA is on premise [page 31]
Download the SAP HANA Server Certificate [page 33]
Product Availability Matrix

2.4.1.1 Supported Platforms and System Requirements

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

Note

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

The host system must have the 64-bit Java JDK installed.

For more information about supported Java versions, see the Product Availability Matrix (PAM).

On Linux platforms, the following additional requirements apply:

- In order to install or uninstall the agent, you must use a user that has root privileges.
- The system must have gcc 4.7 to run the Data Provisioning Agent service.
  For more information see SAP Note 2001528.

Related Information

Product Availability Matrix
SAP Note 2001528 - Linux: SAP HANA Database SPS 08 revision 80 (or higher) on RHEL 6 or SLES 11

2.4.1.2 Software Download

The Data Provisioning Agent installation package is available as optional component SAP HANA SDI 1.0 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 Product Availability Matrix.

On the SAP Software Download Center, you can find the installation packages in the following locations:

- Installation media for an SAP HANA SPS:
  - 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
  - In the Downloads tab, click Installation. Select the package to download, and choose Download from the action menu.
Support Packages and Patches for SAP HANA:

In the Downloads tab, choose your platform from the dropdown list. Select the package to download, and choose Download from the action menu. To verify the agent version, see the Product Availability Matrix.

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 security patches, you can independently download the latest releases of the SAP JVM from the same location and update your agent installation.

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

Related Information

SAP Software Download Center
Product Availability Matrix
Download and Deploy the Data Provisioning Delivery Unit [page 23]
Reconfigure the Java Runtime Environment [page 50]

2.4.1.3 Prepare the Amazon Web Services (AWS) Environment

Before you can install the Data Provisioning Agent on 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
   - IMDB_DPAGENT100_00_2-70000174.SAR
You may need to 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.

```bash
sudo bash
```

4. Install the Java Development Kit.

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

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

```bash
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 36]

**2.4.1.4 Prepare SSL when SAP HANA is on premise**

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.

**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. Generate a keystore on the agent host machine.

   ```
   keytool -genkeypair -alias DPAgent -keyalg RSA -keysize 2048 -dname "CN=<agent_hostname>,OU=<organizational_unit>,O=<organization>,L=<city>,S=<state>,C=<country>" -keypass <key_password> -storepass <store_password> -keystore cacerts
   ```

   `<agent_hostname>` must be the fully qualified hostname of the machine where the agent is installed.

2. Obtain a signed certificate for the agent and import it into the keystore.

   a. Generate the certificate request.

   ```
   keytool -certreq -file <request_filename>.cer –alias DPAgent –keystore cacerts
   ```

   b. Send the certificate request to a Certificate Authority (CA) to be signed.

   c. After receiving the signed certificate from the CA, import it into the agent keystore.

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

3. Import the SAP HANA server root certificate into the agent keystore.

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

   You can obtain the certificate by exporting it with the SAP Web Dispatcher. For more information, see SAP Note 2009483.

4. On SAP HANA, add the signed agent certificate to the sapcli Personal Security Environment (PSE).

   You can add the certificate with the SAP Web Dispatcher. For more information, see SAP Note 2009483.

5. Configure the data provisioning agent for SSL.

Next Steps

If you require stronger encryption than 128 bit key length, you will need to update the existing JCE policy files.

Related Information

- Start and Connect the Configuration Tool [page 39]
- Register the Agent with SAP HANA [page 47]
- SAP Note 2009483 - PSE Management in Web Administration Interface of SAP Web Dispatcher
- Connect to SAP HANA on-premise with SSL [page 41]
Update JCE Policy Files for Stronger Encryption [page 352]

2.4.1.5 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

The SAP HANA server certificate can be downloaded from 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 directly import the server certificate into the agent keystore. This procedure is required only if you do not want the configuration tool to directly import the certificate, and want to manually import it separately.

Procedure

1. Navigate to the SAP HANA server in a web browser.
2. Open the certificate information for the page.
   The exact steps to open the certificate information depend on your browser.
   ○ For Internet Explorer, click on the lock icon in the address bar, and click View Certificates.
   ○ For Chrome, click on the lock icon in the address bar, and click Connection Certificate Information.
3. In the Details tab, click Copy to file.
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 accessible by 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.

#### Prerequisites

To install the Data Provisioning Agent, you must be logged on as a user with root privileges.

- On Windows, you must use the Administrator user or a user in the administrators group.
- On Linux, you must use a user in the root group, or a user with `sudo` permission.

**Note**

For installations on Linux, we recommend that you do not start the Data Provisioning Agent while logged in as the root user.

If you are logged in as the root user for installation, do not start the Data Provisioning Agent as the root user after the installation is complete. Instead, log in with the service user specified during installation, and then start the Data Provisioning Agent.

If you accidentally start the agent as the root user, see .

When you install the Data Provisioning Agent on Linux, there are additional prerequisites:

- GTK 2 is installed so that you can run the graphical installation tool.
- This user is authorized to open a display.
- The Java runtime is accessible either via the `PATH` or `JAVA_HOME` variables or by specifying the `-vm` option.

**Tip**

To set the `-vm` option, open the `dpagent.ini` configuration file located by default at `/usr/sap/dataprovagent`, and add `-vm <path_to_java_installation>/javaw`.

For example, `-vm /usr/Java/jdk1.8.0_60/bin/javaw`

- A local X11 graphical environment and an X server must be available on the machine where you perform the installation.
Context

⚠️ Caution

When you install the Data Provisioning Agent, the agent will use, 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 unpacked the software.
3. Call the installation manager.
   - On Windows, right-click hdbsetup.exe and choose Run as administrator.
   - On Linux, run ./hdbsetup with root privileges.
     For example, sudo ./hdbsetup.
4. Choose Install new SAP HANA Data Provisioning Agent and specify the installation path.
5. Specify the user credentials to use for the agent service.
   - On Windows, the username (<domain>/<username>) and password. The user that runs the agent service must have read/write access to the installation directory so that configuration files can be updated.
   - On Linux, the user name (user ID) and password of the installation owner. This user will be granted all permissions to the installed directory.

⚠️ Caution

For installations on Linux, the installation owner must be a user other than the root user and outside the root group.

6. If you want to use a custom Java Runtime Environment instead of the bundled SAP JVM, specify the path to the JRE installation.

ℹ️ 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/jdk1.7.0_71/jre

ℹ️ 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 to configure the agent as required for your landscape.

Task overview: Install the Data Provisioning Agent [page 27]

Previous: Data Provisioning Agent Planning and Preparation [page 27]

Related Information

Install from the Command Line [page 36]
Installation Logs [page 37]
Default Installation Paths [page 38]
Connect to SAP HANA on-premise with SSL [page 41]
Connect to SAP HANA on Cloud [page 42]

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.

Procedure

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

```xml
<?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>" --service_user=<domain><username> --read_password_from_stdin=xml`  
   - On Linux, run `./hdbinst --silent --batch --path="<DPAgent_root>" --user_id=<user ID>`

**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. If you leave the password XML file on the server, it is a potential 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 to configure the agent as required for your landscape.

### 2.4.2.2 Installation Logs

The Data Provisioning Agent installation is logged by the system. 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.

<table>
<thead>
<tr>
<th>Platform</th>
<th>Package Version</th>
<th>Default Installation Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Windows x86, 64-bit</td>
<td>64-bit</td>
<td>C:\usr\sap\dataprovagent</td>
</tr>
<tr>
<td>Linux x86, 64-bit</td>
<td>64-bit</td>
<td>/usr/sap/dataprovagent</td>
</tr>
</tbody>
</table>

In this documentation, these root installation paths are represented by the variable <DPAgent_root>.

2.5 Configure the Data Provisioning Agent

You must 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 Graphical Mode [page 39]**
  - Connect to the SAP HANA server and configure the agent and adapters with the Data Provisioning Agent Configuration tool.

- **Configuring the Agent in Command Line Interactive Mode [page 51]**
  - 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 61]**
  - Use the command-line configuration tool to connect to the SAP HANA server and configure the Data Provisioning Agent and adapters.

- **Managing Agent Groups [page 70]**
  - Agent grouping provides fail-over capabilities by combining individual Data Provisioning Agents installed on separate host systems.

- **Manage Agents from the Data Provisioning Agent Monitor [page 78]**
  - You can use the Data Provisioning Agent Monitor to perform basic administration tasks such as registering, altering, or dropping Data Provisioning Agents.

- **Agent Preferences [page 80]**
  - The agent preferences provide advanced configuration options for the Data Provisioning Agent.

- **Agent Runtime Options [page 83]**
  - Use the command-line configuration tool to safely manage advanced runtime options stored in the dpagent.ini configuration file.

Parent topic: Configure Smart Data Integration [page 17]

Previous: Install the Data Provisioning Agent [page 27]

Next task: Register Data Provisioning Adapters [page 85]
2.5.1 Configuring the Agent in Graphical Mode

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

The configuration tool allows you to perform standard administrative tasks.

- **Start and Connect the Configuration Tool** [page 39]
  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 46]
  Use the configuration tool to stop or start the agent service.

- **Register the Agent with SAP HANA** [page 47]
  Before you can use adapters deployed on the Data Provisioning Agent, you must register the agent with SAP HANA.

- **Reconfigure an Existing Agent for SSL** [page 48]
  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.

- **Reconfigure the Java Runtime Environment** [page 50]
  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.

**Parent topic:** Configure the Data Provisioning Agent [page 38]

**Related Information**

- Configuring the Agent in Command Line Interactive Mode [page 51]
- Configuring the Agent in Command Line Batch Mode [page 61]
- Managing Agent Groups [page 70]
- Manage Agents from the Data Provisioning Agent Monitor [page 78]
- Agent Preferences [page 80]
- Agent Runtime Options [page 83]

2.5.1.1 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 40]
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-premise with SSL [page 41]**
Specify connection information, user credentials, and SSL configuration information when the SAP HANA system is located on-premise and requires a secure SSL connection.

**Connect to SAP HANA on Cloud [page 42]**
Specify connection information, user credentials, and SSL configuration information when the SAP HANA system is located in the cloud.

### 2.5.1.1.1 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>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect to SAP HANA</td>
<td>● System privilege: AGENT  ADMIN&lt;br&gt;● System privilege: ADAPTER  ADMIN</td>
</tr>
</tbody>
</table>

#### 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.

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.
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 38]

### 2.5.1.1.2 Connect to SAP HANA on-premise with SSL

Specify connection information, user credentials, and SSL configuration information 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. For more information, see Prepare SSL when SAP HANA is on premise.
- The Agent Admin HANA User must have the following roles or privileges.

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect to SAP HANA</td>
<td>○ System privilege: AGENT_ADMIN</td>
</tr>
<tr>
<td></td>
<td>○ System privilege: ADAPTER_ADMIN</td>
</tr>
</tbody>
</table>

### Procedure

1. Navigate to the `<DPAgent_root>/configTool` directory.
2. Start the configuration tool.
   - On Windows, run `dpagentconfigtool.exe`.
   - On Linux, run `./dpagentconfigtool`. 
3. In the configuration tool, choose Configure SSL, enter the SSL configuration information, and select Enable SSL for Agent to HANA communication on TCP.

4. 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:

   ```sql
   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 38]
- Prepare SSL when SAP HANA is on premise [page 31]

### 2.5.1.1.3 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, all communication is initiated by the agent. 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 3: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect to SAP HANA</td>
<td>○ Application privilege: sap.hana.im.dp.admin::Administrator</td>
</tr>
<tr>
<td></td>
<td>○ System privilege: AGENT ADMIN</td>
</tr>
<tr>
<td></td>
<td>○ System privilege: ADAPTER ADMIN</td>
</tr>
<tr>
<td>Create Agent XS HANA User</td>
<td>○ System privilege: USER ADMIN</td>
</tr>
<tr>
<td></td>
<td>○ Object privilege: EXECUTE on GRANT_APPLICATION_PRIVILEGE</td>
</tr>
</tbody>
</table>

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

Table 4: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Messaging between the agent and SAP HANA on Cloud</td>
<td>○ Application privilege: sap.hana.im.dp.proxy::AgentMessaging</td>
</tr>
</tbody>
</table>

**Note**

The password for a new SAP HANA user expires according to the SAP HANA system's password policy settings (default 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, registering adapters, and so on.
      
      Create a new user or grant an existing user the following privileges:
      
      ○ Application privilege `sap.hana.im.dp.admin::Administrator`
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 credentials for this user are saved 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 new user or grant an existing user the following privileges:

- 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 new 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 new user.
Tip
To create a new 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.
   ○ Specify the agent name and click Register.
   The agent service is stopped and restarted.

Related Information

Default Installation Paths [page 38]
Download and Deploy the Data Provisioning Delivery Unit [page 23]

(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-is.
   e. Select *Use SSL to communicate with HANA on Cloud* and click Save.

**Related Information**

Download the SAP HANA Server Certificate [page 33]

### 2.5.1.2 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] to start the agent service or [Stop Agent] to stop the agent service.

**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 Data Provisioning Agent**.

On Linux, you can also manage the agent with a shell script. The shell script is located at `<DPAgent_root>/bin/dpagent_service.sh` and supports the following commands:
2.5.1.3 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>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register adapter</td>
<td>○ System privilege: AGENT_ADMIN</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register adapter</td>
<td>○ System privilege: AGENT_ADMIN</td>
</tr>
<tr>
<td>Messaging between the agent and SAP HANA on Cloud</td>
<td>○ Application privilege: sap.hana.im.dp.proxy::AgentMessaging</td>
</tr>
</tbody>
</table>

Procedure

1. Start the agent configuration tool and connect to the SAP HANA server.
2. Click Register Agent.
3. 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 fully qualify the agent hostname.
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 will be restarted to complete the registration process.

4. 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 will also be deleted, even if they are active.

Related Information

Start and Connect the Configuration Tool [page 39]

2.5.1.4 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:
   ```sql
   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:
   ```sql
   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:
   ```sql
   ALTER REMOTE SOURCE <remote_source_name> RESUME CAPTURE;
   ```

Related Information

Prepare SSL when SAP HANA is on premise [page 31]
Manage Agents from the Data Provisioning Agent Monitor [page 78]
2.5.1.5 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 the version of the SAP JVM, you must 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.

**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 it contains spaces.

<table>
<thead>
<tr>
<th>Platform</th>
<th>Original Value</th>
<th>New Value</th>
</tr>
</thead>
</table>
| Windows  | `-vm
C:\usr\sap\dataprovagent\sapjvm\bin` | `-vm
C:\Program Files\Java\jre7\bin` |
| Linux    | `-vm
/usr/sap/ dataprovagent/ sapjvm/lib/amd64/server` | `-vm
/usr/java/jdk1.7.0_71/jre/lib/amd64/server` |
c. Restart the Data Provisioning Agent service.

Related Information

Manage the Agent Service [page 46]
Software Download [page 29]

2.5.2 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 the 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 will display 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 the command line interactive mode. If an option has an existing password, it is displayed as "*****", and does not need to be re-entered 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 52]
  - Start the configuration tool in interactive mode to modify the agent configuration without a graphical environment.

- **Connect to SAP HANA on Premise [Command Line]** [page 53]
  - Specify connection information and administrator credentials when the SAP HANA system is located on-premise.

- **Connect to SAP HANA on Cloud [Command Line]** [page 55]
  - Specify connection information, user credentials, and SSL configuration information when the SAP HANA system is located in the cloud.

- **Manage the Agent Service [Command Line]** [page 57]
  - Use the command-line configuration tool to stop or start the Data Provisioning Agent service.

- **Register the Agent with SAP HANA [Command Line]** [page 58]
  - Before you can use adapters deployed on the Data Provisioning Agent, you must register the agent with SAP HANA.

- **Manage the Agent XS HANA User Credentials [Command Line]** [page 60]
If the Agent XS HANA User password has changed or expired, you may need to update the credentials in the agent’s secure storage.

**Parent topic:** Configure the Data Provisioning Agent [page 38]

## Related Information

- Configuring the Agent in Graphical Mode [page 39]
- Configuring the Agent in Command Line Batch Mode [page 61]
- Managing Agent Groups [page 70]
- Manage Agents from the Data Provisioning Agent Monitor [page 78]
- Agent Preferences [page 80]
- Agent Runtime Options [page 83]

### 2.5.2.1 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 prior to 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.

2.5.2.2 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>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect to SAP HANA</td>
<td>○ System privilege: AGENT ADMIN</td>
</tr>
<tr>
<td></td>
<td>○ System privilege: ADAPTER ADMIN</td>
</tr>
</tbody>
</table>

- 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 when SAP HANA is On Premise [Command Line] [page 54].

Procedure

1. Start the command-line agent configuration tool.
2. Select 5 to enter the SAP HANA Connection menu.
3. Select 2 to connect to SAP HANA via TCP.
4. 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 Configure SSL when SAP HANA is On Premise [Command Line] [page 54].

5. 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

Prepare SSL when SAP HANA is on premise [page 31]
Start the Configuration Tool [Command Line] [page 52]

2.5.2.2.1 Configure SSL when SAP HANA is On Premise [Command Line]

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. The command-line configuration tool provides an interactive mode for configuring the SSL connection between the agent and the SAP HANA system, as well as discrete keystore actions for more complex configurations.

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.
Procedure

1. At the command line, navigate to <DPAgent_root>\bin.
2. Start the configuration tool with the --configAgentKeystore parameter.
   ○ On Windows, agentcli.bat --configAgentKeystore
   ○ On Linux, agentcli.sh --configAgentKeystore
3. Choose Configure SSL for TCP to enter the interactive configuration process.
4. Enter the SSL configuration information as prompted by the configuration tool.
   The required information may vary depending upon the options you choose for your landscape. For example, if you choose not to use a self-signed certificate, the configuration tool will generate a signing request and direct you through the signing process.

Results

The agent host is prepared for an SSL connection to SAP HANA on premise, and the agent can be fully configured.

Next Steps

If the connection does not work, or the configuration tool reports an error, recover the original configuration:

1. In the <DPAgent_root>/ssl directory, delete dpagent.cer and dpagent_req.cer.
2. Delete cacerts, and rename cacerts.bak to cacerts.
3. On the SAP HANA server, replace sapcli.pse with its backup.
5. Restart the agent.

2.5.2.3 Connect to SAP HANA on Cloud [Command Line]

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, all communication is initiated by the agent. 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 9: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
</table>
| Connect to SAP HANA            | ○ Application privilege: sap.hana.im.dp.admin::Administrator  
|                                 | ○ System privilege: AGENT ADMIN                        |
|                                 | ○ System privilege: ADAPTER ADMIN                      |
| Create Agent XS HANA User      | ○ System privilege: USER ADMIN                         |
|                                 | ○ Object privilege: EXECUTE on GRANT_APPLICATION_PRIVILEGE |

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

Table 10: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Messaging between the agent and SAP HANA on Cloud</td>
<td>○ Application privilege: sap.hana.im.dp.proxy::AgentMessaging</td>
</tr>
</tbody>
</table>

**Note**

The password for a new SAP HANA user expires according to the SAP HANA system’s password policy settings (default 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. Start the command-line agent configuration tool.
2. Select 5 to enter the SAP HANA Connection menu.
3. Select 1 to connect to SAP HANA via HTTP/S.
4. Specify whether to use HTTPS when connecting to SAP HANA.

**Note**

If the agent framework keystore does not already have the certificates for the SAP HANA server, the configuration tool will automatically download and import them during configuration.
5. Specify the hostname, port, and Agent Admin HANA User credentials for the SAP HANA server as prompted.
   The hostname should include the instance name. For example, `<your_instance_name>.hana.ondemand.com`.

6. If there is a firewall between the SAP HANA server and the agent, specify any required proxy information as prompted.

7. Specify the Agent XS HANA User credentials.
   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.

8. Specify whether the Agent XS HANA User is an existing user.
   - Enter `true` if the user already exists.
   - Enter `false` if you want the configuration tool to create a new Agent XS HANA User with the specified credentials.

   **Tip**
   This is generally only done during the initial configuration of an agent instance. If you are modifying the configuration of an existing agent instance, you will usually not need to create a new user.

### Results

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

### Related Information

- Download and Deploy the Data Provisioning Delivery Unit [page 23]
- Start the Configuration Tool [Command Line] [page 52]

### 2.5.2.4 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 Data Provisioning Agent**.

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

- `./dpagent_service.sh start`
- `./dpagent_service.sh stop`
- `./dpagent_service.sh restart`
- `./dpagent_service.sh ping`

Related Information

Start the Configuration Tool [Command Line] [page 52]

2.5.2.5 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>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register adapter</td>
<td>System privilege: AGENT ADMIN</td>
</tr>
</tbody>
</table>

- For SAP HANA on Cloud, the Agent XS HANA User must have the following roles or privileges.
Table 12: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register adapter</td>
<td>○ System privilege: AGENT.ADMIN</td>
</tr>
<tr>
<td>Messaging between the agent and SAP HANA on Cloud</td>
<td>○ Application privilege: sap.hana.im.dp.proxy::AgentMessaging</td>
</tr>
</tbody>
</table>

**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 fully qualify the agent hostname.
  - 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 will be restarted 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 is automatically restarted.

**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 will also be deleted, even if they are active.
2.5.2.6 Manage the Agent XS HANA User Credentials [Command Line]

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 command using the `--setSecureProperty` parameter.
   - On Windows, `agentcli.bat --setSecureProperty`
   - On Linux, `./agentcli.sh --setSecureProperty`
3. If you want to use a different Agent XS HANA User, 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 you may need to configure the real-time subscriptions again.

Related Information

Manage the Agent Service [Command Line] [page 57]
2.5.3 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, automated configuration, and so on.

Execute Single Configuration Commands [page 62]
Execute single commands to perform individual configuration tasks, or automate agent configuration by grouping multiple commands into a script.

Supported Configuration Functions [Batch] [page 63]
Perform configuration tasks by specifying a supported batch mode function.

Connecting to SAP HANA [Batch] [page 65]
Connect the Data Provisioning Agent to SAP HANA in batch mode by specifying additional parameters that depend on your scenario.

Manage the Agent XS HANA User Credentials [Batch] [page 69]
If the Agent XS HANA User password has changed or expired, you may need to update the credentials in the agent’s secure storage.

Parent topic: Configure the Data Provisioning Agent [page 38]

Related Information

Configuring the Agent in Graphical Mode [page 39]
Configuring the Agent in Command Line Interactive Mode [page 51]
Managing Agent Groups [page 70]
Manage Agents from the Data Provisioning Agent Monitor [page 78]
Agent Preferences [page 80]
Agent Runtime Options [page 83]
2.5.3.1 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 prior to 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 is executed without additional input.
2.5.3.2 Supported Configuration Functions [Batch]

Perform configuration tasks by specifying a supported batch mode function.

Table 13: Supported Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Additional Parameters and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>adapterStatus</td>
<td>Display the status of adapters on the agent instance.</td>
<td><strong>Restriction</strong>&lt;br&gt;The configuration tool must already be connected to SAP HANA for this function.</td>
</tr>
<tr>
<td>adapterVersions</td>
<td>Display the version of adapters on the agent instance.</td>
<td>(Optional)--adapter.name &lt;adapter_name&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong>&lt;br&gt;&lt;adapter_name&gt; must match the name displayed by adapterStatus. If you do not specify the --adapter.name parameter, all adapter versions are displayed.</td>
</tr>
<tr>
<td>agentComponentVersions</td>
<td>Display the version for all components of the agent instance.</td>
<td></td>
</tr>
<tr>
<td>agentPreferences</td>
<td>Set adapter framework preferences.</td>
<td>--D&lt;name&gt;=&lt;value&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For preference details, see Agent Preferences [page 80]</td>
</tr>
<tr>
<td>agentStatus</td>
<td>Display the status of the agent instance.</td>
<td></td>
</tr>
<tr>
<td>agentVersion</td>
<td>Display the version of the agent instance.</td>
<td></td>
</tr>
<tr>
<td>configureAdaptersKeystore</td>
<td>Configure the SSL keystore used by adapters on the agent instance.</td>
<td></td>
</tr>
<tr>
<td>configureAdaptersTruststore</td>
<td>Configure the SSL truststore used by adapters on the agent instance.</td>
<td></td>
</tr>
<tr>
<td>configureFrameworkKeystore</td>
<td>Configure the SSL keystore used by the agent framework.</td>
<td></td>
</tr>
<tr>
<td>connectHanaViaHTTP</td>
<td>Connect to the SAP HANA server using HTTP or HTTPS.</td>
<td>For parameter details, see Connecting to SAP HANA [Batch] [page 65]</td>
</tr>
<tr>
<td>connectHanaViaTCP</td>
<td>Connect to an on-premise SAP HANA server using TCP.</td>
<td>For parameter details, see Connecting to SAP HANA [Batch] [page 65]</td>
</tr>
<tr>
<td>deployAdapter</td>
<td>Deploy a custom adapter on the agent instance.</td>
<td>--adapter.filepath &lt;path_to_jar_file&gt;</td>
</tr>
<tr>
<td>pingAgent</td>
<td>Ping the agent instance to verify connectivity.</td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td>Description</td>
<td>Additional Parameters and Notes</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>registerAdapter</td>
<td>Register an adapter with the SAP HANA server.</td>
<td><code>--adapter.name &lt;adapter_name&gt;</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>&lt;adapter_name&gt;</code> must match the name displayed by <code>adapterStatus</code>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Restriction</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The configuration tool must already be connected to SAP HANA for this function.</td>
</tr>
<tr>
<td>registerAgent</td>
<td>Register the agent instance with the SAP HANA server.</td>
<td><code>-Dagent.name=&lt;agent_name&gt;</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td>For TCP only: <code>-Dagent.hostname=&lt;hostname&gt;</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Restriction</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The configuration tool must already be connected to SAP HANA for this function.</td>
</tr>
<tr>
<td>showAgentPreferences</td>
<td>Display agent framework preferences.</td>
<td></td>
</tr>
<tr>
<td>showKeystores</td>
<td>Display all keystores for the agent instance.</td>
<td></td>
</tr>
<tr>
<td>startAgent</td>
<td>Start the agent service.</td>
<td></td>
</tr>
<tr>
<td>stopAgent</td>
<td>Stop the agent service.</td>
<td></td>
</tr>
<tr>
<td>undeployAdapter</td>
<td>Undeploy a custom adapter from the agent instance.</td>
<td><code>--adapter.name &lt;adapter_name&gt;</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>&lt;adapter_name&gt;</code> must match the name displayed by <code>adapterStatus</code>.</td>
</tr>
<tr>
<td>unregisterAdapter</td>
<td>Unregister an adapter from the SAP HANA server.</td>
<td><code>--adapter.name &lt;adapter_name&gt;</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>&lt;adapter_name&gt;</code> must match the name displayed by <code>adapterStatus</code>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Restriction</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The configuration tool must already be connected to SAP HANA for this function.</td>
</tr>
</tbody>
</table>
### Accessing Help for Batch Functions

The configuration tool provides help for each supported command and function that includes required and optional parameters, as well as 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:

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

### 2.5.3.3 Connecting to SAP HANA [Batch]

Connect the Data Provisioning Agent to SAP HANA in batch mode by specifying additional 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 landscape scenario.

### Common Connection Parameters

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Dhana.server=&lt;hostname&gt;</td>
<td>Hostname of the SAP HANA server.</td>
</tr>
<tr>
<td>-Dhana.port=&lt;port&gt;</td>
<td>Port used to connect to the SAP HANA server.</td>
</tr>
<tr>
<td>-Dhana.admin.username=&lt;username&gt;</td>
<td>Name of the Agent Admin HANA User used to connect to the SAP HANA server.</td>
</tr>
<tr>
<td>-Dhana.admin.password=&lt;password_path&gt;</td>
<td>Path to the file that contains the Agent Admin HANA User password.</td>
</tr>
</tbody>
</table>
**Tip**

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

```sql
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 66]
Connecting to SAP HANA on Cloud [Batch] [page 67]

### 2.5.3.3.1 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>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect to SAP HANA</td>
<td>○ System privilege: AGENT ADMIN</td>
</tr>
<tr>
<td></td>
<td>○ System privilege: ADAPTER ADMIN</td>
</tr>
</tbody>
</table>

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

**Additional Connection Parameters**

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

Note

The agent host must already be configured for SSL.

Related Information

Prepare SSL when SAP HANA is on premise [page 31]

2.5.3.3.2 Connecting to SAP HANA on Cloud [Batch]

Connect to SAP HANA on cloud with the connectHanaViaHttp function of the command-line configuration tool.
In addition to the common parameters, additional 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 17: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect to SAP HANA</td>
<td>○ Application privilege:</td>
</tr>
<tr>
<td></td>
<td>sap.hana.im.dp.admin::Administrator</td>
</tr>
<tr>
<td></td>
<td>○ System privilege:AGENT ADMIN</td>
</tr>
<tr>
<td></td>
<td>○ System privilege:ADAPTER ADMIN</td>
</tr>
</tbody>
</table>
Table 18: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create Agent XS HANA User</td>
<td>○ System privilege: USER_ADMIN</td>
</tr>
<tr>
<td></td>
<td>○ Object privilege: EXECUTE on</td>
</tr>
<tr>
<td></td>
<td>GRANT_APPLICATION_PRIVILEGE</td>
</tr>
</tbody>
</table>

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

Table 19: Additional Parameters

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

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>
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 false
```

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 true
```

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>
```

2.5.3.4 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.

2.5.4 Managing Agent Groups

Agent grouping provides fail-over capabilities by combining individual Data Provisioning Agents installed on separate host systems.

⚠️ Restriction

Data Provisioning Agent groups do not provide load balancing.

Planning considerations

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

- 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.

Agent Group Failover Behavior [page 71]
When an agent node in an agent group is inaccessible for a time longer than the configured heart beat time limit, the Data Provisioning Server chooses a new active agent within the group and resumes replication for any remote subscriptions active on the original agent.

Create or Remove an Agent Group [page 72]
You can create a new agent group or remove an existing group in the Data Provisioning Agent Monitor.

Manage Agent Nodes in an Agent Group [page 73]
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 75]
Before you can create remote sources on 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 76]
To receive the benefits of fail over from an agent group, you must configure your remote sources on the agent group.

Parent topic: Configure the Data Provisioning Agent [page 38]

Related Information

Configuring the Agent in Graphical Mode [page 39]
Configuring the Agent in Command Line Interactive Mode [page 51]
Configuring the Agent in Command Line Batch Mode [page 61]
Manage Agents from the Data Provisioning Agent Monitor [page 78]
Agent Preferences [page 80]
Agent Runtime Options [page 83]

2.5.4.1 Agent Group Failover Behavior

When an agent node in an agent group is inaccessible for a time longer than the configured heart beat time limit, the Data Provisioning Server chooses a new active agent within the group and 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 accessible agent in the group.

Restriction
Failover is not supported for initial and batch load requests. You must 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 master and slave agent node information.
To query the current master agent node name for a remote source:

```sql
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:

```sql
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's failover behavior, and a new active master node is selected.

### 2.5.4.2 Create or Remove an Agent Group

You can create a new 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>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
</table>
| Create agent group| • Role: sap.hana.im.dp.monitor.roles::Operations  
|                   | • Application privilege: sap.hana.im.dp.monitor::CreateAgentGroup  
|                   | • System privilege: AGENT ADMIN                                                  |
| Remove agent group| • Role: sap.hana.im.dp.monitor.roles::Operations  
|                   | • Application privilege: sap.hana.im.dp.monitor::DropAgentGroup  
|                   | • System privilege: AGENT ADMIN                                                  |
Context

Use the buttons in the Agent Group table to create or remove an agent group.

Procedure

- Click Create to create a new 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.

  **Note**
  When you remove an agent group, any agent nodes for the group will first be removed from the group. 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

- Smart Data Integration: CREATE AGENT GROUP [page 371]
- Smart Data Integration: DROP AGENT GROUP [page 380]

2.5.4.3 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>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create agent</td>
<td>- Role: sap.hana.im.dp.roles::Operations</td>
</tr>
<tr>
<td></td>
<td>- Application privilege: sap.hana.im.dp.monitor::CreateAgent</td>
</tr>
<tr>
<td></td>
<td>- System privilege: AGENT ADMIN</td>
</tr>
<tr>
<td>Action</td>
<td>Role or Privilege</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Add agent to agent group           | • Role: sap.hana.im.dp.roles::Operations  
• Application privilege: sap.hana.im.dp.monitor::AlterAgent  
• System privilege: AGENT ADMIN |
| Remove agent from agent group      | • Role: sap.hana.im.dp.roles::Operations  
• Application privilege: sap.hana.im.dp.monitor::AlterAgent  
• System privilege: AGENT ADMIN |

**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 78]
Smart Data Integration: CREATE AGENT [page 369]
2.5.4.4 Add Adapters to an Agent Group

Before you can create remote sources on 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 22: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add adapter to agent group</td>
<td>● System privilege: ADAPTER_ADMIN</td>
</tr>
</tbody>
</table>

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.
   ```sql
   SELECT AGENT_NAME, AGENT_GROUP_NAME FROM SYS."AGENTS";
   ```
3. Create the adapter on the first agent node.
   ```sql
   CREATE ADAPTER "<adapter_name>" AT location agent "<agent1_name>";
   ```
4. Add the agent to each additional agent node in the agent group.
   ```sql
   ALTER ADAPTER "<adapter_name>" ADD location agent "<agent#_name>";
   ```
2.5.4.5 Configure Remote Sources in an Agent Group

To receive the benefits of fail over from an agent group, you must configure your remote sources on 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`.

Configure Remote Sources in a 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:
     
     ```sql
     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:
     
     ```sql
     ALTER REMOTE SOURCE <source_name> ADAPTER <adapter_name> AT LOCATION AGENT GROUP <group_name> <configuration_clause> <credential_clause>
     ```
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>
```

For more information about the CREATE REMOTE SOURCE and ALTER REMOTE SOURCE statements, see the SAP HANA SQL and System Views Reference.

**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="cdd_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="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>
</ConnectionProperties>
```
<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>

(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>
</ConnectionProperties>'

i Note
Changing user names are not allowed when remote source is suspended.

2.5.5 Manage Agents from the Data Provisioning Agent Monitor

You can 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 23: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Data Provisioning Agent</td>
<td>• Role: sap.hana.im.dp.monitor.roles::Operations</td>
</tr>
<tr>
<td></td>
<td>• Application privilege: sap.hana.im.dp.monitor::CreateAgent</td>
</tr>
<tr>
<td></td>
<td>• System privilege: AGENT ADMIN</td>
</tr>
<tr>
<td>Alter Data Provisioning Agent</td>
<td>• Role: sap.hana.im.dp.monitor.roles::Operations</td>
</tr>
<tr>
<td></td>
<td>• Application privilege: sap.hana.im.dp.monitor::AlterAgent</td>
</tr>
<tr>
<td></td>
<td>• System privilege: AGENT ADMIN</td>
</tr>
<tr>
<td>Remove Data Provisioning Agent</td>
<td>• Role: sap.hana.im.dp.monitor.roles::Operations</td>
</tr>
<tr>
<td></td>
<td>• Application privilege: sap.hana.im.dp.monitor::DropAgent</td>
</tr>
<tr>
<td></td>
<td>• System privilege: AGENT ADMIN</td>
</tr>
</tbody>
</table>

### Context

Use the buttons in the *Agent Monitor* table to perform the action.

### Procedure

- **Click** *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, check *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.

- **Click** *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 cannot 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.

- **Click** *Drop Agent* to remove an agent from the SAP HANA system.
  - a. To automatically drop any dependent objects such as registered adapters, choose the *CASCADE option*.
     You cannot remove an agent while it has dependent objects such as registered adapters. First manually remove the adapters from the agent, or check the *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 is also removed from the agent group.
Task overview: Configure the Data Provisioning Agent [page 38]

Related Information

Configuring the Agent in Graphical Mode [page 39]
Configuring the Agent in Command Line Interactive Mode [page 51]
Configuring the Agent in Command Line Batch Mode [page 61]
Managing Agent Groups [page 70]
Agent Preferences [page 80]
Agent Runtime Options [page 83]

2.5.6 Agent Preferences

The agent preferences provide advanced configuration options for the Data Provisioning Agent. The method for accessing and modifying the agent preferences depends on the configuration mode that you choose to 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 24: Agent Preferences

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framework listener port</td>
<td>The port the agent monitors for requests from the SAP HANA server.</td>
<td>5050</td>
</tr>
<tr>
<td>framework.listenerPort</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>The Framework listener port should be SSL enabled for security.</td>
<td></td>
</tr>
<tr>
<td>Admin port</td>
<td>The local port used for internal communication between the agent and the agent configuration tool.</td>
<td>5051</td>
</tr>
<tr>
<td>framework.adminPort</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>The admin port should not be enabled within a firewall (that is, it should be blocked from outside access), in order to prevent unauthorized changes on the agent.</td>
<td></td>
</tr>
<tr>
<td>Worker thread pool</td>
<td>The number of worker threads.</td>
<td>10</td>
</tr>
<tr>
<td>framework.threadPoolSize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polling timeout</td>
<td>The length of time to perform a blocking wait on queue.</td>
<td>10</td>
</tr>
<tr>
<td>framework.pollingTimeout</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polling timeout unit</td>
<td>The unit used by the polling timeout.</td>
<td>SECONDS</td>
</tr>
<tr>
<td>framework.timeUnit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max data size in bytes</td>
<td>The maximum amount of data to fetch.</td>
<td>1000000000</td>
</tr>
<tr>
<td>framework.maxDataSize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row fetch size (max)</td>
<td>The maximum number of items (browse nodes or rows) to fetch from an adapter.</td>
<td>1000</td>
</tr>
<tr>
<td>framework.fetchSize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row fetch size (min)</td>
<td>The minimum number of rows to fetch from an adapter.</td>
<td>10</td>
</tr>
<tr>
<td>framework.min.fetchSize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key</td>
<td>Description</td>
<td>Default Value</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Max number of retries</td>
<td>The maximum number of times the agent tries to connect after a registration or ping failure.</td>
<td>10</td>
</tr>
<tr>
<td>framework.retry.maxTries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time to wait before retry</td>
<td>The amount of time to wait before retrying.</td>
<td>30</td>
</tr>
<tr>
<td>framework.retry.waitTime</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shared Directory for Agent Group</td>
<td>The shared directory for the agent group to which this agent instance belongs, if any.</td>
<td>None</td>
</tr>
<tr>
<td>framework.clusterSharedDir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logging level</td>
<td>The type of logging to perform for the agent:</td>
<td>TRACE</td>
</tr>
<tr>
<td>framework.log.level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log max backup</td>
<td>The number of log files to keep.</td>
<td>10</td>
</tr>
<tr>
<td>framework.log.maxBackupIndex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log file max size</td>
<td>The maximum file size, in MB or KB, that the log file should use.</td>
<td>10MB</td>
</tr>
<tr>
<td>framework.log.maxFileSize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trace message max size</td>
<td>Truncates after printing the specified number of characters when tracing is enabled.</td>
<td>1024</td>
</tr>
<tr>
<td>framework.trace.length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trace ping message</td>
<td>Enables printing the ping message. Valid only when tracing is enabled.</td>
<td>false</td>
</tr>
<tr>
<td>framework.trace.pingMessage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trace all data</td>
<td>Enables printing the content of the data (rows) being sent to server.</td>
<td>false</td>
</tr>
<tr>
<td>framework.trace.data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max HTTP Connection per route</td>
<td>The number of maximum connections to be created by internal HTTP client.</td>
<td>20</td>
</tr>
<tr>
<td>cloud.defaultMaxPerRoute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max available HTTP connection</td>
<td>The maximum number of connections.</td>
<td>20</td>
</tr>
<tr>
<td>cloud.maxTotal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proxy type</td>
<td>The type of proxy being used.</td>
<td>http</td>
</tr>
<tr>
<td>proxyType</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proxy Host</td>
<td>The hostname of the proxy being used.</td>
<td></td>
</tr>
<tr>
<td>proxyHost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proxy Port</td>
<td>The port used by the proxy.</td>
<td></td>
</tr>
<tr>
<td>proxyPort</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Proxy Hosts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nonProxyHosts</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Key

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum open socket connections</td>
<td>framework.so.maxOpenConnection</td>
<td></td>
</tr>
</tbody>
</table>

Parent topic: Configure the Data Provisioning Agent [page 38]

Related Information

- Configuring the Agent in Graphical Mode [page 39]
- Configuring the Agent in Command Line Interactive Mode [page 51]
- Configuring the Agent in Command Line Batch Mode [page 61]
- Managing Agent Groups [page 70]
- Manage Agents from the Data Provisioning Agent Monitor [page 78]
- Agent Runtime Options [page 83]

#### 2.5.7 Agent Runtime Options

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

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 choose to 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 will prompt you for any information required for the runtime option that you want to modify.

**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 16GB on Windows:

```
agentcli.bat --configAgentIniFile --function setDPAgentMemory -Ddpagent.vm.xmx=16g
```
## Supported Runtime Options

Table 25: Agent Runtime Options

<table>
<thead>
<tr>
<th>Option and Function</th>
<th>Description and Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear DPAgent Cache on Next Start</td>
<td>By enabling this option, the next time the agent is restarted any cached agent, OSGi, and Eclipse runtime data is removed and the caches are reinitialized.</td>
</tr>
<tr>
<td></td>
<td><strong>Caution</strong></td>
</tr>
<tr>
<td></td>
<td>Do not enable this option unless instructed to do so by SAP Support.</td>
</tr>
<tr>
<td>Switch Java Virtual Machine</td>
<td>Update the version of the SAP JVM used by an installed agent, or replace it with a custom Java Runtime Environment.</td>
</tr>
<tr>
<td>changeDefaultJVM</td>
<td>The SAP JVM is bundled with the Data Provisioning Agent and used as the default Java Runtime Environment.</td>
</tr>
<tr>
<td></td>
<td>-Ddpagent.vm.directory=&lt;jvm_path&gt;</td>
</tr>
<tr>
<td>Switch DPAgent Log Directory</td>
<td>Modify the location of the root directory where all agent-related log files are generated.</td>
</tr>
<tr>
<td>changeLogDirectory</td>
<td>The default root log path is &lt;DPAgent_root&gt;/log.</td>
</tr>
<tr>
<td></td>
<td>-Ddpagent.log.directory=&lt;log_root_path&gt;</td>
</tr>
<tr>
<td>Change DPAgent Max Available Memory</td>
<td>Modify the maximum amount of memory that can be used by the agent.</td>
</tr>
<tr>
<td>setDPAgentMemory</td>
<td>-Ddpagent.vm.vmx=&lt;amount&gt;</td>
</tr>
<tr>
<td></td>
<td>For example, for 16GB, 16g.</td>
</tr>
<tr>
<td>Enable Remote Debugging</td>
<td>Assists SAP Support in troubleshooting agent-related issues.</td>
</tr>
<tr>
<td>enableRemoteDebugging</td>
<td>-Ddpagent.remoteDebugging.port=&lt;port_number&gt;</td>
</tr>
<tr>
<td></td>
<td>-Ddpagent.remoteDebugging.suspend=&lt;value&gt;</td>
</tr>
<tr>
<td></td>
<td>Available values: <strong>true</strong> or <strong>false</strong></td>
</tr>
<tr>
<td><strong>Caution</strong></td>
<td>Do not enable this option unless instructed to do so by SAP Support.</td>
</tr>
</tbody>
</table>
## Option and Function

<table>
<thead>
<tr>
<th>Option and Function</th>
<th>Description and Parameters</th>
</tr>
</thead>
</table>
| **Inject System Property**  
injectSystemProperty | Enables runtime JVM system properties.  
- `Ddpagent.system.key=<value>`  
- `Ddpagent.system.value=<value>`  

**Caution**  
Do not enable this option unless instructed to do so by SAP Support. |
| **Revert dpagent.ini to original state**  
setCleanParameter | Removes any changes to the agent runtime options and reverts the dpagent.ini to its original state. |

**Parent topic:** [Configure the Data Provisioning Agent](page_38)

### Related Information

- Configuring the Agent in Graphical Mode [page 39]
- Configuring the Agent in Command Line Interactive Mode [page 51]
- Configuring the Agent in Command Line Batch Mode [page 61]
- Managing Agent Groups [page 70]
- Manage Agents from the Data Provisioning Agent Monitor [page 78]
- Agent Preferences [page 80]

## 2.6  Register Data Provisioning Adapters

After configuring the Data Provisioning Agent, deploy and register adapters.

### Prerequisites

- Install and configure the data provisioning agent
- If required, download and install any necessary JDBC libraries. For information about the proper JDBC library for your source, see the Product Availability Matrix (PAM).
Procedure

1. Register the adapter.
2. If necessary, configure the source system to which the adapter connects. For example, log reader adapters require source configuration to enable realtime replication.

Next Steps

Create a remote source in SAP HANA.

**Note**
The OData adapter is not part of the Data Provisioning Agent installation. The OData adapter is installed with the SAP HANA server and requires configuration that cannot 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 1GB. To prevent this limitation, set the option to `LOB`. This applies to all adapters.

Task overview: Configure Smart Data Integration [page 17]

Previous: Configure the Data Provisioning Agent [page 38]

Next task: Create a Remote Source [page 90]

Related Information

- Register Adapters with SAP HANA [page 87]
- Register Adapters with SAP HANA [Command Line] [page 88]
- SAP HANA Smart Data Integration Product Availability Matrix
- OData Adapter [page 249]
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 26: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register an adapter</td>
<td>• System privilege: ADAPTER_ADMIN</td>
</tr>
<tr>
<td></td>
<td>• Application privilege: sap.hana.im.dp.admin::Administrator</td>
</tr>
</tbody>
</table>

**Note**

This application privilege is required only for SAP HANA in the cloud.

**Note**

Before you register the adapter with the SAP HANA system, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the Product Availability Matrix (PAM).

Place your JDBC library in `<DPAgent_root>/lib`, and you may need to manually create the `/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.

**Note**

SAP-delivered data provisioning adapters are automatically deployed on the agent during agent installation.

3. Select the adapter to register and click **Register Adapter**.
4. If required, configure the source system to which the adapter connects.

   For example, log reader adapters require source configuration to enable realtime replication.

   For complete information about source system configuration, see the relevant section for each adapter in “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 119]
Start and Connect the Configuration Tool [page 39]
Adapter Preferences [page 311]

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 27: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Register an adapter</td>
<td>• System privilege: ADAPTER_ADMIN</td>
</tr>
<tr>
<td></td>
<td>• Application privilege: sap.hana.im.dp.admin::Administrator</td>
</tr>
</tbody>
</table>

Note
This application privilege is required only for SAP HANA in the cloud.
Procedure

1. Start the command-line agent configuration tool and connect to SAP HANA.
2. For custom adapters, select 8 to enter the Custom Adapters menu.
   
   Note
   SAP-delivered data provisioning adapters are automatically deployed on the agent during agent installation.

   a. Select 1 to deploy a custom adapter.
   b. Specify the location of the adapter JAR files.
   c. Select b to return to the main menu.
3. Select 7 to enter the Adapter Registration menu.
4. Select 2 to register an adapter.
5. Specify the name of the adapter to register with SAP HANA.
   
   Note
   The adapter name must match the name displayed by the Display Adapters option.

6. If required, configure the source system to which the adapter connects.
   For example, log reader adapters require source configuration to enable realtime replication.
   For complete information about source system configuration, see the relevant section for each adapter in “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 119]  
Start the Configuration Tool [Command Line] [page 52]  
Adapter Preferences [page 311]

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 28: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a remote source</td>
<td>System privilege: CREATE REMOTE SOURCE</td>
</tr>
</tbody>
</table>

- 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 91]  
How to create a remote source in SAP HANA smart data integration with the Web-based Development Workbench user interface.
Create a Remote Source in the SQL Console [page 92]

In SAP HANA smart data integration, in addition to using the Web-based Development Workbench to create a remote source, you can also do so using the SQL console.

Create Credentials for a Secondary User [page 94]

The syntax for creating secondary user credentials for SAP HANA smart data integration adapters is different than the syntax for SAP HANA system adapters.

Task overview: Configure Smart Data Integration [page 17]

Previous task: Register Data Provisioning Adapters [page 85]

Next: Set Up Data Provisioning Monitoring [page 94]

2.7.1 Create a Remote Source in the Web-based Development Workbench

How to create a remote source in SAP HANA smart data integration with the Web-based Development Workbench user interface.

Prerequisites

The user who creates the remote source must have the following roles or privileges.

Table 29: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a remote source</td>
<td>• System privilege: CREATE REMOTE SOURCE</td>
</tr>
</tbody>
</table>

Procedure

1. In the Web-based Development Workbench Catalog editor, expand the Provisioning node.
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 only be used for querying virtual tables.
   ◦ If the remote source will be 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.
Related Information

Configure Data Provisioning Adapters [page 119]
CREATE REMOTE SOURCE Statement [Smart Data Integration] (SAP HANA SQL and System Views Reference) [page 373]

2.7.2 Create a Remote Source in the SQL Console

In SAP HANA smart data integration, in addition to using the Web-based Development Workbench to create a remote source, you can also do so using the SQL console.

Prerequisites

The user who creates the remote source must have the following roles or privileges.

Table 30: Roles and Privileges

<table>
<thead>
<tr>
<th>Action</th>
<th>Role or Privilege</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create a remote source</td>
<td>● System privilege: CREATE REMOTE SOURCE</td>
</tr>
</tbody>
</table>

Context

To create an remote source using the SQL console, you need to know the connection information that is particular to 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:

- Note that if you have recently updated the Data Provisioning Agent, the connection information XML string might have also 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. (To ensure you can view the entire XML string in the CONNECTION_INFO column, in 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 (displayName). For example:

```
<PropertyEntry name="pds_database_name" displayName="Database Name"></PropertyEntry>
<PropertyEntry name="pdb_dcmode" displayName="Database Data Capture Mode">MSCDC</PropertyEntry>
```

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="data_type_covation" displayName="Data Type Covation">
      <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 processing errors">false</PropertyEntry>
      </PropertyGroup>
    </PropertyGroup>
  </ConnectionProperties>
  'WITH CREDENTIAL TYPE 'PASSWORD' USING
    '<?CredentialEntry name="credential">
      <user>myuser</user>
      <password>mypassword</password>
    </CredentialEntry>'
```

Related Information

Configure Data Provisioning Adapters [page 119]
Update the Data Provisioning Agent [page 113]
CREATE REMOTE SOURCE Statement [Smart Data Integration] (SAP HANA SQL and System Views Reference) [page 373]
### 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 than the syntax for SAP HANA system adapters.

The syntax for creating secondary user credentials for SAP HANA smart data integration adapters is as follows.

```xml
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>
```

### 2.8 Set Up Data Provisioning Monitoring

After you install the SAP HANA smart data integration option for SAP HANA, you must take several actions to enable and access the monitoring user interfaces for Data Provisioning agents, remote subscriptions, and tasks.

These actions will allow you to access the Data Provisioning monitors by either typing the URL directly in your browser or through tiles in SAP HANA Cockpit.

- **Grant Roles to Users [page 95]**
  
  You must grant the appropriate roles to users who will perform the various tasks to set up Data Provisioning monitoring in SAP HANA Cockpit.

- **Assign Catalog to Data Provisioning Monitoring Role [page 96]**
  
  This procedure uses the Role-Based Authorization (RBA) user interface to assign the SAP HANA Data Provisioning Monitoring catalog to the role `sap.hana.im.dp.roles::Monitoring`.

- **Add Data Provisioning Tiles to the SAP HANA Cockpit [page 97]**
  
  Create a Data Provisioning group in the SAP HANA Cockpit and add the Data Provisioning tiles to the group to enable monitoring of Data Provisioning agents, remote subscriptions, and tasks.

**Parent topic:** Configure Smart Data Integration [page 17]

**Previous task:** Create a Remote Source [page 90]

**Next:** Enabling Enterprise Semantic Services [page 97]

**Related Information**

- Download and Deploy the Data Provisioning Delivery Unit [page 23]
2.8.1 Grant Roles to Users

You must grant the appropriate roles to users who will perform the various tasks to set up Data Provisioning monitoring in SAP HANA Cockpit.

Prerequisites

Ensure that you have 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.uis.db::SITE_DESIGNER` to the user who will do the RBA (Role-Based Authorization) UI configuration.
3. Grant the role `sap.hana.im.dp.monitor.roles::Monitoring` to the user who will add the Data Provisioning tiles to SAP HANA Cockpit and will also 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` will allow the user to access the SAP HANA Data Provisioning monitoring user interfaces.

Next Steps

To use the Data Provisioning Monitoring user interface through the SAP HANA Cockpit you must also assign the appropriate catalog to this monitoring role (Assign Catalog to Data Provisioning Monitoring Role [page 96]). However, users can also 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`
2.8.2 Assign Catalog to Data Provisioning Monitoring Role

This procedure uses the Role-Based Authorization (RBA) user interface to assign the SAP HANA Data Provisioning Monitoring catalog to the role `sap.hana.im.dp.roles::Monitoring`.

Prerequisites

You have the role `sap.hana.uis.db::SITE_DESIGNER`. For information about how to grant this role, see Grant Roles to Users [page 95].

Context

To configure the RBA for the SAP HANA Data Provisioning catalog in SAP HANA Cockpit:

Procedure

1. To launch the RBA user interface, type the following URL address into a web browser:
   
   `http://<host>:80<2-digit instance>/sap/hana/uis/clients/role-editor/RoleEditor.html?scenario=onPremise`

2. Log in with a user name that has the role `sap.hana.uis.db::SITE_DESIGNER`.

3. In the Roles pane on the left, go to the role `sap.hana.im.dp.monitoring.roles::Monitoring` and select it. You can search for this role using the search text box in the Roles pane.

4. To assign the catalogs to this role, click on the “+” button next to Assigned Catalogs. A list of catalogs appears.

5. Select `HANA Enterprise Information Management Data Provisioning Monitoring` from the list of catalogs. You may select other catalogs if you wish to use their tiles in the SAP HANA Cockpit.

6. When you are done selecting catalogs, click OK.
2.8.3 Add Data Provisioning Tiles to the SAP HANA Cockpit

Create a Data Provisioning group in the SAP HANA Cockpit and add the Data Provisioning tiles to the group to enable monitoring of Data Provisioning agents, remote subscriptions, and tasks.

Prerequisites

- You have the role `sap.hana.im.dp.roles::Monitoring`
- The role `sap.hana.im.dp.roles::Monitoring` has been authorized to catalog `HANA Data Provisioning Monitoring`.

Procedure

1. Launch SAP HANA Cockpit by taking one of the following actions:
   - In the `Systems` view of SAP HANA studio, right-click the name of your SAP HANA server and choose `Configuration and Monitoring` > `Open SAP HANA Cockpit`.
   - In a web browser, type the following URL address:
     `http://<<host name>:80<2 digit instance number>/sap/hana/admin/cockpit`
2. Log in to SAP HANA Cockpit with a user name that has the role `sap.hana.im.dp.roles::Monitoring`.
   
   **Note**
   
   If you cannot launch SAP HANA Cockpit, then ask your administrator to grant you either the application privilege `sap.hana.admin::Monitoring` or the role `sap.hana.admin.roles::Monitoring`.
3. Click on the `Show/hide group panel` icon in the upper left corner to display options `New Group` and `Tile Catalog`.
4. Click `New Group` and enter a name.
5. Click `Tile Catalog` to display the tiles in the catalog `HANA Data Provisioning Monitoring`.
6. To add each tile (Agent Monitor, Remote Subscription Monitor, Task Monitor, and Smart Data Integration for Documentation):
   a. Click the “+” icon at the bottom of the tile.
   b. On the `Add Tile To Groups` window, select the name of your group and click `OK`.
   As you add each tile, the “+” icon turns into a checkmark.
7. Click `Home` to access your group and tiles.

2.9 Enabling Enterprise Semantic Services

(Optional) 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:
About SAP HANA Enterprise Semantic Services

What is Enterprise Semantic Services and what can it do for my applications?

The Enterprise Semantic Services component supports both on-premise (single database and multitenant) and SAP HANA cloud platform deployments.

Download Enterprise Semantic Services Delivery Unit

Download the Enterprise Semantic Services delivery unit and deploy it to enable semantic searches of data sources.

Importing the Enterprise Semantic Services Delivery Unit

To install Enterprise Semantic Services (ESS), after downloading the ESS delivery unit, you then import it.

Install or Upgrade Enterprise Semantic Services

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

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

These instructions describe the process to permanently uninstall Enterprise Semantic Services, for example in the case of an upgrade.

Parent topic: Configure Smart Data Integration

Previous: Set Up Data Provisioning Monitoring

Next: Enable SAP HANA Smart Data Integration REST API

Related Information

SAP HANA Enterprise Semantic Services JavaScript API Reference
SAP HANA Enterprise Semantic Services REST API Reference

2.9.1 About SAP HANA Enterprise Semantic Services

What is Enterprise Semantic Services and what can it do for my applications?

The growing volume of data in many enterprises has made it harder to leverage tasks such as:
Get a global view of data

Find specific content

Understand where a given dataset comes from

Make use of the data for business decisions

For example, a business user wants to analyze insurance claims and is looking for an analytical model that fits her needs. She has access to hundreds of SAP HANA views that involve insurance claims, but which ones should she use? SAP HANA Enterprise Semantic Services prevents her from having to browse through numerous views and documentation and simply do a semantic search for the most relevant view.

Another example might be a business analyst who wants to acquire data from a remote system to create an SAP HANA view with vendor information. He also wants to make the view easily findable by others. He can use SAP HANA Enterprise Semantic Services search functionality to find the most relevant remote objects to acquire and publish that dataset to a knowledge graph so it is available to others. This facilitates the retrieval of remote data without having to create unnecessary additional virtual tables.

Specifically, SAP HANA Enterprise Semantic Services includes services that provide:

- **Search**: Enable semantic searches for objects such as tables and views. The semantic search service enables applications to submit natural language keyword search queries and combines SAP HANA linguistic text search capabilities with the semantics contained in the knowledge graph to retrieve the datasets that are most relevant to the query.

- **Profiling**: When acquiring a dataset, Enterprise Semantic Services profiles the data to determine the content type (also known as business type) of each column in a table (for example, ADDRESS or COUNTRY). This content type identification service automatically and interactively identifies the content types associated with the columns of any user-provided dataset (for example a Microsoft Excel file uploaded to SAP HANA).

- **Publishing**: An SAP HANA administrator or an application that uses the Enterprise Semantic Services API publishes a user-defined dataset to extract its semantics to the knowledge graph, which makes the dataset available for semantic search, data lineage, and join services, for example.

- **Joins**: Expand a dataset by adding columns from another dataset. For example, in SAP Agile Data Preparation, when merging two worksheets, the application suggests a join column in each worksheet based on the content type.

- **Object-level data lineage**: Enterprise Semantic Services provides several table functions that let you get data lineage information about SAP HANA catalog objects consisting of SAP HANA column views and activated SQL views.

*Note*

Not all applications that use Enterprise Semantic Services employ all of these services.

### 2.9.2 Setting Up the SAP HANA Instance for Enterprise Semantic Services

The Enterprise Semantic Services component supports both on-premise (single database and multitenant), and SAP HANA cloud platform deployments.

For details on supported versions, see the Product Availability Matrix at [https://apps.support.sap.com/sap(bD1IiZjPTAwMQ==)/support/pam/pam.html?smrsrv=https%3A%2F%2Fwebsmp202.sap-ag.de&pvnr=7355490010090000125&pt=g%7Cd#pvnr=7355490010090000125&ts=0&pt=g%7Cd](https://apps.support.sap.com/sap(bD1IiZjPTAwMQ==)/support/pam/pam.html?smrsrv=https%3A%2F%2Fwebsmp202.sap-ag.de&pvnr=7355490010090000125&pt=g%7Cd#pvnr=7355490010090000125&ts=0&pt=g%7Cd)
2.9.2.1 On Premise Single Database Deployment

For a single database deployment, Enterprise Semantic Services requires the SAP HANA job scheduler and script server.

Context

Perform the following procedures to set up the SAP HANA instance for Enterprise Semantic Services in an on premise single database deployment.

Procedure

1. Enable the XS Job Scheduler.
2. Enable the Script Server.

2.9.2.1.1 Enable the XS Job Scheduler

Enable the XS Job Scheduler for Enterprise Semantic Services.

Context
Procedure

1. Log in to SAP HANA studio as the SYSTEM user or user name with the equivalent SYSTEM privileges.
2. Navigate to the appropriate .ini element and set the parameters as follows.
   a. Double-click your system in the Systems view.
   b. Choose the Configuration tab.
   c. Expand the xsengine.ini element, and go to the scheduler section.
   d. Set the Enabled parameter to true.
   e. Set the sessiontimeout parameter to 36000.

   **Note**
   If the scheduler section does not exist, create it and set its parameters with the following steps:

   1. Right-click xsengine.ini and select Add Section.
   2. Type scheduler for Section Name and click Next.
   3. Click Next on the Scope Selection dialog.
      Type Enabled for Key and type true for Value.
   4. Click Add New Pair.
   5. Type sessiontimeout for Key and type 36000 for Value.
      Set the sessiontimeout parameter to 36000.
   6. Click Finish.

3. Alternatively, you can open the SQL console of the SAP HANA studio and execute the following statements:

   ```sql
   ALTER SYSTEM ALTER CONFIGURATION ('xsengine.ini', 'SYSTEM')
   SET ('scheduler', 'enabled')='true' with reconfigure;
   
   ALTER SYSTEM ALTER CONFIGURATION ('xsengine.ini', 'SYSTEM')
   SET ('scheduler', 'sessiontimeout')='36000';
   ```

2.9.2.1.2 Enable the Script Server

Enable the Script Server if you will be using smart data quality.

Context

If the smart data quality component of SAP HANA Enterprise Information Management is already installed, you do not need to enable the Script Server.
Procedure

1. Log in to SAP HANA studio as the SYSTEM user or user name with the equivalent SYSTEM privileges.
2. Double-click your system in the Systems view.
3. In the Administration editor, choose the Configuration tab.
4. Expand the daemon.ini configuration file, and expand the scriptserver section.
5. Select Instances, right click, and choose Change.
6. Set the Instances parameter to 1.

2.9.2.2 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 HANA instance has been installed with multiple containers
- At least one tenant database container (for example, DB0) has been created

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:
   ```sql
   ALTER DATABASE DB0 ADD 'scriptserver';
   ```
   **Note**
   If the Smart Data Quality component is already installed, then the scriptserver service is already added.

2. Configure HTTP access to Multitenant Database Containers.
   Use the information in the topic "Configure HTTP Access to Multitenant Database Containers" in SAP HANA Administration Guide.
   **Note**
   To determine the port of the XS engine service used by a particular tenant database, use the following SQL query:
   ```sql
   SELECT
   ```
3. Add the tenant database alias names that you configured in step 2 using the parameter SRCVHOST to your Domain Name System (DNS).

2.9.3 Download Enterprise Semantic Services Delivery Unit

Download the Enterprise Semantic Services delivery unit and deploy it to enable semantic searches of data sources.

Context

The HANA_IM_ESS delivery unit is included with the smart data integration (SDI) download package.

Procedure

1. Go to the SAP Software Download Center.
2. Select Software Downloads.
3. Select the Support Packages & Patches tab, expand By Alphabetical Index (A-Z), and select H.
4. Scroll down and select SAP HANA SDI ➔ SAP HANA SDI 1.0 ➔
5. Select Comprised Software Component Versions ➔ HANA ESS 1.0 ➔ # OS independent ➔ SAP HANA database ➔
6. From the list of 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.
7. Click the Add Selected Items to Download Basket icon.
8. Select Download Basket and select Download Manager to start the download process.
9. In the downloaded ZIP file, locate the HANAIMESS.tgz file and extract it.
2.9.4 Importing the Enterprise Semantic Services Delivery Unit

To install Enterprise Semantic Services (ESS), after downloading the ESS delivery unit, you then import it.

You can import the delivery using one of two interfaces:

- SAP HANA studio
- SAP HANA Application Lifecycle Management

2.9.4.1 Import the 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.

### 2.9.4.2 Import the 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.

**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 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.
2.9.5 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, then 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, then follow this procedure, which requires the installation script install.html.

Procedure

1. Access the ESS installation URL using the following structure: http(s)://<hostname>:<port>/sap/hana/im/ess/setup/install.html
   Refer to the SAP HANA Administration Guide for HTTP access requirements regarding SSL, port numbers, and multitentnant 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 time of the installation.
3. On the Welcome page, click Run ESS Setup.
   You can monitor the details of the installation status.
4. You are prompted to set the password for ESS technical users. Enter a password 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 you can monitor the installation status by accessing the install.html URL. Any errors will display with messages for corrective actions.

Related Information

Uninstall Enterprise Semantic Services [page 108]

2.9.6 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 that has the EXECUTE privilege on the GRANT_ACTIVATED_ROLE procedure.
2. In the Systems view, expand your SAP HANA server name and expand Security.
3. For each user, do the following steps to grant the roles described in the table.
   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.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sap.hana.im.ess.roles::Administrator</td>
<td>For users who will access the Enterprise Semantic Services Administration user interface</td>
</tr>
<tr>
<td>sap.hana.im.ess.roles::Publisher</td>
<td>For users who will access the Enterprise Semantic Services publication API to define content to be published in the knowledge graph</td>
</tr>
<tr>
<td>sap.hana.im.ess.roles::User</td>
<td>For users who will access the Enterprise Semantic Services consumption (read-only) APIs such as Search, Autocomplete, and content-type identification (CTID)</td>
</tr>
</tbody>
</table>
2.9.7 Uninstall Enterprise Semantic Services

These instructions describe the process to 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 who will 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 deletion.
2. Remove 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.
3 Configure Smart Data Quality

To take advantage of smart data quality functionality, you will need to perform a few tasks.

You must do the following to use smart data quality:

- Enable the Script Server
- Download and deploy the smart data quality directories
- (Optional) Set alerts to inform you when the directories will expire

Related Information

Enable the Script Server [page 110]
Download and Deploy Directory Files [page 111]
Update Directories [page 112]

3.1 Enable the Script Server

Enable the Script Server if you will be using smart data quality.

Context

If the smart data quality component of SAP HANA Enterprise Information Management is already installed, you do not need to enable the Script Server.

Procedure

1. Log in to SAP HANA studio as the SYSTEM user or user name with the equivalent SYSTEM privileges.
2. Double-click your system in the Systems view.
3. In the Administration editor, choose the Configuration tab.
4. Expand the daemon.ini configuration file, and expand the scriptserver section.
5. Select Instances, right click, and choose Change.
6. Set the Instances parameter to 1.
3.2 Download and Deploy Directory Files

Download and deploy optional directories to take advantage of smart data quality functionality.

Context

The Cleanse and Geocode nodes rely on reference data found in directories you download and deploy to the SAP HANA server.

If reference data is not provided, the Cleanse node will perform parsing, but it will not do assignment. Additionally, you will be able to create and activate flowgraphs that include the Geocode node, but their execution will fail.

You may need to download multiple directories, depending on your license agreement. You need to follow steps 4-8 for each of the directories that you need to download.

i Note

We recommend that, before you install your directories, you stop the Script server, and then restart it once the installation is complete. We also recommend restarting the SAP HANA database after installing and making sure that you do not have any running flowgraph tasks.

Procedure

2. Click Software Downloads.
3. Click the Installation and Upgrades tab, expand By Alphabetical Index (A-Z), and click ADDRESS DIRECTORIES & REFERENCE DATA.
4. Click <directory_name>. (For example, SAP ADDR DIR ALL WORLD 4.X)
5. Click <directory_name> again to display the list of download files.
6. Click the check box to the left of the item or items that you want to install, and choose Download from the action menu.
7. To download directories, click the Address Directories & Reference Data link above the Downloads section.
8. Follow steps 4-8 for each directory as needed.
9. Run the Download Manager to start the download process.
10. Once they have been downloaded, extract the directory files, and then copy and paste all of the files (some examples these file extensions include .dir, .shs, .dpv and so on) into the following SAP HANA Server installation location:

/usr/sap/<SID>/SYS/global/hdb/IM/reference_data
Next Steps

Note

If you need to change the directory location, you can do so by running the following:

```
ALTER SYSTEM ALTER CONFIGURATION
('scriptserver.ini', 'SYSTEM') SET ('adapter_framework',
'dq_reference_data_path')='<Your Path>' WITH RECONFIGURE;
```

Related Information

Address Directories & Reference Data

3.3 Update Directories

Be aware of the following when updating your directories.

To update, remove, or add reference data to the existing directories, create a new directory location. Copy and paste any unchanged data to the new directory location, and add any new or updated directories. Then make sure to update the directory location of the dq_reference_data in your SAP HANA applications to reference the new location.

Changing the reference data path will drop all cached operations (if cache is enabled), and recreate the cache. We recommend that you update the dq_reference_data path when flowgraph task plans are not running, or when the server is not busy.

You can also set alerts to inform you when the directories will expire.
4 Update the Data Provisioning Agent

You can 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 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, you should also 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, 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` with 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 Linux, start the Agent service.

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`.

7. Apply new adapter capabilities.

To allow SAP HANA to detect any new adapter capabilities, use the SQL console in the SAP HANA Studio or Web-based Development Workbench.

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, you only need to refresh each adapter a single time with an upgraded agent. Refreshing the adapters with each agent is not 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 have not upgraded all agents, do that first and then return to this section.

After all agents have been upgraded, use the SQL console in the SAP HANA Studio or Web-based Development Workbench 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.

Related Information

Update the SAP ASE Adapter Preferences [page 115]

4.1 Update the SAP ASE Adapter Preferences

After updating the Data Provisioning Agent, you must update the SAP ASE Adapter Preferences before you can use it in SAP HANA smart data integration processes.

Procedure

1. Add the following line to `<DPAgent_root>/adapters/cppframework.props`:

   ```
   ASEAdapter.ld_library_path=<installpath>/Sybase/ci/64bit,<installpath>/Sybase/OCSS-16_0/lib,<installpath>/Sybase/OCSS-16_0/lib3p64
   ```

   Replace `<installpath>` with the actual path to the Data Provisioning Agent installation.

2. Add the following lines to `<DPAgent_root>/bin/dpagent_env.sh`:

   ```
   SYBASE=<installpath>/Sybase
   ```
export SYBASE
SYBASE_OCS=OCS-16_0
export SYBASE_OCS

Replace `<installpath>` with the actual path to the Data Provisioning Agent installation.

3. Add the following lines to `<DPAgent_root>/Sybase/interfaces`:

```
ASEAdapterOCSserver
master tcp ether <hostname> <adapterAgentPort>
query tcp ether <hostname> <adapterAgentPort>
```

Replace `<hostname>` with the host name or IP address of the Data Provisioning Agent host machine, and `<adapterAgentPort>` with the port number configured for the Data Provisioning Agent.
5 Uninstall the Data Provisioning Agent

You can uninstall the Data Provisioning Agent in graphical mode on Windows and Linux.

Procedure

- On Windows, call the uninstallation program from Control Panel.
  
  ![Programs and Features SAP HANA Data Provisioning Agent Uninstall]

- On Linux, call the uninstallation program from the command line.
  
  a. Navigate to the `<DPAgent_root>/install` directory.
     
     For example, `/usr/sap/dataprovagent/install`.
  b. Run `./hdbuninst --main SDB::Install::App::Gui::Uninstallation::main --path "<DPAgent_root>"`.

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 may be 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/`

Related Information

Uninstall from the Command Line [page 118]
5.1 Uninstall from the Command Line

If you cannot use or do not want to use the graphical uninstallation mode, you can uninstall the Data Provisioning Agent using the command line.

Procedure

1. Navigate to the `<DPAgent_root>/install` directory. For example, `C:\usr\sap\dataprovagent\install` or `/usr/sap/dataprovagent/install`.

2. Call the uninstallation program.
   - On Windows, run `hdbuninst.exe --path "<DPAgent_root>"`.
   - On Linux, run `./hdbuninst --path "<DPAgent_root>"`.

Results

The Data Provisioning Agent is uninstalled from the system without displaying the graphical uninstallation manager.
6 Configure Data Provisioning Adapters

Data provisioning adapters connect to a sources and move data into SAP HANA.

The adapters in the following table are delivered with the Data Provisioning Agent. For information about configuring each adapter, see the individual adapter documentation in this guide.

For information about using adapters, see the Modeling Guide for SAP HANA Smart Data Integration and SAP HANA Smart Data Quality.

If the source you are using is not in the list, 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 SAP HANA Smart Data Integration Product Availability Matrix for information about supported versions.

<table>
<thead>
<tr>
<th>Adapter Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB2LogReaderAdapter</td>
<td>This adapter retrieves data from DB2. It can also receive changes that occur to tables in real time. You can also write back to a virtual table.</td>
</tr>
<tr>
<td>OracleLogReaderAdapter</td>
<td>This adapter retrieves data from Oracle. It can also receive changes that occur to tables in real time. You can also write back to a virtual table.</td>
</tr>
<tr>
<td>MssqlLogReaderAdapter</td>
<td>This adapter retrieves data from SQL Server. It can also receive changes that occur to tables in real time. You can also write back to a virtual table.</td>
</tr>
<tr>
<td>DB2ECCAdapter</td>
<td>This adapter retrieves data from an SAP ERP system running on 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.</td>
</tr>
<tr>
<td>OracleECCAdapter</td>
<td>This adapter 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.</td>
</tr>
<tr>
<td>MssqlECCAdapter</td>
<td>This adapter retrieves data from an SAP ERP system running on 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.</td>
</tr>
<tr>
<td>AseECCAdapter</td>
<td>This adapter retrieves data from an SAP ERP system running on SAP ASE. It can also receive changes that occur to tables in real time.</td>
</tr>
<tr>
<td>CamelAccessAdapter</td>
<td>The Camel Access adapter is a pre-delivered component that is based on the Apache Camel adapter. This adapter retrieves data from a Microsoft Access source.</td>
</tr>
<tr>
<td>Adapter Name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>CamelFacebookAdapter</td>
<td>The Camel Facebook adapter is a pre-delivered component that is based on the Apache Camel adapter. Use the Camel Facebook component to connect to and retrieve data from Facebook. In addition to Facebook, many other components are available from the Apache Software Foundation website.</td>
</tr>
<tr>
<td>CamelJdbcAdapter</td>
<td>The Camel JDBC adapter is a pre-delivered component that is based on the Apache Camel adapter. Use the Camel JDBC adapter to connect to databases for which we do not already provide a pre-delivered adapter, such as MySQL, Amazon Redshift, and so on.</td>
</tr>
<tr>
<td>CamelInformixAdapter</td>
<td>The Camel Informix adapter is a pre-delivered component that is based upon Camel adapter. This adapter retrieves data from an Informix source. It can also write back to an Informix virtual table.</td>
</tr>
<tr>
<td>CassandraAdapter</td>
<td>This adapter retrieves data from an Apache Cassandra remote source. You can also write to an Apache Cassandra target.</td>
</tr>
<tr>
<td>DB2MainframeAdapter</td>
<td>This adapter retrieves data from IBM DB2 mainframe systems. You can also write back to a DB2 for z/OS virtual table.</td>
</tr>
<tr>
<td>Note</td>
<td>Currently, only DB2 for z/OS is supported.</td>
</tr>
<tr>
<td>OutlookAdapter</td>
<td>This adapter retrieves data from Microsoft Outlook.</td>
</tr>
<tr>
<td>ExcelAdapter</td>
<td>This adapter retrieves data from Microsoft Excel. You can also access SharePoint source data.</td>
</tr>
<tr>
<td>FileAdapter</td>
<td>This adapter 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.</td>
</tr>
<tr>
<td>GoogleAdapter</td>
<td>This adapter retrieves data from Google+.</td>
</tr>
<tr>
<td>HanaAdapter</td>
<td>This 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. You can also write back to a virtual table. Use the HanaAdapter to extract data from an ECC on SAP HANA source.</td>
</tr>
<tr>
<td>HiveAdapter</td>
<td>This adapter retrieves data from HADOOP.</td>
</tr>
<tr>
<td>ImpalaAdapter</td>
<td>The Apache Impala adapter is a pre-delivered component that is based on the Apache Camel adapter. This adapter retrieves data from a Apache Impala source.</td>
</tr>
<tr>
<td>ODataAdapter</td>
<td>This adapter retrieves data from an OData service. You can also write to an OData target.</td>
</tr>
<tr>
<td>ASEAdapter</td>
<td>This adapter 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.</td>
</tr>
<tr>
<td>ABAPAdapter</td>
<td>This adapter retrieves data from virtual tables through RFC for ABAP tables and ODP extractors. It also provides change data capture for ODP extractors.</td>
</tr>
</tbody>
</table>
### Adapter Name | Description
--- | ---
**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.

**TwitterAdapter** | This adapter retrieves data from Twitter. It can also receive new data from Twitter in real time.

**TeradataAdapter** | This adapter 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.

---

**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 are using either TSL/SSL or Kerberos and you require stronger encryption than 128 bit key length, you need to update the existing JCE policy files.

---

**Related Information**

- Custom Adapters [page 122]
- Apache Impala [page 122]
- Apache Cassandra [page 128]
- Apache Camel Facebook [page 137]
- Apache Camel Informix [page 140]
- Apache Camel JDBC [page 143]
- Apache Camel Microsoft Access [page 146]
- File [page 148]
- Google+ [page 169]
- Hive [page 172]
- IBM DB2 Log Reader [page 178]
- IBM DB2 Mainframe [page 204]
- Microsoft Excel [page 209]
- Microsoft Outlook [page 217]
- Microsoft SQL Server Log Reader [page 218]
- OData [page 249]
- Oracle Log Reader [page 254]
- SAP ABAP [page 284]
- SAP ASE [page 297]
6.1 Custom Adapters

Use the Adapter SDK to create your own custom adapters.

The adapters that are described in this document and 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 and to connect to virtually any source you require.

An administrator will then need to register the custom adapter on the appropriate agent.

Related Information

Register Data Provisioning Adapters [page 85]

6.2 Apache Impala

Information about the Apache Impala data provisioning adapter

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. But 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 meta data only. The Impala adapter supports operations that are legal to the backend Impala table.

Adapter Functionality

This adapter supports the following functionality:
• Virtual table as a source

Table 31: Global Settings

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT from a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>INSERT into a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>No</td>
</tr>
<tr>
<td>Real-time changed data capture (CDC)</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 32: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>Yes</td>
</tr>
<tr>
<td>Add a WHERE clause</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN multiple tables</td>
<td>Yes</td>
</tr>
<tr>
<td>Aggregate data via a GROUP BY clause</td>
<td>No</td>
</tr>
<tr>
<td>Support a DISTINCT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a TOP or LIMIT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>ORDER BY</td>
<td>Yes</td>
</tr>
<tr>
<td>GROUP BY</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Related Information

Apache Impala Remote Source Configuration [page 124]
Kerberos Realm and KDC [page 127]
Update JCE Policy Files for Stronger Encryption [page 352]
## 6.2.1 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.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>Host</td>
<td>Impala host name or IP address.</td>
</tr>
<tr>
<td></td>
<td>Port</td>
<td>Impala server port. Default value is 21050.</td>
</tr>
<tr>
<td>Authentication Mechanism</td>
<td>Host</td>
<td>Authentication mechanism that is used to connect to Impala Server. Choose from the following values:</td>
</tr>
<tr>
<td></td>
<td>Authentication Mechanism</td>
<td>- No Authentication (0 in SQL)</td>
</tr>
<tr>
<td></td>
<td>Authentication Mechanism</td>
<td>- Kerberos (1 in SQL)</td>
</tr>
<tr>
<td></td>
<td>Authentication Mechanism</td>
<td>- User Name (The LDAP bind name) (2 in SQL)</td>
</tr>
<tr>
<td></td>
<td>Authentication Mechanism</td>
<td>- User Name and Password (Default) (Used for LDAP authentication) (3 in SQL)</td>
</tr>
<tr>
<td>Security</td>
<td>Enable SSL Encryption</td>
<td>Specify whether to connect to Impala server using SSL.</td>
</tr>
<tr>
<td></td>
<td>Allow Self-Signed Server SSL Certificate</td>
<td>Specify whether to allow the server to use self-signed SSL certificate. This property is meaningful only if SSL is enabled.</td>
</tr>
<tr>
<td></td>
<td>Require Certificate Name</td>
<td>Specify whether to require CA-issued SSL certificate name to match Impala server host name. This property is meaningful only if SSL is enabled.</td>
</tr>
<tr>
<td></td>
<td>Match Server Host Name</td>
<td></td>
</tr>
<tr>
<td>Kerberos</td>
<td>Realm</td>
<td>Kerberos realm. This parameter is optional. If this is specified, the realm part (for example, @EXAMPLE.COM) of Impala Service Principal and User Principal property can be omitted.</td>
</tr>
<tr>
<td></td>
<td>KDC</td>
<td>Kerberos Key Distribution Center (KDC). This property is optional, and meaningful only if the Realm parameter is specified. If the property is not specified, it must be manually configured in <code>&lt;DPAgent_root&gt;/krb5/krb5.conf</code> for the realm of Impala Service Principal and User Principal.</td>
</tr>
<tr>
<td></td>
<td>Impala Service Principal</td>
<td>Kerberos principal of Impala service.</td>
</tr>
<tr>
<td></td>
<td>User Principal</td>
<td>Kerberos principal of the connection user.</td>
</tr>
<tr>
<td></td>
<td>Use Keytab</td>
<td>Specify whether to use keytab. If keytab is used, the keytab file path must be specified through Keytab parameter. If keytab is not used, the password of the user principal must be provided through Password parameter of Credential (Kerberos).</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Keytab</td>
<td>Keytab file path. Required if the Use Keytab property value is “Yes”.</td>
<td></td>
</tr>
<tr>
<td>Use Ticket Cache</td>
<td>Specify whether to use ticket cache (i.e. credential cache or ccache). Required if Use Ticket Cache property is “Yes”.</td>
<td></td>
</tr>
<tr>
<td>Ticket Cache</td>
<td>The Ticket cache file path.</td>
<td></td>
</tr>
<tr>
<td>Data Type Mapping</td>
<td>Map Impala STRING to</td>
<td>Specify to which SAP HANA type Impala STRING is mapped. Choose from the following values:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CLOB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• VARCHAR(5000)</td>
</tr>
<tr>
<td></td>
<td>Map Impala VARCHAR(length &gt; 5000) to</td>
<td>Specify to which SAP HANA type Impala VARCHAR(length &gt; 5000) is mapped. Choose from the following values:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• NCLOB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• NVARCHAR(5000)</td>
</tr>
<tr>
<td>Schema Alias Replace- ments</td>
<td>Schema Alias</td>
<td>Schema name to be replaced with the schema given in Schema Alias Replacement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If given, accessing tables under the schema given in Schema name to use to replace the schema given in Schema Alias.</td>
</tr>
<tr>
<td></td>
<td>Schema Alias Replacement</td>
<td>Schema name to be used to replace the schema given in Schema Alias.</td>
</tr>
<tr>
<td>Credentials</td>
<td>Credentials Mode</td>
<td>Select Technical User or Secondary User depending on the purpose of the remote source you want to create.</td>
</tr>
<tr>
<td>i Note</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Credential (User Name and Password) &gt; User Name</td>
<td>User name. Required only if the Authentication Mechanism parameter is set to Username and Password.</td>
</tr>
<tr>
<td></td>
<td>Credential (User Name and Password) &gt; Password</td>
<td>Password. Required only if the Authentication Mechanism parameter is set to Username and Password.</td>
</tr>
</tbody>
</table>
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 will be replaced with a string username@ldap_domain;
- If ldap_baseDN is configured, the User Name will be 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 (this is the most general option), the User Name is replaced with the string ldap_bind_pattern, where all instances of the string #UID are replaced with userid. For example, an ldap_bind_pattern of "user=#UID,OU=house,CN=boat" with a username of "customer" will construct a bind name of "user=customer,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

```sql
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>
</ConnectionProperties>
```
Related Information

Using a Schema Alias [page 199]

6.2.2 Kerberos Realm and KDC

You can configure the Kerberos environment (context) either through the krb5.conf file or through remote source parameters.

The Kerberos realm's KDC (Key Distribution Center) host name or address must be configured through either adapter remote source parameters or the krb5.conf file.

Through the krb5.conf File

<DPAgent_root>/krb5/krb5.conf is a standard Kerberos V5 configuration file. Initially, it is an empty configuration file with [libdefaults], [realms] and [domain_realm] headers in it. You can configure KDC under the [realms] section. Also, if there is not default realm configured in the file, you need to configure it under [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 needing to restart the DP agent.
Through Remote Source Parameters

You can also 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 at the time when the adapter connects to KDC.

6.3 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 129]
- Enable Kerberos Authentication [page 131]
- Cassandra Remote Source Configuration [page 133]
- Cassandra to SAP HANA Data Type Mapping [page 136]
- SAP HANA Smart Data Integration and all its patches Product Availability Matrix (PAM) for SAP HANA SDI 1.0
- SAP HANA Smart Data Integration and all its patches Product Availability Matrix (PAM) for SAP HANA SDI 2.0
6.3.1 Cassandra SSL Configuration

Configure SSL for connecting to your Cassandra remote source.

Related Information

Enable SSL on Cassandra [page 129]
Enable Client Authentication [page 130]
Update JCE Policy Files for Stronger Encryption [page 352]

6.3.1.1 Enable SSL on Cassandra

Enable SSL on your Cassandra remote source.

Context

Prior to connecting to your Cassandra remote source via SSL, you need to enable SSL on your remote source.

Procedure

1. Prepare the server certificates.
2. Configure Cassandra to use SSL by editing the cassandra.yaml file.
   
   ```yaml
   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 DP Agent host.
   
   ```bash
   keytool -export -alias dse_node0 -file dse_node0.cer -keystore .keystore
   ```
4. Import the certificates into the DP Agent truststore.

```bash
$ 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. Enable SSL when configuring your Cassandra remote source.

**Related Information**

*Cassandra Remote Source Configuration [page 133]*

### 6.3.1.2 Enable Client Authentication

Enable client authentication when you are using SSL.

**Context**

To enable client authentication, you need to edit a Cassandra file and properly configure your remote source.

**Procedure**

1. **Edit the `cassandra.yaml` file.**

   ```yaml
client_encryption_options:
   enabled: true
   optional: false
   keystore: .keystore
   keystores_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 DP Agent node.**

   ```bash
   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
```

4. Restart Cassandra.

5. Enable client authentication when creating a remote source, by setting the `Use Client Authentication` parameter to "True".

**Related Information**

*Cassandra Remote Source Configuration* [page 133]

### 6.3.2 Enable Kerberos Authentication

Enable Kerberos authentication for your Cassandra remote source.

**Context**

The Cassandra adapter allows user name and password authentication. However, you can configure Kerberos authentication for improved security.

**Procedure**

1. On each node, confirm DNS is working:

   ```
   $ hostname
   node1.example.com
   ```

2. On each node, confirm that NTP is configured and running:

   ```
   $ ntpq -p
   +time01.muskegon 64.113.32.5 2 u 402 1024 377 59.378 -1.635 1.840
   +golem.canonical 131.188.3.220 2 u 994 1024 377 144.080 -1.732 20.072
   ```
3. 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

4. Edit the `/etc/krb5.conf` file to add 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
   ```


10. Prepare the keytab for the DP Agent. The principal must have the value of the user created in step 4.

   ```
   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](#)  
[Update JCE Policy Files for Stronger Encryption](#)
6.3.3 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.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>Hosts</td>
<td>The list of host names and ports the cassandra used to connect to cassandra cluster.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The hosts and ports should be provided in following format:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● host1[:port1],host2[:port2],host3[:port3]...</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the port number is not provided for a host, the default port (9042) will be used for the host.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Only one host is needed to discover the cluster topology, but it is usually a good idea to provide more, so that the driver can fall back if the first one is down.</td>
</tr>
<tr>
<td>Authentication Mechanism</td>
<td></td>
<td>User Name and Password (Default): Use user name and password to perform the authentication.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kerberos: Use Kerberos to perform the authentication.</td>
</tr>
<tr>
<td>Paging Status</td>
<td></td>
<td>Specify whether to enable paging when getting the results of a query from Cassandra. The default value is “On”.</td>
</tr>
<tr>
<td>Load Balancing Policy</td>
<td>Use Round Robin Policy</td>
<td>Specify whether to use the Round Robin Policy. The default value is False.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You can use either Round Robin Policy or DC Aware Round Robin Policy, not both.</td>
</tr>
<tr>
<td></td>
<td>Use DC Aware Round Robin Policy</td>
<td>Specify whether to use the DC Aware Round Robin Policy. The default value is False.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You can use either DC Aware Round Robin Policy or DC Aware Round Robin Policy, not both.</td>
</tr>
<tr>
<td></td>
<td>Use Token Aware Policy</td>
<td>Specify whether to use the Token Aware Policy. The default value is False.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Either Round Robin Policy or DC Aware Round Robin Policy must be used as child policy if this parameter is set to “True”.</td>
</tr>
<tr>
<td></td>
<td>Use Latency Aware Policy</td>
<td>Specify whether to use the Latency Aware Policy. The default value is False.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Either Round Robin Policy or DC Aware Round Robin Policy must be used as child policy if this parameter is set to “True”.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Security</td>
<td>Use SSL</td>
<td>Specify whether to connect to Cassandra using SSL. The default value is “False”.</td>
</tr>
<tr>
<td></td>
<td>Use Client Authentication</td>
<td>Specify whether to connect to Cassandra using client authentication. The default value is “False”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This parameter only works if Use SSL is set to “True”.</td>
</tr>
<tr>
<td>Kerberos</td>
<td>Kerberos Realm</td>
<td>(Optional when using Kerberos) Authenticate using a principal from this realm (instead of the system’s default realm). The Realm option must be used together with KDC.</td>
</tr>
<tr>
<td></td>
<td>Kerberos KDC</td>
<td>(Optional when using Kerberos) The address of the KDC (Key Distribution Center) to be used with the specified Realm (has to be used together with Realm)</td>
</tr>
<tr>
<td></td>
<td>Kerberos Protocol</td>
<td>The SASL protocol name to use. It should match the username of the Kerberos service principal used by the DSE server.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Use Keytab</td>
<td>Specify whether to use keytab. If keytab is used, the keytab file path must be specified in the Kerberos Keytab File parameter. The default value is “False”.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Keytab File</td>
<td>Set this to the file name of the keytab to get the principal’s secret key.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Store Key</td>
<td>Set this to “True” to if you want the principal’s key to be stored in the Subject’s private credentials. The default value is “False”.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Use Ticket Cache</td>
<td>Specify whether to use ticket cache (i.e. credential cache or ccache). The default value is “False”.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Ticket Cache File</td>
<td>Set this to the name of the ticket cache that contains user’s TGT. If this is set, Kerberos Use Ticket Cache must also be set to true; otherwise, a configuration error will be returned.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Renew TGT</td>
<td>Set this to true, if you want to renew the TGT. If this is set, Kerberos Use Ticket Cache must also be set to true; otherwise, a configuration error will be returned. The default value is “False”.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Debug</td>
<td>Enable debugging mode by setting this to true. You can view debugging information in the DP Agent log.</td>
</tr>
<tr>
<td>Credentials</td>
<td>Credentials Mode</td>
<td>“technical user” or “secondary user”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Select one of the choices, depending on the purpose of the remote source you want to create.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>The user used to connect to Cassandra database. If Kerberos is used, the user should be the client principal (and also a Cassandra user).</td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>The password of the Cassandra user. If Kerberos is used to authenticate the user, and the Use Ticket Cache and Renew TGT parameters are set to True, the password is needed and should be the password that is used to get the TGT from KDC. Otherwise, the password can be any string (not empty).</td>
</tr>
</tbody>
</table>

**SQL**

```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" displayValue="oakl00548161a.amer.global.corp.sap"/>
    <PropertyEntry name="auth_mech" displayValue="user_password"/>
    <PropertyEntry name="paging_status" displayValue="true"/>
  </PropertyGroup>
  <PropertyGroup name="load_balancing_policy" displayName="Load Balancing Policy">
    <PropertyEntry name="use_rr_policy" displayValue="false"/>
    <PropertyEntry name="use_dc_aware_rr_policy" displayValue="false"/>
    <PropertyEntry name="shuffle_replicas" displayValue="true"/>
  </PropertyGroup>
  <PropertyGroup name="security" displayName="Security">
    <PropertyEntry name="use_ssl" displayValue="false"/>
    <PropertyEntry name="use_client_auth" displayValue="false"/>
  </PropertyGroup>
  <PropertyGroup name="kerberos" displayName="Kerberos">
    <PropertyEntry name="krb_realm" allowAlterWhenSuspended="true"/>
    <PropertyEntry name="krb_kdc" allowAlterWhenSuspended="true"/>
    <PropertyEntry name="krb_protocol" allowAlterWhenSuspended="true"/>
    <PropertyEntry name="krb_keytab" allowAlterWhenSuspended="true"/>
    <PropertyEntry name="use_ticket_cache" allowAlterWhenSuspended="true"/>
    <PropertyEntry name="krb_renew_tgt" allowAlterWhenSuspended="true"/>
  </PropertyGroup>
</ConnectionProperties>
'```
6.3.4 Cassandra to SAP HANA Data Type Mapping

The following table shows the conversion between Apache Cassandra data types and SAP HANA data types.

<table>
<thead>
<tr>
<th>Cassandra</th>
<th>SAP HANA</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCII</td>
<td>CLOB</td>
<td></td>
</tr>
<tr>
<td>BIGINT</td>
<td>BIGINT</td>
<td>-9223372036854775808 to +9223372036854775807</td>
</tr>
<tr>
<td>BLOB</td>
<td>BLOB</td>
<td>&lt;2GB</td>
</tr>
<tr>
<td>BOOLEAN</td>
<td>TINYINT</td>
<td>true or false (1 or 0)</td>
</tr>
<tr>
<td>COUNTER</td>
<td>BIGINT</td>
<td>-9223372036854775808 to +9223372036854775807</td>
</tr>
<tr>
<td>DATE</td>
<td>DATE</td>
<td></td>
</tr>
<tr>
<td>DECIMAL</td>
<td>DECIMAL</td>
<td></td>
</tr>
<tr>
<td>DOUBLE</td>
<td>DOUBLE</td>
<td></td>
</tr>
<tr>
<td>FLOAT</td>
<td>REAL</td>
<td></td>
</tr>
<tr>
<td>INET</td>
<td>VARCHAR</td>
<td></td>
</tr>
<tr>
<td>INT</td>
<td>INTERGER</td>
<td>-2147483648 to 2147483647</td>
</tr>
<tr>
<td>LIST</td>
<td>NCLOB</td>
<td></td>
</tr>
<tr>
<td>MAP</td>
<td>NCLOB</td>
<td></td>
</tr>
<tr>
<td>SET</td>
<td>NCLOB</td>
<td></td>
</tr>
<tr>
<td>SMALLINT</td>
<td>SMALLINT</td>
<td>-32768 to 32767</td>
</tr>
<tr>
<td>TEXT</td>
<td>NCLOB</td>
<td></td>
</tr>
</tbody>
</table>
### Apache Camel Facebook

The Apache Camel Facebook adapter is created based on Camel Adapter. It makes use of the Facebook Component (http://camel.apache.org/facebook.html) to access Facebook APIs. Facebook data of the configured Facebook user, like friends, families, movies, etc., are exposed to SAP HANA server via virtual tables by Camel Facebook Adapter.

This adapter supports the following functionality:

- Virtual table as a source
- `CAP_SELECT`

#### Related Information

- [Set up the Camel Facebook Adapter][138]
- [Camel Facebook Adapter Remote Source Configuration][139]

---

<table>
<thead>
<tr>
<th>Cassandra</th>
<th>SAP HANA</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME</td>
<td>TIME</td>
<td></td>
</tr>
<tr>
<td>TIMESTAMP</td>
<td>TIMESTAMP</td>
<td></td>
</tr>
<tr>
<td>TIMEUUID</td>
<td>VARCHAR</td>
<td></td>
</tr>
<tr>
<td>TINYINT</td>
<td>SMALLINT</td>
<td>-128 to 127</td>
</tr>
<tr>
<td>UUID</td>
<td>BARCHAR</td>
<td></td>
</tr>
<tr>
<td>VARINT</td>
<td>BIGINT</td>
<td></td>
</tr>
<tr>
<td>VARCHAR</td>
<td>NCLOB</td>
<td></td>
</tr>
</tbody>
</table>
6.4.1 Set up the Camel Facebook Adapter

Set up the Camel Facebook adapter, prior to using it.

**Context**

By default, Camel Facebook Adapter is not available in Data Provisioning Agent. To use it, you must do the following:

**Procedure**

1. Open `<DPAgent_root>/camel/adapters.xml` and uncomment the configuration of Camel Facebook Adapter.

   ```xml
   <Adapter type="CamelFacebookAdapter" displayName="Camel Facebook Adapter">
     <RemoteSourceDescription>
       <PropertyGroup name="configuration" displayName="Configuration">
         <PropertyEntry name="httpProxyHost" displayName="HTTP Proxy Host"
         description="HTTP Proxy Host" isRequired="false"/>
       </PropertyGroup>
       <PropertyEntry name="httpProxyPort" displayName="HTTP Proxy Port"
       description="HTTP Proxy Port" isRequired="false"/>
     </RemoteSourceDescription>
     <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</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
6.4.2 Camel Facebook Adapter Remote Source Configuration

Configuration settings for accessing an 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. All these parameters are used to configure Facebook component options (See <DPAgent_root>/camel/facebook.xml). If you need to specify non-default values for Facebook component options (See http://camel.apache.org/facebook.html for a complete list of these 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.

Facebook requires the use of OAuth for all client application authentication. In order to use the Camel Facebook adapter with your account, you'll 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 will allow access to Facebook APIs which do not require a current user. A user access token is required for APIs that require a logged in user. More information about obtaining a user access token can be found at https://developers.facebook.com/docs/facebook-login/access-tokens/.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>App Credential</td>
<td>App ID</td>
<td>Facebook application ID</td>
</tr>
<tr>
<td></td>
<td>App Secret</td>
<td>Facebook application Secret</td>
</tr>
<tr>
<td>User Credential</td>
<td>User ID</td>
<td>Facebook user ID</td>
</tr>
<tr>
<td></td>
<td>User Access Token</td>
<td>The user access token. More information on obtaining a user access token can be found at <a href="https://developers.facebook.com/docs/facebook-login/access-tokens/">https://developers.facebook.com/docs/facebook-login/access-tokens/</a></td>
</tr>
</tbody>
</table>

**Example**

**Sample Code**

```sql
CREATE REMOTE SOURCE "MyFacebookSource" ADAPTER "CamelFacebookAdapter" AT LOCATION AGENT "MyAgent" CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configuration">
   <PropertyEntry name="httpProxyHost" displayName="HTTP Proxy Host">myproxy.sap.corp</PropertyEntry>
   <PropertyEntry name="httpProxyPort" displayName="HTTP Proxy Port">8080</PropertyEntry>
</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>'
```
6.5  Apache Camel Informix

Use the Camel Informix adapter to connect to an IBM Informix remote source.

You can connect to an Informix source using the Camel Informix adapter.

**Note**

Before registering your adapter with the SAP HANA system, be sure that you have downloaded and installed the correct JDBC libraries.

This adapter supports the following functionality:

- Virtual table as a source

**Related Information**

Set Up the Camel Informix Adapter [page 140]
Camel Informix Remote Source Configuration [page 141]
SQL Conversion [page 142]

6.5.1  Set Up the Camel Informix Adapter

Set up the Camel Informix adapter, prior to using it.

**Context**

By default, Camel Informix Adapter is not available in Data Provisioning Agent. To use it, you must do the following:

**Procedure**

1. Open `<DPAgent_root>/camel/adapters.xml` and uncomment the configuration of Camel Informix 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](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.

### 6.5.2 Camel Informix Remote Source Configuration

Configure the following options in 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.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Host</td>
<td>Host</td>
</tr>
<tr>
<td></td>
<td>Port</td>
<td>Port</td>
</tr>
<tr>
<td></td>
<td>Database Name</td>
<td>Database name</td>
</tr>
<tr>
<td></td>
<td>Server Name</td>
<td>Server name</td>
</tr>
<tr>
<td></td>
<td>Delimident</td>
<td>If set to &quot;True&quot;, the Informix database object name will be enclosed with double quotation marks.</td>
</tr>
<tr>
<td>Credentials</td>
<td>Credentials Mode</td>
<td>technical user or secondary user</td>
</tr>
<tr>
<td></td>
<td>User Credential</td>
<td>The Informix user name</td>
</tr>
</tbody>
</table>
### Example

**Sample Code**

```sql
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>';```

### 6.5.3 SQL Conversion

Convert Informix SQL to SAP HANA SQL

In some cases, Informix SQL and SAP HANA SQL are not compatible. The following table lists the conversions that may take place:

<table>
<thead>
<tr>
<th>Informix</th>
<th>SAP HANA</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1::DECIMAL</td>
<td>TO_DECIMAL($1)</td>
</tr>
<tr>
<td>$1::DECIMAL($2)</td>
<td>TO_DECIMAL($1,$2)</td>
</tr>
<tr>
<td>$1::REAL</td>
<td>TO_REAL($1)</td>
</tr>
<tr>
<td>$1::INT</td>
<td>TO_INT($1)</td>
</tr>
</tbody>
</table>
Informix | SAP HANA
---|---
$1::BIGINT | TO_BIGINT($1)
$1::SMALLINT | TO_SMALLINT($1)
$1::INTEGER | TO_INTEGER($1)

### 6.6 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 will support 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

<table>
<thead>
<tr>
<th>Link</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camel JDBC to SAP HANA Data Type Mapping</td>
<td>143</td>
</tr>
<tr>
<td>SQL Conversion</td>
<td>146</td>
</tr>
<tr>
<td>Apache Camel Microsoft Access</td>
<td>146</td>
</tr>
<tr>
<td>Apache Camel Informix</td>
<td>140</td>
</tr>
</tbody>
</table>

### 6.6.1 Camel JDBC to SAP HANA Data Type Mapping

Data type conversion between Camel JDBC and SAP HANA.

Use the following table when moving data from your database into SAP HANA.

The Camel JDBC adapter is a general adapter that supports databases that have SQL-based data types and functions and a JDBC driver. Therefore, in the `sample-jdbc-dialect.xml`, all the data type mapping is general.
If you want to support some specific data types of your database, you will need to add the mappings to this file or modify the existing mappings. You can find this file at `<DPAgent_root>/camel/sample-jdbc-dialect.xml`.

<table>
<thead>
<tr>
<th>Camel JDBC</th>
<th>SAP HANA</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIGINT</td>
<td>BIGINT</td>
</tr>
<tr>
<td>BLOB</td>
<td>BLOB</td>
</tr>
<tr>
<td>BINARY</td>
<td>VARBINARY</td>
</tr>
<tr>
<td>BINARY</td>
<td>BLOB</td>
</tr>
<tr>
<td>BIT</td>
<td>TINYINT</td>
</tr>
<tr>
<td>BOOLEAN</td>
<td>TINYINT</td>
</tr>
<tr>
<td>BYTE</td>
<td>BLOB</td>
</tr>
<tr>
<td>CHAR</td>
<td>VARCHAR</td>
</tr>
<tr>
<td>CHAR</td>
<td>CLOB</td>
</tr>
<tr>
<td>CHARACTER</td>
<td>VARCHAR</td>
</tr>
<tr>
<td>CLOB</td>
<td>CLOB</td>
</tr>
<tr>
<td>DATE</td>
<td>DATE</td>
</tr>
<tr>
<td>DATETIME</td>
<td>TIMESTAMP</td>
</tr>
<tr>
<td>DEC</td>
<td>DECIMAL</td>
</tr>
<tr>
<td>DECIMAL</td>
<td>DECIMAL</td>
</tr>
<tr>
<td>DOUBLE</td>
<td>DOUBLE</td>
</tr>
<tr>
<td>FLOAT</td>
<td>DOUBLE</td>
</tr>
<tr>
<td>INT</td>
<td>INTEGER</td>
</tr>
<tr>
<td>INT8</td>
<td>BIGINT</td>
</tr>
<tr>
<td>INTEGER</td>
<td>INTEGER</td>
</tr>
<tr>
<td>LVARCHAR(1,5000)</td>
<td>VARCHAR</td>
</tr>
<tr>
<td>LVARCHAR(5000,2147483648)</td>
<td>CLOB</td>
</tr>
<tr>
<td>NCHAR(1,5000)</td>
<td>VARCHAR</td>
</tr>
<tr>
<td>NCHAR(5000,2147483648)</td>
<td>CLOB</td>
</tr>
<tr>
<td>NCLOB(1,2147483648)</td>
<td>NCLOB</td>
</tr>
<tr>
<td>Camel JDBC</td>
<td>SAP HANA</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>NUMBER scale=[1,38]</td>
<td>DECIMAL</td>
</tr>
<tr>
<td>NUMBER scale=(-38,0]</td>
<td>INTEGER</td>
</tr>
<tr>
<td>NUMERIC</td>
<td>DECIMAL</td>
</tr>
<tr>
<td>NVARCHAR(1,5000)</td>
<td>VARCHAR</td>
</tr>
<tr>
<td>NVARCHAR(5000,2147483648)</td>
<td>CLOB</td>
</tr>
<tr>
<td>REAL</td>
<td>REAL</td>
</tr>
<tr>
<td>SMALLFLOAT</td>
<td>REAL</td>
</tr>
<tr>
<td>SMALLINT</td>
<td>SMALLINT</td>
</tr>
<tr>
<td>TEXT</td>
<td>CLOB</td>
</tr>
<tr>
<td>TIME</td>
<td>TIME</td>
</tr>
<tr>
<td>TIMESTAMP</td>
<td>TIMESTAMP</td>
</tr>
<tr>
<td>TINYINT</td>
<td>TINYINT</td>
</tr>
<tr>
<td>VARBINARY(1,5000)</td>
<td>VARBINARY</td>
</tr>
<tr>
<td>VARBINARY(5000,2147483648)</td>
<td>BLOB</td>
</tr>
<tr>
<td>VARCHAR(1,5000)</td>
<td>VARCHAR</td>
</tr>
<tr>
<td>VARCHAR(5000,2147483648)</td>
<td>CLOB</td>
</tr>
</tbody>
</table>

Mapping Considerations

- The Camel JDBC Adapter, at times, may have trouble supporting the BYTEINT data type with a Netezza source. By default, BYTEINT maps to TINYINT; however this is incompatible. To fix this, manually add the following mapping role into `<DPAgent_root>/camel/sample-jdbc-dialect.xml`: `<Mapping srcType="BYTEINT" length="" precision="" scale="" hanaType="SMALLINT" />

- The Camel JDBC adapter does not support TO_REAL() number comparison in a WHERE condition in those databases that do not support the TO_DOUBLE() function.
- The Camel JDBC Adapter cannot produce the sub-second precision for the TIME data type.
### 6.6.2 SQL Conversion

Convert Informix SQL to SAP HANA SQL

In some cases, Informix SQL and SAP HANA SQL are not compatible. The following table lists the conversions that may take place:

<table>
<thead>
<tr>
<th>Informix</th>
<th>SAP HANA</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1::DECIMAL</td>
<td>TO_DECIMAL($1)</td>
</tr>
<tr>
<td>$1::DECIMAL($2)</td>
<td>TO_DECIMAL($1,$2)</td>
</tr>
<tr>
<td>$1::REAL</td>
<td>TO_REAL($1)</td>
</tr>
<tr>
<td>$1::INT</td>
<td>TO_INT($1)</td>
</tr>
<tr>
<td>$1::BIGINT</td>
<td>TO_BIGINT($1)</td>
</tr>
<tr>
<td>$1::SMALLINT</td>
<td>TO_SMALLINT($1)</td>
</tr>
<tr>
<td>$1::INTEGER</td>
<td>TO_INTEGER($1)</td>
</tr>
</tbody>
</table>

### 6.7 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.

**Note**

The Camel Access adapter can only be used 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 MS Access Adapter [page 147]
- Microsoft Access Remote Source Configuration [page 147]
6.7.1 Set Up the Camel MS Access Adapter

Set up the Camel Access adapter, prior to using it.

Context

By default, Camel MS Access adapter is not available in Data Provisioning Agent. To use it, you must do the following:

Procedure

1. In MS Access, if the file version is 2003, in the Tables window, right-click MSysObjects, and select Navigation Options to show system objects.
2. In the Info window of MS 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 MS Access Trust Center.
4. Run the following command:

   ```vbscript
   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:

   ```xml
   <Adapter type="CamelAccessAdapter" displayName="Camel access Adapter">
   ...
   </Adapter>
   ```

6.7.2 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.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Access File Path</td>
<td>Specifies the path to the Access database file.</td>
</tr>
<tr>
<td></td>
<td>Access File Name</td>
<td>Specifies the name of the Access database file.</td>
</tr>
</tbody>
</table>
### Example

**Sample Code**

```sql
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>'
```

### 6.8 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 order to specify the file format (for example, delimited character), a configuration file (.cfg) has to be created containing 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 text (unstructured) files, you do not need to designate a file format definition, and you can use the FILECONTENT virtual table to view the data.

**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)
• SharePoint source support
• HDFS target file support (except from SharePoint)
• Realtime change data capture

Note
Changes to rows or the addition of a file to the root directory will initiate the capture. This is not supported for HDFS source files.

• Virtual procedures for calling a BAT or SH file.

In addition, this adapter supports the following capabilities:

Table 33: Global Settings

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT from a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>INSERT into a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>Yes</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>Yes</td>
</tr>
<tr>
<td>Realtime</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 34: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>Yes</td>
</tr>
<tr>
<td>Add a WHERE clause</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN multiple tables</td>
<td>No</td>
</tr>
<tr>
<td>Aggregate data via a GROUP BY clause</td>
<td>No</td>
</tr>
<tr>
<td>Support a DISTINCT clause in the select</td>
<td>No</td>
</tr>
<tr>
<td>Support a TOP or LIMIT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>ORDER BY</td>
<td>No</td>
</tr>
<tr>
<td>GROUP BY</td>
<td>No</td>
</tr>
</tbody>
</table>
If you execute the following SQL in SAP HANA (for example):

```sql
select * from "FILEADAPTERSRC"."V_cdc_test2" where NAME like 'ccc%'; or
select * from "FILEADAPTERSRC"."V_cdc_test2" where PATH = '/ttt';
```

If the NAME or PATH does not exist, it will throw an error, rather than return null.

**Related Information**

- Configure the File Adapter [page 150]
- File Adapter Remote Source Configuration [page 151]
- Generate the Configuration File With a Command Line Utility [page 156]
- Generating a Configuration File When Creating a Virtual Table [page 159]
- File Format Configuration Files [page 159]
- Authorizations [page 165]
- Remote Source Tables [page 165]
- Access SharePoint Using HTTPS/SSL [page 166]
- Accessing Files On a Shared Network [page 167]
- Generate a Dynamic Target File Name [page 168]
- Writing to Multiple Files at Once [page 169]

### 6.8.1 Configure the File Adapter

Follow these steps to configure the File adapter.

**Context**

The File adapter is already deployed with the Data Provisioning Agent that you installed. However, you first need to 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**

[FileAdapter Preferences](page 151)

### 6.8.1.1 FileAdapter Preferences

Configuration parameters for the File adapter.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root directory</td>
<td>The root directory for your data files. This is used for security. No remote source can reach beyond this directory for data files.</td>
</tr>
<tr>
<td>File format root directory</td>
<td>The root directory for your File Format definitions. This is used for security. No remote source can reach beyond this directory for data files.</td>
</tr>
<tr>
<td>Access Token</td>
<td>A password. An access token protects the files from access from different agents. Use this same password when creating a remote source.</td>
</tr>
</tbody>
</table>

### 6.8.2 File Adapter Remote Source Configuration

File adapter remote source configuration parameters. Also included are code samples for creating a remote source using the SQL console.

The active parameters may change, depending on which options you choose.

**Note**

If you want to use a DPAgent agent, installed on Linux, to connect to the SharePoint site, enable Basic Authentication on the SharePoint server.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ConnectionInfo</td>
<td>Source Options</td>
<td>• Local File System: Specifies that the source file is on a local system.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SharePoint Server: Specifies that the source is on a SharePoint server.</td>
</tr>
<tr>
<td>Target Options</td>
<td></td>
<td>The path to the folder that you want to access on the local file system where the DP Agent is deployed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remote HDFS: Specifies that the target file is on a remote HDFS system.</td>
</tr>
<tr>
<td>Root Directory</td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do not use a link directory or directory shortcut for a value in this parameter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If you are using a shared network directory, enter the path as follows: \&lt;host_name&gt;&lt;directory&gt;</td>
</tr>
<tr>
<td>Directory of the file format definitions</td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do not use a link directory or directory shortcut for a value in this parameter.</td>
</tr>
<tr>
<td>Use CDC</td>
<td></td>
<td>Set this parameter to “True”, if you want to use realtime change data capture with the File adapter.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i Note</td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>ConnectionInfo &gt; HDFS Configuration</td>
<td>Host Name</td>
<td>The remote URL to connect to the remote HDFS, usually defined in the core-site.xml.</td>
</tr>
<tr>
<td></td>
<td>Port Number</td>
<td>Port Number to connect to remote HDFS, usually defined in the core-site.xml.</td>
</tr>
<tr>
<td></td>
<td>Target File Location</td>
<td>The location where 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.</td>
</tr>
<tr>
<td></td>
<td>Hadoop User Name</td>
<td>The user of Hadoop system when logging in. It can also be the owner of the file location you want to put the copied target files. Make sure you have the proper permissions to access this location.</td>
</tr>
<tr>
<td>ConnectionInfo &gt; SharePoint Server Configuration</td>
<td>Server URL</td>
<td>Enter the URL for the server where the SharePoint source is located. 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 http://&lt;server_name&gt;/ and your new site name is &quot;site1&quot;, your URL would be &quot;http://&lt;server_name&gt;/site1&quot;</td>
</tr>
<tr>
<td></td>
<td>Local Folder Path</td>
<td>The path to the folder on the local file system you want to access.</td>
</tr>
<tr>
<td>Credentials</td>
<td>Credentials Mode</td>
<td>technical user or secondary user Select one of the choices, depending on the purpose of the remote source you want to create.</td>
</tr>
<tr>
<td>Credentials &gt; AccessTokenEntry</td>
<td>AccessToken</td>
<td>A password. An access token protects the files from access from different locations</td>
</tr>
</tbody>
</table>
The following code samples illustrate how to create a remote source using the SQL console.

### Local file system

**Example**

**Sample Code**

```sql
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
<PropertyEntry name="rootdir">myrooddire</PropertyEntry>
<PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
<PropertyEntry name="source_options">local</PropertyEntry>
<PropertyEntry name="usecdc">true</PropertyEntry>
<PropertyEntry name="target_options">local</PropertyEntry>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="AccessTokenEntry">
<password>mytoken</password>
</CredentialEntry>'
```

### Local file system with real-time

**Example**

**Sample Code**

```sql
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
<PropertyEntry name="rootdir">myrooddire</PropertyEntry>
<PropertyEntry name="fileformatdir">myfileformatdir</PropertyEntry>
<PropertyEntry name="source_options">local</PropertyEntry>
<PropertyEntry name="usecdc">true</PropertyEntry>
<PropertyEntry name="target_options">local</PropertyEntry>
</ConnectionProperties>
```

---

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credentials &gt; SharePoint Login</td>
<td>SharePoint User (Domain\Username)</td>
<td>The domain and user name for the SharePoint account.</td>
</tr>
<tr>
<td></td>
<td>SharePoint Password</td>
<td>The password for the SharePoint account.</td>
</tr>
</tbody>
</table>
HDFS as target

Example

```
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT "MyAgent"
CONFIGURATION
'"<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
  <PropertyEntry name="rootdir">myrooddire</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>''
```

Sharepoint location

Example

```
CREATE REMOTE SOURCE "MyFileSource" ADAPTER "FileAdapter" AT LOCATION AGENT "MyAgent"
CONFIGURATION
'"<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties>
  <PropertyEntry name="rootdir">myrooddire</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">mysharepointdir</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
'" WITH CREDENTIAL TYPE 'PASSWORD' USING
  '<CredentialEntry name="AccessTokenEntry">
    <password>mytoken</password>
  </CredentialEntry>''
```
<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>
';

Related Information

Accessing Files On a Shared Network [page 167]

6.8.3 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 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,-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 path to a single file name for which the configuration files need to be generated. The value for the -cfgdir is the path to the output directory where the generated configuration files will be stored.

   A number of options and value pairs can be provided as additional parameters. The following are supported:
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-colDelimiter</td>
<td>The column delimiter</td>
</tr>
<tr>
<td>-rowDelimiter</td>
<td>The row delimiter</td>
</tr>
<tr>
<td>-txtDelimiter</td>
<td>Text quotes</td>
</tr>
<tr>
<td>-escChar</td>
<td>Escape character</td>
</tr>
<tr>
<td>-txtEscChar</td>
<td>Quote escape character</td>
</tr>
<tr>
<td>-dateformat</td>
<td>Default date format</td>
</tr>
<tr>
<td>-timeformat</td>
<td>Default time format</td>
</tr>
<tr>
<td>-secondDateformat</td>
<td>Default second date format</td>
</tr>
<tr>
<td>-format</td>
<td>The format of the file.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td>This is a required parameter, if you are using a CSV file. The syntax is <code>-format &quot;CSV&quot;</code>.</td>
</tr>
<tr>
<td>-firstRowAsColumnName</td>
<td>Specifies whether to use the first row in a data file as the column names when generating a CFG file with the createfileformat.sh/bat tool.</td>
</tr>
<tr>
<td></td>
<td>If set to true, createfileformat.sh/bat will use the row above the real data as the column name. Otherwise, createfileformat.sh/bat will set the row names as “COL1”, “COL2”, ... by default. The default value is false.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td>To use this parameter together with -skipHeaderLine, the row containing the column names should be included in -skipHeaderLine count. If you set -firstRowAsColumnName to true and didn’t configure -skipHeaderLine, -skipHeaderLine will be set to 1 automatically.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td>○ FIXED format files do not support -firstRowAsColumnName</td>
</tr>
<tr>
<td></td>
<td>○ The count of column name in the column name line must be correct.</td>
</tr>
<tr>
<td></td>
<td>○ If there are 2 column names, but there are 3 columns in the file data, the last column will be ignored.</td>
</tr>
<tr>
<td></td>
<td>○ The column delimiter also applies to the column name line.</td>
</tr>
<tr>
<td>-skipHeaderLine</td>
<td>Skips header lines</td>
</tr>
</tbody>
</table>
### Parameter Description

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-columnStartEndPosition</td>
<td>FIXED file column start end position (for example, -columnStartEndPosition 0:10:11:20)</td>
</tr>
</tbody>
</table>

Windows and Linux systems should be handled differently with this parameter. This is an example for Windows:

```bash
./createfileformat.sh -file /dpagent/text/test.txt -cfgdir /dpagent/cfg -rowLength 16 -columnStartEndPosition 0-14;14-15 -format "FIXED"
```

With Linux, however, you must enclose the semicolon with double quotes:

```bash
./createfileformat.sh -file /dpagent/text/test.txt -cfgdir /dpagent/cfg -rowLength 16 -columnStartEndPosition 0-14";"14-15 -format "FIXED"
```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-rowLength</td>
<td>FIXED file rowlength</td>
</tr>
<tr>
<td>-quotedTxtContainsRowDelimiter</td>
<td>Quoted text contains row delimiter (TRUE or FALSE)</td>
</tr>
<tr>
<td>-locale</td>
<td>Default locale</td>
</tr>
<tr>
<td>-codePage</td>
<td>Default code page</td>
</tr>
</tbody>
</table>

If no options are provided as parameters, the default delimiters are:

<table>
<thead>
<tr>
<th>Delimiter</th>
<th>Character</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column delimiter</td>
<td>.</td>
</tr>
<tr>
<td>Row delimiter</td>
<td>\n (UNIX)</td>
</tr>
<tr>
<td></td>
<td>\n\n (Windows)</td>
</tr>
<tr>
<td>Escape character</td>
<td>\</td>
</tr>
<tr>
<td>Quote escape character</td>
<td>&quot;</td>
</tr>
<tr>
<td>Default text quotes</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

### Note

Only one format of each type (date, time, second date) is allowed per file. So, if you have two columns containing different formatted dates in it, only the first one will be recognized. The second will be 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:

```bash
createfileformat.sh -file C:sap\data\provagent\sasi\FileServer\call_center.dat
```
6.8.4 Generating a 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 will generate a file named `v_plan_2.cfg`, and it will be created in file format directory.

```sql
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 151]
Format Parameters [page 162]

6.8.5 File Format Configuration Files

Create a file format configuration file to work with your data file.

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 will be ignored for processing.
- Then a set of key-value-pairs to specify the various parsing options
- A set of `COLUMN=<name>;<Hana datatype>;<optional description>`
Example

Fileformat 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=
LOCAL=
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 COLUMNSTARTENDPOSITION, or the ROW_DELIMITER and ROWLENGTH parameters.

Example

Fixed Fileformat
FORMAT=FIXED
FORCE_FILENAME_PATTERN=fixed%.txt
CODEPAGE=UTF-8
LOCAL=
COLUMN_DELIMITER=\r\n
ROW_DELIMITER=\r\n
SKIP_HEADER_LINES=1
COLUMNSTARTENDPOSITION=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 FORCEDIRECTORY_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>
```

**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 162]
**6.8.5.1 Format Parameters**

**Global**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description and Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORCE_FILENAME_PATTERN</td>
<td>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 single file in the root directory and subdirectories will be read and parsed according to this virtual table format definitions. That might take a while and produce many errors. However, if the virtual table does map 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:</td>
</tr>
<tr>
<td></td>
<td>- Reading all files in that directory only:</td>
</tr>
</tbody>
</table>
|                              |     ```
|                              |     FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/FileSync\n|                              |     ```                                                                                                                                                                                                              |
|                              | - Reading all files in that directory and subdirectories:                                                                                                                                                               |
|                              |     ```
|                              |     FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/FileSync/plan%\n|                              |     ```                                                                                                                                                                                                              |
|                              | - Reading all files in directories that start with "plan"                                                                                                                                                               |
|                              |     ```
|                              |     FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/FileSync/plan%\n|                              |     ```                                                                                                                                                                                                              |
|                              | - Reading files like plan20120101.txt                                                                                                                                                                                     |
|                              |     ```
|                              |     FORCE_FILENAME_PATTERN=plan%.txt\n|                              |     ```                                                                                                                                                                                                              |
|                              | - Reading files inside the directory and matching the provided name pattern                                                                                                                                              |
|                              |     ```
<p>|                              |     FORCE_DIRECTORY_PATTERN=/usr/sap/FileAdapter/FileSync/plandata\n|                              |     FORCE_FILENAME_PATTERN=plan%.txt\n|                              |     ```                                                                                                                                                                                                              |
| FORMAT                        | &quot;CSV&quot;. This is required for CSV files.                                                                                                                                                                                   |
| CODEPAGE                      | The character encoding the file is read with. By default the operating system default is used. In case the file has a Byte Order Mark this codepage is used always. Valid values of the Java installation can be found by creating a virtual table for CODEPAGE and querying its contents. |</p>
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description and Examples</th>
</tr>
</thead>
</table>
| ROW_DELIMITER        | A character sequence indicating the end of a row in the file. In case these are non-printable characters they can be provided encoded as \d65536 or \xFFFF or as Unicode notation \u+FFFF. Alternatively the typical \r and \n is supported as well. Examples:  
  - \n Unix standard  
  - \r\n Windows standard  
  - \d13\d10 Windows standard but characters provided as decimal number  
  - \x0D\x0A Windows standard but characters provided as hex number |
| SKIP_HEADER_LINES    | In case the file has a header, the number of lines to be skipped is entered here.                                                                     |
| ERROR_ON_COLUMNCOUNT | 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 as many columns as defined. |
| LOCALE               | 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 the date “14. Oktober 2000”, and you are using a German locale, it will work. However, for all other languages, it will not work. Valid values for the locale can be found by querying a virtual table based on the LOCALE table of the adapter. |
| DATEFORMAT           | The file format can use these datatypes for the 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      |                                                                                                                                                          |
| COLUMN               | Multiple entries consist of the columnname:datatype, where the datatype is any normal SAP HANA datatype.                                                      |

**CSV only**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description and Examples</th>
</tr>
</thead>
</table>
| COLUMN_DELIMITER     | The character sequence indicating the next column. If non-printable characters are used then either one of the encodings will work \d65536, \xFFFF or \u+FFFF  
  - “;” Meaning the ; is the column separator, so a line looks like 2000;IT Costs; 435.55  
  - “|” using the pipe character as delimiter  
  - “\d09” using an ASCII tab character as delimiter |
### Parameter: 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 as 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 needs to act more carefully and not just search for the next column delimiter. It needs to check if the text is inside the text quote character or outside.

### Parameter: ESCAPE_CHAR

Another way to deal with inline special characters is to escape those, like in `2000;"IT Costs\; software related only";435.55`. Here the `\` char is an escape char and indicates that the subsequent character is to be taken literally, not as e.g. column delimiter.

### Parameter: TEXT_QUOTES_ESCAPE_CHAR

Leaves the question on 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 simply use the global escape character: `2000;"IT Costs; \"software related\" only";435.55`. Another popular method is the have the quotes escaped by another quote like in `2000;"IT Costs; \"software related\" only";435.55`. In that case both the TEXT_QUOTE=“ and the TEXT_QUOTE_ESCAPE_CHAR=“ are set to the “ character.

### Parameter: QUOTED_TEXT_CONTAIN_ROW_DELIMITER

The default value is false and tells the parser regardless of any quotes or escape characters the text inside a row does never contain the row delimiter character sequence. In this case the parser can break the file into rows much faster, it needs to search for the character sequence only, and only the column parsing has to consider the escape and quote characters. If set to true parsing will be slower.

---

### Fixed Width only

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description and Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLUMNSSTARTENDPOSITION</td>
<td>In a fixed width file the column positions need to be specified for each column. Example:</td>
</tr>
<tr>
<td></td>
<td>• 0:3:4:11:12:37:38-53 defines that the first 4 characters are the first column, the next 8</td>
</tr>
<tr>
<td></td>
<td>contain the data for the second column etc. Columns need to be in the proper order.</td>
</tr>
<tr>
<td></td>
<td>• 0:4:12:38 is equivalent to above example, the last column ends with the line end</td>
</tr>
<tr>
<td></td>
<td>• 0:4:12:38-53 can be used as well. In fact every single column can either specify the start</td>
</tr>
<tr>
<td></td>
<td>and end position or just the start.</td>
</tr>
</tbody>
</table>
### Parameter Description and Examples

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROWLENGTH</td>
<td>In fixed with files there does not need to be a row delimiter. Often the file has some and then they need to be stripped away. Examples assuming the last data character is at index 53 as specified above:</td>
</tr>
<tr>
<td></td>
<td>- ROWLENGTH=56 ROW_DELIMITER= would work for a file that has a row delimiter. The payload text ranges from 0..53 and hence 54 characters long plus two characters for \r \n. But the last column does not contain the \r\n as it is told to end at index 53.</td>
</tr>
<tr>
<td></td>
<td>- ROWLENGTH=54 ROW_DELIMITER=\r\n is equivalent to above. Each row is expected to be 54 characters plus 2 characters long. The main advantage of this notation is that COLUMNSTARTENDPOSITION=0;4;12;38 would work as well as the trailing \r\n is stripped away. In the previous example the the last column would start at 38 but end at index 55 due to rowlength=56 and hence contain the \r\n characters in the last column.</td>
</tr>
</tbody>
</table>

### 6.8.6 Authorizations

File access authorization prerequisites.

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.

### 6.8.7 Remote Source Tables

The remote source provides certain 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>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CODEPAGES</td>
<td>Use this table to retrieve all supported codepages of the Java installation and optionally specify one in the various file format configuration files. The codepage controls the used character encodings of the source files.</td>
</tr>
<tr>
<td>FILECONTENT</td>
<td>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.</td>
</tr>
<tr>
<td>FILECONTENTROWS</td>
<td>Similar to FILECONTENT, this table returns the data as is, without any conversion, but splits the file at every &lt;newline&gt; character into a new row.</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>FILECONTENTTEXT</td>
<td>This virtual table has one row per file, and the entire file content is inside a NCLOB column. Use</td>
</tr>
<tr>
<td></td>
<td>this table for unstructured data files. In case the file has no ByteOrderMark (BOM) header to</td>
</tr>
<tr>
<td></td>
<td>identify the codepage, or the operating system default codepage is not the proper one, the reader</td>
</tr>
<tr>
<td></td>
<td>option CODEPAGE can be supplied.</td>
</tr>
<tr>
<td>FILEDIRECTORY</td>
<td>Returns the list of all files in the remote source configured root directory and its sub directories.</td>
</tr>
<tr>
<td>LOCALES</td>
<td>This table returns all supported Java locales, and the values can be used to control the locale</td>
</tr>
<tr>
<td></td>
<td>of the file read, which impacts the decimal format, the month names of a date format, and so on.</td>
</tr>
<tr>
<td>STATISTICS_CHAR</td>
<td>Calculates the number of occurrences of each character in the files. Characters that occur often</td>
</tr>
<tr>
<td></td>
<td>will be column delimiters, optional text quotes, and row delimiter characters.</td>
</tr>
</tbody>
</table>

### 6.8.8 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 need to 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'.

   ```bash
   c:\<user>\dpagent\ssl>keytool -storepwd -keystore cacerts
   Enter keystore password: changeit
   New keystore password:
   Re-enter new keystore password:
   ```

   **Note**
   
   Keytool is in the jre/bin folder. You should add it to the $PATH environment. For example, `C:\Program Files\Java\jre7\bin\keytool.exe`

3. Import the certificate that you exported.

   ```bash
   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: 34973632d6cb31934fd6be04352cc5dc
Valid from: Thu Jan 05 01:29:45 PST 2017 until: Thu Jan 04 16:00:00 PST 2018
Certificate fingerprints:
    OA:8E:79:OB: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 step 8.

5. If you are not using the TCP SSL connection between SAP HANA and the DPAgent, un-check 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 DPAgent. SSL configuration will not work until the DPAgent restarts.

### 6.8.9 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 files (data and format) in a shared directory, however you'll need to follow a few rules.

**Windows**

When using Windows, make sure that you manually access the network folder first (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 DP Agent root install directory.

File Adapter Remote Source Parameters

Pay attention to 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 151]

6.8.10 Generate a Dynamic Target File Name

Generate a dynamic target file name with the File adapter.

Context

You can generate a dynamic target file name, using the File adapter. The following example adds a dynamic timestamp to the target file name.

Procedure

1. Add a percent character (%) in the target file name. (For example abc%.txt).
2. When executing an INSERT, do not include the NAME column in source table.

Results

The File adapter will replace first “%” character with the current datetime with the following format: yyyy_MM_dd_HH_mm_ss.
6.8.11 Writing to Multiple Files at Once

You can write output to multiple files at once, using the File adapter.

There may be times when you want to output to multiple files. You can do this using SQL and the `FORCE_FILENAME_PATTERN` format parameter.

For example, suppose you have a virtual table named "SYSTEM"."fileAdapter_file_end_without_row_delimiter", and, in the file format, you have defined the following: `FORCE_FILENAME_PATTERN=allnums_end_without_delimiter%.txt`

By using the following syntax,

```sql
insert into "SYSTEM"."fileAdapter_file_end_without_row_delimiter" ("NAME", "C_INTEGER_YEAR", "C_TINYINT", "C_SMALLINT", "C_BIGINT", "C_DECIMAL", "C_REAL", "C_DOUBLE", "C_VARCHAR") values ('allnums_end_without_delimiter|| C_INTEGER_YEAR ||.txt', 2016, 7, 1, 1, 1, 1, 1, '0p0');
```

data will write to the file `allnums_end_without_delimiter2016.txt`. Whichever value appears for `C_INTEGER_YEAR`, a new file will be created and data will be written to a file with that value in the file name.

Note

If the file does not currently exist, the file is created. If it already exists, then data will be written to the file with the same name.

6.9 Google+

Access Google+ data with the GoogleAdapter.

Use the Google+ adapter to access social information from the Google+ website.

This adapter supports the following functionality:

- Virtual table as a source

Related Information

Set up the Google+ Adapter [page 170]
Google+ Remote Source Configuration [page 171]
6.9.1 Set up the Google+ Adapter

Before you can create a Google+ remote source, you need to acquire a Google+ user ID and a verification code.

Procedure

1. Create a Google account or use an existing Google account to obtain a user ID (a Google e-mail address).
2. Copy and paste the following URL into your browser to complete the authorization:
   ```
   https://accounts.google.com/o/oauth2/auth?
   access_type=offline&approval_prompt=force&client_id=586205812917-
   qd1qensh4fqt3p78tmf54hci44sk1eim.apps.googleusercontent.com&redirect_uri=oob&response_type=code
   ```
3. Sign in to your Google account.
4. Click the Allow button. (You will not be able to retrieve your verification code if you click Deny.)
5. Copy and paste your verification code into the Google+ Verification Code parameter when creating your remote source.

   **Note**

   If you see the following error, it means that the token is expired. Open the above authorization link again and update the verification code in the remote source parameters.

   ```
   Failed to login due to 400 Bad Request
   {
   "error" : "invalid_grant",
   "error_description" : "Code was already redeemed."
   }
   ```

Apply for a Google API Account

The information above is a trial account. If the token quota has been exceeded, you may need to apply for your own account.

1. Create a project in Google API Console and enable Google+ API and Google People API. Refer to the Google People API Guide on the Google website for information.
2. Under `<DPAgentInstallDir>\googleplus\`, open the `client_id.json` configuration file.
3. Replace the values of `client_id`, `project_id`, and `client_secret` fields with your Google API client settings, which you can find on the Google API Console API Manager > Credentials page.
4. Before you create a remote source, replace the `client_id=<YourClientID>` with your own client ID in the URL above.
6.9.2 Google+ Remote Source Configuration

Configure a remote source to access Google+ data.

Configure the following options in smart data access to configure your connection to your Google+ source. Also included is sample code for creating a remote source using the SQL console.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google+ User ID</td>
<td>The user ID for the Google+ account being used. This is your Google e-mail address.</td>
</tr>
<tr>
<td>Google+ Verification Code</td>
<td>The verification code you are given when accessing the following URL (Existing Google account necessary for access.)</td>
</tr>
</tbody>
</table>

<i>Note</i>

You may need to copy and paste the URL into a browser and replace the client_id portion with your client ID.

Example

Sample Code

```
CREATE REMOTE SOURCE "MyGoogleplusSource" ADAPTER "GooglePlusAdapter" AT LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
  <ConnectionProperties name="connections">
    'WITH CREDENTIAL TYPE 'PASSWORD' USING
    '<CredentialEntry name="credential">
      <user>mygoogleuser@gmail.com</user>
      <password displayName="Google plus Verification Code">-Gb867KIRK4CZAOQ5moc6rn</password>
    </CredentialEntry>';
```
6.10 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, the majority of SELECT features are available. Because Hadoop stores its data in distributed files using one of a number of file formats, INSERT, UPDATE and DELETE functions are more complicated than with “standard” SQL, and therefore they are not supported in this first version of the Hive Adapter. Transactions are currently not supported by Hive. 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.

**Note**

Before registering your adapter with the SAP HANA system, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the Product Availability Matrix. The Product Availability Matrix also provides information about supported Hive versions.

Place your files in `<DPAgent_root>/lib`, and you will need to manually create the `/lib` folder.

### Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source

In addition, this adapter supports the following capabilities:

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT from a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>INSERT into a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>No</td>
</tr>
<tr>
<td>Realtime</td>
<td>No</td>
</tr>
</tbody>
</table>
Table 36: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>Yes</td>
</tr>
<tr>
<td>Add a WHERE clause</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN multiple tables</td>
<td>Yes</td>
</tr>
<tr>
<td>Aggregate data via a GROUP BY clause</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a DISTINCT clause in the select</td>
<td>No</td>
</tr>
<tr>
<td>Support a TOP or LIMIT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>ORDER BY</td>
<td>Yes</td>
</tr>
<tr>
<td>GROUP BY</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Related Information

Hive Remote Source Configuration [page 173]
Hive to SAP HANA Data Type Mapping [page 178]
Update JCE Policy Files for Stronger Encryption [page 352]

6.10.1 Hive Remote Source Configuration

Configure the following options in smart data access to configure your connection to a Hive remote source. Also included is sample code for creating a remote source using the SQL console.

**Note**
If you change the remote source parameters after you have made a connection with Hive, you will need to restart the DP Agent.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>Hive Version</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Host</td>
<td>The host of Hive</td>
</tr>
<tr>
<td></td>
<td>Port</td>
<td>The port number of Hive</td>
</tr>
<tr>
<td></td>
<td>Database Name</td>
<td>The Hive database name</td>
</tr>
<tr>
<td>Security</td>
<td>Use SSL</td>
<td>Specifies whether to use SSL.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>The default value is “false”.</td>
<td></td>
</tr>
<tr>
<td>SSL Trust Store</td>
<td></td>
<td>Specifies the SSL Trust Store. If this value is not defined, the adapter will use the centralized trust store by default.</td>
</tr>
<tr>
<td>SSL Trust Store Password</td>
<td></td>
<td>Specifies the SSL Trust Store password. If this value is not defined, the adapter will use the centralized trust store and the DP Agent password by default.</td>
</tr>
<tr>
<td>Logon Mechanism</td>
<td></td>
<td>Controls the authentication (+authorization) method used, and which username and password values to enter in the credentials field below.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Default</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Kerberos: If set to Kerberos, the Kerberos Realm, Kerberos KDC, and Kerberos Principal settings are used when making the Hive connection.</td>
</tr>
<tr>
<td>Kerberos Realm</td>
<td></td>
<td>(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.</td>
</tr>
<tr>
<td>Kerberos KDC</td>
<td></td>
<td>(Optional when using Kerberos) The address of the KDC (Key Distribution Center) to be used with the specified Realm (has to be used together with Realm)</td>
</tr>
<tr>
<td>Kerberos Principal</td>
<td></td>
<td>The Kerberos principal. Speeds up retrieving large amounts of data from Hive (disabled when using Kerberos authentication)</td>
</tr>
<tr>
<td>Kerberos Refresh KRB5</td>
<td></td>
<td>Set this to true, if you want the configuration to be refreshed before the login method is called.</td>
</tr>
<tr>
<td>Kerberos Use Ticket Cache</td>
<td></td>
<td>Set this to true, if you want the TGT to be obtained from the ticket cache. Set</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>this option to false if you do not want this module to use the ticket cache. (Default is False). This module will search for the ticket cache in the following locations: On Solaris and Linux it will look for the ticket cache in <code>/tmp/krb5cc_uid</code> where the uid is numeric user identifier. If the ticket cache is not available in the above location, or if we are on a Windows platform, it will look 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 Kerberos Ticket Cache parameter. For Windows, if a ticket cannot be retrieved from the file ticket cache, it will use Local Security Authority (LSA) API to get the TGT.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Ticket Cache</td>
<td>Set this to the name of the ticket cache that contains user’s TGT. If this is set, Kerberos Use Ticket Cache must also be set to true; otherwise, a configuration error will be returned.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Renew TGT</td>
<td>Set this to true, if you want to renew the TGT. If this is set, Kerberos Use Ticket Cache must also be set to true; otherwise, a configuration error will be returned.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Use Key Tab</td>
<td>Set this to true if you want the module to get the principal’s key from the keytab. (default value is False) If Kerberos Key Tab is not set, then the module will locate the keytab from the Kerberos configuration file. If it is not specified in the Kerberos configuration file then it will look for the file <code>&lt;user.home&gt;&lt;file.separator&gt;krb5.keytab</code>.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Key Tab</td>
<td>Set this to the file name of the keytab to get principal’s secret key.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Kerberos Store Key</td>
<td>Set this to true to if you want the principal's key to be stored in the Subject's private credentials.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Is Initiator</td>
<td>Set this to true, if initiator. Set this to false, if acceptor only. (Default is true).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do not set this value to false for initiators.</td>
</tr>
<tr>
<td></td>
<td>Kerberos Debug</td>
<td>Enable debugging mode by setting this to true. You can view debugging information in the DP Agent log.</td>
</tr>
<tr>
<td></td>
<td>Additional Properties</td>
<td>Additional JDBC settings that are added directly to the JDBC URL. The parameters must be specified in the following format: key=value,key=value,...</td>
</tr>
<tr>
<td></td>
<td>Credentials Mode</td>
<td>“technical user” or “secondary user”</td>
</tr>
<tr>
<td></td>
<td>Credentials Mode</td>
<td>Select one of the choices, depending on the purpose of the remote source you want to create.</td>
</tr>
<tr>
<td></td>
<td>JDBC Credentials</td>
<td>Username</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Hive user name</td>
</tr>
<tr>
<td></td>
<td>JDBC Credentials</td>
<td>Password</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Hive user password</td>
</tr>
</tbody>
</table>

The following sample codes illustrate how to create a remote source using the SQL console.

**Basic**

**Example**

```sql
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" displayValue="Host">myhost.sap.corp</PropertyEntry>
    <PropertyEntry name="PORT" displayValue="Port Number">10000</PropertyEntry>
    <PropertyEntry name="DB_NAME" displayValue="Database Name">mydb</PropertyEntry>
    <PropertyEntry name="VERSION" displayValue="Database Version">1.2.1</PropertyEntry>
  </PropertyGroup>
</ConnectionProperties>
```
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">Kerberos</PropertyEntry>
<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">true</PropertyEntry>
<PropertyEntry name="KERBEROS_KEY_TAB">my.keytab</PropertyEntry>
<PropertyEntry name="KERBEROS_STORE_KEY"></PropertyEntry>
<PropertyEntry name="KERBEROS_IS_INITIATOR">true</PropertyEntry>
<PropertyEntry name="KERBEROS_DEBUG">true</PropertyEntry>
<PropertyEntry name="ADDITIONAL"></PropertyEntry>
</PropertyGroup>
</ConnectionProperties>' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
<user>myuser@SAPDS.CORP</user>
<password>mypassword</password>
</CredentialEntry>';
6.10.2 Hive to SAP HANA Data Type Mapping

The following table shows data type mappings from Hive to SAP HANA.

<table>
<thead>
<tr>
<th>Hive Data Type</th>
<th>SAP HANA Data Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>TINYINT</td>
<td>TINYINT</td>
<td>1-byte signed integer, from -128 to 127</td>
</tr>
<tr>
<td>SMALLINT</td>
<td>SMALLINT</td>
<td>2-byte signed integer, from -32,768 to 32,767</td>
</tr>
<tr>
<td>INT</td>
<td>INT</td>
<td>4-byte signed integer, from -2,147,483,648 to 2,147,483,647</td>
</tr>
<tr>
<td>BIGINT</td>
<td>BIGINT</td>
<td>8-byte signed integer, from -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807</td>
</tr>
<tr>
<td>FLOAT</td>
<td>DOUBLE</td>
<td>4-byte single precision floating point number</td>
</tr>
<tr>
<td>DOUBLE</td>
<td>DOUBLE</td>
<td>8-byte double precision floating point number • range (approximately -10³⁰⁸ to 10³⁰⁸) or very close to zero (-10⁻³⁰⁸ to 10⁻³⁰⁸)</td>
</tr>
<tr>
<td>DECIMAL</td>
<td>DECIMAL</td>
<td>Introduced in Hive 0.11.0 with a precision of 38 digits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hive 0.13.0 introduced user definable precision and scale</td>
</tr>
<tr>
<td>TIMESTAMP</td>
<td>TIMESTAMP</td>
<td>Timestamp format &quot;YYYY-MM-DD HH:MM:SS.fffffffff&quot; (9 decimal place precision)</td>
</tr>
<tr>
<td>DATE</td>
<td>DATE</td>
<td>DATE values describe a particular year/month/day, in the form {{YYYY-¬MM-¬DD}}</td>
</tr>
<tr>
<td>STRING</td>
<td>VARCHAR</td>
<td>Only available starting with Hive 0.12.0</td>
</tr>
<tr>
<td>VARCHAR</td>
<td>VARCHAR</td>
<td>Only available starting with Hive 0.12.0</td>
</tr>
<tr>
<td>CHAR</td>
<td>CHAR</td>
<td>Only available starting with Hive 0.13.0</td>
</tr>
<tr>
<td>BOOLEAN</td>
<td>VARCHAR</td>
<td>Only available starting with Hive 0.13.0</td>
</tr>
<tr>
<td>BINARY</td>
<td>VARBINARY</td>
<td></td>
</tr>
</tbody>
</table>

6.11 IBM DB2 Log Reader

The 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 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.
Note
Before registering your adapter with the SAP HANA system, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the Product Availability Matrix.

Place your files in `<DPAgent_root>/lib`, and you will need to manually create the `/lib` folder.

**Adapter Functionality**

This adapter supports the following functionality:

- With this adapter, you can add multiple remote sources using the same Data Provisioning Agent
- Virtual table as a source
- Realtime change data capture (CDC)

Note
Log Reader adapters do not support the truncate table operation.

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.

- 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

Note
The IBM DB2 log reader adapter does not support the following LDAP scenarios:
  - LDAP + SSL authentication
  - LDAP + Kerberos authentication
  - LDAP failover mode

In addition, this adapter supports the following capabilities:
Table 37: Global Settings

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT</td>
<td>Yes</td>
</tr>
<tr>
<td>INSERT</td>
<td>Yes</td>
</tr>
<tr>
<td>UPDATE</td>
<td>Yes</td>
</tr>
<tr>
<td>DELETE</td>
<td>Yes</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>No</td>
</tr>
<tr>
<td>Realtime</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 38: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>Yes</td>
</tr>
<tr>
<td>WHERE</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN</td>
<td>Yes</td>
</tr>
<tr>
<td>DISTINCT</td>
<td>Yes</td>
</tr>
<tr>
<td>TOP or LIMIT</td>
<td>Yes</td>
</tr>
<tr>
<td>ORDER BY</td>
<td>Yes</td>
</tr>
<tr>
<td>GROUP BY</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Related Information

IBM DB2 Realtime Replication [page 181]
DB2LogReaderAdapter Preferences [page 190]
DB2 Log Reader Remote Source Configuration [page 192]
Using a Schema Alias [page 199]
DB2 to SAP HANA Data Type Mapping [page 200]
Log Reader Adapter Log Files [page 201]
Configure SSL for the DB2 Log Reader Adapter [page 202]
6.11.1 IBM DB2 Realtime Replication

Information about setting up your source system and adapter for realtime replication.

Related Information

Remote Database Setup for DB2 Realtime [page 181]
Remote Database Cleanup for DB2 Realtime Replication [page 190]

6.11.1.1 Remote Database Setup for DB2 Realtime

The remote database must be set up properly for Log Reader adapters to function correctly when using realtime replication.

This setup process is necessary only when using realtime.

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 turned on (automcommit=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 turned on, a deadlock problem can occur. The path to the CLI configuration file is: %DB2DIR% \sqlib\db2cli.ini where %DB2DIR% is the path to the DB2 client installation. Alternatively, to turn on autocommit, open the DB2 administrative command line console and run:
  
  `db2set DB2OPTIONS=-c`

- To initialize Replication Agent 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:

- You will need to suspend any remote subscriptions before upgrading. Prior to suspending your subscriptions, ensure that all data has been synched to the SAP HANA target table.
- After suspending your subscriptions, ensure that there is 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, you should reset your subscriptions and then resume all of your subscriptions.
Realtime Replication Limitations

The following limitations exist when performing realtime 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 UDB Environment Variables [page 182]
Installing Data Provisioning Agent and DB2 Server on Different Servers [page 183]
Primary DB2 UDB Database Configuration for Replication [page 185]
DB2 Log Reader Adapter Required Libraries [page 189]

6.11.1.1 Setting DB2 UDB Environment Variables

The method to set DB2 UDB environment variables depends on the operating system.

*Note*

The DB2 UDB environment variables should be set up regardless of whether your DP Agent is installed on the same server as the DB2 database. 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 `<$HOME/sqllib/lib32>` and `<$HOME/sqllib/lib64>`, respectively, where `<$HOME>` is the home directory of the DB2 UDB instance owner.

*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.
Note

We recommend that you add a line to the `<DPAgent_root>/bin/dagent_env.sh` file to source the `db2profile`. This will ensure that when you use `dagent_service.sh` to start and stop the DP Agent service, the DB2 UDB environment variables will be sourced automatically. For example, you could add a line such as `source /home/db2inst1/sqlib/db2profile`.

6.11.1.2 Installing 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 DP Agent and the DB2 Server are on different machines, the IBM Data Server Runtime Client must be installed on the DP Agent machine.

Related Information

- DB2 Connectivity [page 183]
- Catalog the Remote TCP/IP Node from the DB2 Client [page 184]
- Catalog the Primary Database from the DB2 Client [page 184]

6.11.1.2.1 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`. 
6.11.1.2.2 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. Log in as the DB2 instance owner. (For Linux only)
   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:
   ```
   <$HOME>/sqllib/db2profile
   ```
   In C shell, source the `db2cshrc` file:
   ```
   source <$HOME>/sqllib/db2cshrc
   ```
   (where `$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
   ```

6.11.1.2.3 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
   ```

2. Verify the catalog entry:
   ```
   db2 => list database directory
   ```

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MYDB</td>
<td>Database name</td>
</tr>
<tr>
<td>MYDB_ALIAS</td>
<td>Alias for the database</td>
</tr>
<tr>
<td>MYNODE</td>
<td>The node name used in the catalog TCPIP node command</td>
</tr>
</tbody>
</table>
DB2 should return something similar to:

<table>
<thead>
<tr>
<th>System Database Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of entries in the directory</td>
</tr>
<tr>
<td>Database 1 entry</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Directory entry type = Remote</td>
</tr>
</tbody>
</table>

### 6.11.1.3 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 turned on (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 turned on, a deadlock problem can occur. The path to the CLI configuration file is: `%DB2DIR%\sqlib\db2cli.ini` where `%DB2DIR%` is the path to the DB2 client installation. Alternatively, to turn on autocommit, open the DB2 administrative command line console and run: `db2set DB2OPTIONS=+c`
- To initialize Replication Agent 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 186]
- Verify the Current Archive Setting of the Transaction Log [page 187]
- Create a DB2 UDB User and Grant Permissions [page 188]
6.11.1.3.1 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/sql/lib/db2profile
   %>db2
   ```

2. 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.)*

3. Create a buffer pool:

   ```
   db2 => create bufferpool pdb_buffer_name size 1000 pagesize same_pagesize_as_pdb
   ```

   *(where `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
   ```

   *(where `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.)*

   **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 16KB page size and buffer pool named tom_servo, enter:

   ```
   db2 => create user temporary tablespace deep13 pagesize 16K managed by automatic storage bufferpool tom_servo
   ```
6.11.1.1.3.2 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:
   ○ To use the default archive location:
      
      ```
      db2 => UPDATE DATABASE CONFIGURATION USING logarchmeth1 LOGRETAIN
      ```
   ○ 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 DB2 UDB database to make the configuration change take effect:
   a. 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.)
   b. Backup 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.)

c. 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 on-disk (DBCONFIG_TYPE=0) value and another for in-memory (DBCONFIG_TYPE=1) value. Make sure that both of the values are changed to LOGRETAIN or DISK.

6.11.1.3.3 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 sybase is the password corresponding to the ra_user user name.)

2. Start the DB2 UDB command-line processor:

   `%>bash
   %>source /db2home/db2inst1/sqllib/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:

```sql
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>
```

### 6.11.1.1.4 DB2 Log Reader Adapter Required Libraries

The following table contains a list of the required libraries for setting up the DB2 Log Reader Adapter.

<table>
<thead>
<tr>
<th>Library</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB2 UDB JDBC driver</td>
<td>Include the DB2 JDBC driver library in the Data Provisioning Agent CLASSPATH environment variable. Please use the corresponding version of JDBC driver listed in the IBM documentation. For information about required JDBC libraries, see the Product Availability Matrix. This JAR file (db2jcc4.jar) needs to be copied to the following directory: <code>&lt;DPAgent_root&gt;/lib</code></td>
</tr>
<tr>
<td>Log Reader native interface</td>
<td>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 into the DPAgent PATH (for Windows) or LD_LIBRARY_PATH (for Linux) environment variable or JVM -Djava.library.path variable if you start up the Data Provisioning Agent from Eclipse.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Platform</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows (64-bit)</td>
<td>sybrauni.dll (to support DB2 v9.5)</td>
</tr>
<tr>
<td></td>
<td>sybrauni97.dll (to support DB2 v9.7)</td>
</tr>
<tr>
<td></td>
<td>sybrauni98.dll (to support DB2 v10.1, v10.5)</td>
</tr>
<tr>
<td>Linux (64-bit)</td>
<td>libsybrauni.so (to support DB2 v9.5)</td>
</tr>
<tr>
<td></td>
<td>libsybrauni97.so (to support DB2 v9.7)</td>
</tr>
<tr>
<td></td>
<td>libsybrauni98.so (to support DB2 v9.8, v10.1, v10.5)</td>
</tr>
</tbody>
</table>

**Note**
The native interface libraries will be packaged into Data Provisioning Agent installer.
**DB2 Log Reader Adapter internal libraries**

<table>
<thead>
<tr>
<th>Library</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>sybrautrunc.jar</td>
<td></td>
</tr>
<tr>
<td>sybraudb2flsn.jar</td>
<td></td>
</tr>
</tbody>
</table>

These libraries will be installed into DB2 database during replication initialization for specific procedure calls. Please include them in the Data Provisioning Agent CLASSPATH environment variable. These libraries will be packaged into Data Provisioning Agent installer.

---

**Related Information**

- IBM driver documentation
- SAP HANA Smart Data Integration and SAP HANA Smart Data Integration Product Availability Matrix

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### 6.11.1.2 Remote Database Cleanup for DB2 Realtime Replication

Run SQL scripts to manually clean objects from the DB2 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 database-level objects are dropped automatically by the adapter. 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 DB2 cleanup script file at `<DPAgent_root>\LogReader\scripts\db2_logreader_cleanup.sql`.

---

### 6.11.2 DB2LogReaderAdapter Preferences

Configuration parameters for the DB2 Log Reader adapter.

**Note**

Log Reader 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.

You can adjust DB2 Log Reader adapter settings in the Data Provisioning Agent Configuration Tool. (`<DPAgent_root>/configTool/dagentconfigtool.exe`)
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum operation queue size</td>
<td>The maximum number of operations permitted in the log reader operation queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum scan queue size</td>
<td>The maximum number of log records permitted in the log reader log scan queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Ignore log record processing errors</td>
<td>Determines whether to ignore log record processing errors.</td>
<td>false</td>
</tr>
<tr>
<td>Replicate LOB columns</td>
<td>Determines whether the agent applies each individual LOB change.</td>
<td>true</td>
</tr>
<tr>
<td>Database connection pool size</td>
<td>Maximum number of connections allowed in the connection pool on a secondary node.</td>
<td>15</td>
</tr>
<tr>
<td>Number of times to retry to connect if a connections fails</td>
<td>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.</td>
<td>5</td>
</tr>
<tr>
<td>Timeout in seconds to retry connecting</td>
<td>The number of seconds the agent waits between retry attempts to connect to the primary database.</td>
<td>10</td>
</tr>
<tr>
<td>Number of wrapped log files</td>
<td>The maximum size, in 1K blocks, of the Replication Agent system log file before wrapping.</td>
<td>3</td>
</tr>
<tr>
<td>Enable verbose trace</td>
<td>Enables or disables additional diagnostic information in the agent system log files.</td>
<td>false</td>
</tr>
<tr>
<td>Maximum log file size</td>
<td>Limit the size of the message log to conserve disk space.</td>
<td>1000</td>
</tr>
<tr>
<td>Turn on asynchronous logging mode</td>
<td>Specifies whether or not Replication Agent should turn on a-synchronized logging mode. (TRUE, FALSE)</td>
<td>TRUE</td>
</tr>
<tr>
<td>Maximum size of work queue for asynchronous logging</td>
<td>The Maximum size of the work queue for asynchronous logging file handler to collect the log records (1-2147483647)</td>
<td>1000</td>
</tr>
</tbody>
</table>
### Parameter Description Default value

- **Discard policy for asynchronous logging file handler**
  - Specifies the discard policy for asynchronous logging file handler when the work queue is saturated.
  - **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.
  - **DISCARD**: The log records that cannot be offered into queue are dropped.
  - **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.).
  - **BLOCKING**

---

### 6.11.3 DB2 Log Reader Remote Source Configuration

Configure the following options in smart data access to configure your connection to a DB2 remote source. Also included is sample code for creating a remote source using the SQL console.

#### 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/` will be converted to "AGENT<xxxx>".

- The log file is located at `<DPAgent_root>/log/Framework.trc`, and will read: “The instance name `<original_name>` exceeds 30 characters and it is converted to `<converted_name>`.”

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Generic</td>
<td>Always Map Character Types to Unicode</td>
<td>Determines whether a CHAR/ CHARACTER/VARCHAR/ LONGVARCHAR/CLOB column in the source database will be mapped to a Unicode column type in SAP HANA, only when the source database character set is non-ASCII. The default value is false.</td>
</tr>
</tbody>
</table>

#### Note

- The value of this parameter can be changed when the remote source is suspended.
<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note</td>
<td></td>
<td>Set this parameter to “true” only when the remote database is multibyte character sets, such as UTF-8, GBK, JA16SJIS, and so on.</td>
</tr>
<tr>
<td></td>
<td>Load and Replicate LOB columns</td>
<td>When this parameter is set to false, the LOB columns are filtered out when doing an initial load and realtime replication.</td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>This option is not available for an ECC adapter</td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Database</td>
<td>Host</td>
<td>The host name or IP address on which the DB2 Server is running.</td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Port Number</td>
<td>The port number of the DB2 Server.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If the DB2 port number set to 0 or bigger than 65535, DB2 will convert into another port number that is less than 65535. The translation rule is:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If the port number is 0 or 65536, DB2 will set a random port number after the restart of DB2, each time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If the port number is bigger than 65536, the real port number that DB2 set is the port number minus 65536.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For example, 70000-65536=4464, where 4464 is the real port number that DB2 set.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>Database Name</td>
<td>The name of the database</td>
</tr>
<tr>
<td></td>
<td>Database Source Name</td>
<td>Set the Source Name parameter to MYDB_ALIAS when creating a remote source (where MYDB_ALIAS is the database alias that was used when cataloging the primary database)</td>
</tr>
<tr>
<td>LDAP Authentication</td>
<td>Use LDAP Authentication</td>
<td>Set to “true” to enable LDAP authentication for the DB2 database. The default is “false”</td>
</tr>
</tbody>
</table>
| Schema Alias Replacements | Schema Alias | 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.  
  
  **Note**  
  The value of this parameter can be changed when the remote source is suspended. |
|          | Schema Alias Replacement | Schema name to be used to replace the schema given in Schema Alias.  
  
  **Note**  
  The value of this parameter can be changed when the remote source is suspended. |
| Security | Use SSL | Specifies whether you are using SSL. The default value is “false”.  
  
  **Note**  
  The value of this parameter can be changed when the remote source is suspended. |
<p>| CDC Properties &gt; Log Reader | Maximum operation queue size | The maximum number of operations permitted in the log reader operation queue during replication. |</p>
<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum scan queue size</td>
<td>The maximum number of log records permitted in the log reader log scan queue during replication.</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Ignore log record processing errors</td>
<td>Determines whether to ignore log record processing errors.</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Database connection pool size</td>
<td>Maximum number of connections allowed in the connection pool on a secondary node.</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Number of times to retry to connect if a connections fails</td>
<td>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.</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Timeout in seconds to retry connecting</td>
<td>The number of seconds the agent waits between retry attempts to connect to the primary database.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LogReader Character Set</td>
<td>Represents the charset of the source DB2 database. There is no default value, which means no character set conversion will occur during the replication from DB2 to SAP HANA. For the accepted character set name please refer to <a href="http://www.iana.org/assignments/character-sets">http://www.iana.org/assignments/character-sets</a>.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Logreader read buffer size</td>
<td>Allows you to adjust the size of the DB2 log read. If the size is too small, you may encounter a “sqlcode -2650 reason 8” error. The default value is 65536.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Credentials</td>
<td>“technical user” or “secondary user” Select one of the choices, depending on the purpose of the remote source you want to create.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>User Name</td>
<td>The name of the DB2 database user which DB2 LogReader Adapter uses to access the DB2 database.</td>
<td></td>
</tr>
</tbody>
</table>
### Category | Option | Description
--- | --- | ---
 | Password | The password of the DB2 database user which DB2 LogReader Adapter uses to access the DB2 database

**Note**
The value of this parameter can be changed when the remote source is suspended.

The following sample codes illustrate how to create a remote source using the SQL console.

**Basic**

**Example**

**Sample Code**

```
CREATE REMOTE SOURCE "MyDB2Source" ADAPTER "DB2LogReaderAdapter" AT LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
<PropertyGroup name="database" display="Database">
<PropertyEntry name="pds_host_name" display="Host">myhost.sap.corp</PropertyEntry>
<PropertyEntry name="pds_port_number" display="Port Number">50000</PropertyEntry>
<PropertyEntry name="pds_database_name" display="Database Name">mydb</PropertyEntry>
<PropertyEntry name="pds_datasource_name" display="Database SourceName">mydb</PropertyEntry>
</PropertyGroup>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'<CredentialEntry name="credential">
    <user>myuser</user>
    <password>mypassword</password>
</CredentialEntry>';
```
Multibyte charset

Example

Sample Code

```sql
CREATE REMOTE SOURCE "MyDB2Resource" ADAPTER "DB2LogReaderAdapter" AT LOCATION
AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?><ConnectionProperties
name="configurations">
<PropertyGroup name="generic" displayName="Generic">
<PropertyEntry name="map_char_types_to_unicode" displayName="Always Map Character Types to Unicode">true</PropertyEntry>
<PropertyEntry name="pdb_dflt_column_repl" displayName="Load and Replicate LOB columns">true</PropertyEntry>
</PropertyGroup>
<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="cdc" displayName="CDC Properties">
<PropertyGroup name="logreader" displayName="LogReader">
<PropertyEntry name="skip_lr_errors" displayName="Ignore log record processing errors">false</PropertyEntry>
<PropertyEntry name="lr_max_op_queue_size" displayName="Maximum operation queue size">1000</PropertyEntry>
<PropertyEntry name="lr_max_scan_queue_size" displayName="Maximum scan queue size">1000</PropertyEntry>
<PropertyEntry name="pds_sql_connection_pool_size" displayName="Database connection pool size">15</PropertyEntry>
<PropertyEntry name="pds_retry_count" displayName="Number of times to retry to connect if a connection fails">5</PropertyEntry>
<PropertyEntry name="pds_retry_timeout" displayName="Timeout in seconds to retry connecting">10</PropertyEntry>
<PropertyEntry name="lr_character_set" displayName="LogReader Character Set">UTF-8</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'\<CredentialEntry name="credential">
<user>myuser</user>
<password>mypassword</password>
</CredentialEntry>''

Related Information

Setting the DB2 Port Number [page 199]
Using a Schema Alias [page 278]
6.11.3.1 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 will convert 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 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 the 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.

6.11.4 Using a Schema Alias

Using a schema alias can help make managing multiple schema, remote sources, and tables easier.

The Schema Alias and Schema Alias Replacement options, available in the remote source configuration parameters for some Data Provisioning adapters allows you too easily switch 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, “DB1”), and then create virtual tables under that remote source. Afterward, you may switch to the production database (“DB2”) without needing to create new virtual tables; the same tables exist in both DB1 and DB2, but under different schema and different databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB1, for example. (Note: OWNER1.MYTABLE is the unique name of the source table.) This 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 (DB2), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name info 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 DB2, while OWNER2 is Schema Alias Replacement.

To use this functionality, both of these options need to be populated.
6.11.5 DB2 to SAP HANA Data Type Mapping

The following table shows the conversion between DB2 data types and SAP HANA data types.

<table>
<thead>
<tr>
<th>DB2 data type</th>
<th>SAP HANA data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIGINT</td>
<td>BIGINT</td>
</tr>
<tr>
<td>DECIMAL(16)</td>
<td>DOUBLE</td>
</tr>
<tr>
<td>DECIMAL(32)</td>
<td>DECIMAL</td>
</tr>
<tr>
<td>DECIMAL</td>
<td>DECIMAL</td>
</tr>
<tr>
<td>DOUBLE</td>
<td>DOUBLE</td>
</tr>
<tr>
<td>INTEGER</td>
<td>INTEGER</td>
</tr>
<tr>
<td>REAL</td>
<td>REAL</td>
</tr>
<tr>
<td>SMALLINT</td>
<td>SMALLINT</td>
</tr>
<tr>
<td>GRAPHIC</td>
<td>NVARCHAR</td>
</tr>
<tr>
<td>VARGRAPHIC(n)</td>
<td>• NVARCHAR (n&lt;=5000)</td>
</tr>
<tr>
<td></td>
<td>• NCLOB (n&gt;5000)</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td>When the source table contains a VARGRAPHIC(n) column, the tablespace pagesize on this table should be set to 32k.</td>
</tr>
<tr>
<td>LONGVARGRAPHIC</td>
<td>NCLOB</td>
</tr>
<tr>
<td>CHAR</td>
<td>VARCHAR</td>
</tr>
<tr>
<td>CHARACTER</td>
<td>VARCHAR</td>
</tr>
<tr>
<td>VARCHAR(n)</td>
<td>• VARCHAR (n&lt;=5000)</td>
</tr>
<tr>
<td></td>
<td>• CLOB (n&gt;5000)</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td>When the source table contains a VARCHAR(n) column, the tablespace pagesize on this table should be set to 32k.</td>
</tr>
<tr>
<td>DB2 data type</td>
<td>SAP HANA data type</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>LONG VARCHAR</td>
<td>CLOB</td>
</tr>
<tr>
<td>CHAR FOR BIT DATA</td>
<td>VARBINARY</td>
</tr>
<tr>
<td>VARCHAR(n) FOR BIT DATA</td>
<td>VARBINARY(n)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Note</td>
<td></td>
</tr>
<tr>
<td>When the source table contains a VARCHAR(n) FOR BIT DATA column, the tablespace pagesize on this table should be set to 32k.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>LONG VARCHAR FOR BIT DATA</td>
<td>BLOB</td>
</tr>
<tr>
<td>DATE</td>
<td>DATE</td>
</tr>
<tr>
<td>TIME</td>
<td>TIME</td>
</tr>
<tr>
<td>TIMESTAMP</td>
<td>TIMESTAMP</td>
</tr>
<tr>
<td>BLOB</td>
<td>BLOB</td>
</tr>
<tr>
<td>CLOB</td>
<td>CLOB</td>
</tr>
<tr>
<td>DBCLOB</td>
<td>NCLOB</td>
</tr>
<tr>
<td>ROWID</td>
<td>Unsupported</td>
</tr>
<tr>
<td>XML</td>
<td>Unsupported</td>
</tr>
<tr>
<td>User-defined data types</td>
<td>Unsupported</td>
</tr>
</tbody>
</table>

### 6.11.6 Log Reader Adapter Log Files

You can review processing information in the Log Reader log files.

The following files are available:

<table>
<thead>
<tr>
<th>Log file name and location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;DPAgent_root&gt;/LogReader/admin_logs/admin&lt;instance_name&gt;.log</code></td>
<td>Log Reader administration log</td>
</tr>
<tr>
<td><code>&lt;DPAgent_root&gt;/log/&lt;instance_name&gt;.log</code></td>
<td>Log Reader instance log</td>
</tr>
</tbody>
</table>

**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.
6.11.7 Configure SSL for the DB2 Log Reader Adapter

Set up secure SSL communication between DB2 and the Data Provisioning Adapter.

Context

If you want to use SSL communication between your DB2 source and the Data Provisioning Adapter, you must complete a series of steps, such as preparing and importing certificates, configuring the source database, and so on.

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/sqllib/gskit/bin/gsk8capicmd_64 -keydb -create -db "key.kdb" -pw "ibm123456" -stash
      /home/db2inst1/sqllib/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/sqllib/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 192]

### 6.12 IBM DB2 Mainframe

The DB2 Mainframe adapter supports DB2 for z/OS.

The DB2 Mainframe adapter is a data provisioning adapter that provides DB2 client access to the database deployed on IBM DB2 for z/OS system with its service provider and data/metadata. The z/OS DB2 service provider is created as a data provisioning remote source. 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
- Virtual table as a target using a Data Sink in a flowgraph (Only INSERT is supported)

In addition, this adapter supports the following capabilities:

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT from a virtual table</td>
<td>Yes</td>
</tr>
</tbody>
</table>

---

[page 192]: #
<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSERT into a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>No</td>
</tr>
<tr>
<td>Realtime</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 40: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>Yes</td>
</tr>
<tr>
<td>Add a WHERE clause</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN multiple tables</td>
<td>Yes</td>
</tr>
<tr>
<td>Aggregate data via a GROUP BY clause</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a DISTINCT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a TOP or LIMIT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>ORDER BY</td>
<td>Yes</td>
</tr>
<tr>
<td>GROUP BY</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Related Information

- Setting DB2 UDB Environment Variables [page 182]
- IBM DB2 z/OS Permissions [page 206]
- Bind the DB2 SYSHL Package [page 207]
- Preparing JDBC Files [page 207]
- IBM DB2 z/OS Remote Source Configuration [page 208]
6.12.1 Setting DB2 UDB Environment Variables

The method to set DB2 UDB environment variables depends on the operating system.

**Note**

The DB2 UDB environment variables should be set up regardless of whether your DP Agent is installed on the same server as the DB2 database. 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 `<$HOME/sqllib/lib32>` and `<$HOME/sqllib/lib64>`, respectively, where `<$HOME>` is the home directory of the DB2 UDB instance owner.

**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.

**Note**

We recommend that you add a line to the `<DPAgent_root>/bin/dpagent_env.sh` file to source the `db2profile`. This will ensure that when you use `dpagent_service.sh` to start and stop the DP Agent service, the DB2 UDB environment variables will be sourced automatically. For example, you could add a line such as `source /home/db2inst1/sqllib/db2profile`.

6.12.2 IBM DB2 z/OS Permissions

Database users need to have certain permissions granted to them.

The IBM DB2 for z/OS adapter requires a user with read privileges to the `SYSIBM.SYSCOLUMNS` system table.
6.12.3 Bind the DB2 SYSHL Package

You may need to bind 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 z/OS 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** button.

6.12.4 Preparing JDBC Files

Prepare the IBM DB2 JDBC JAR files to use the IBM DB2 Mainframe adapter.

In order to use the DB2 Mainframe adapter, 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](http://www-01.ibm.com/support/docview.wss?uid=swg21363866). Be sure to download the JDBC JAR file according to your DB2 database version.

- **db2jcc_license_cisuz.jar** (Required)

You can find these JAR files in the following ways:

- These JAR files will be available in the installation directory after you have installed the IBM DB2 client. For example, on a Windows System, the JAR files will be 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.
### 6.12.5 IBM DB2 z/OS Remote Source Configuration

Options for connecting to the remote z/OS data server. Also included is sample code for creating a remote source using the SQL console.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Database</strong></td>
<td>Host</td>
<td>Host name or IP address on which the remote DB2 data server is running.</td>
</tr>
<tr>
<td></td>
<td>Port Number</td>
<td>The DB2 data server port number.</td>
</tr>
<tr>
<td></td>
<td>Database Name</td>
<td>The DB2 database name.</td>
</tr>
<tr>
<td></td>
<td>Database Source Name</td>
<td>The DB2 instance name.</td>
</tr>
<tr>
<td><strong>z/OS DB2 Additional Info</strong></td>
<td>Bind Packages</td>
<td>When this option is set to Yes, the DB2 z/OS adapter automatically checks and binds all of the required missing JAR files. 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.</td>
</tr>
</tbody>
</table>

**Note**

If any necessary packages are missing, an error occurs. Setting this option for subsequent attempts will help improve performance by eliminating the need for redundant checks for the necessary JDBC packages.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credential Properties</strong></td>
<td>Credentials Mode</td>
<td><em>technical user or secondary user</em></td>
</tr>
<tr>
<td></td>
<td>User Name</td>
<td>The DB2 user that has access to the tables that will be added as virtual tables in HANA.</td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>DB2 database user password.</td>
</tr>
</tbody>
</table>

**Example**

```sql
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>
  </PropertyGroup>
  </ConnectionProperties>
```

---

**Sample Code**
6.13 Microsoft Excel

Access Microsoft Excel files using the Excel Adapter.

The Microsoft Excel adapter enables SAP HANA users to read MS Excel files.

Authorizations

Keep the following in mind when accessing files:

- Password-protected Excel files are not supported.
- You must ensure that the user account under which the DP Agent is running has access to the Excel files on the local host, a shared directory, or a SharePoint site.
- If the Excel files are located on the same host as the DP Agent, the files must be located in the same directory, or a sub directory, of the DP Agent root directory.

Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Search for tables
- SharePoint source support

In addition, this adapter supports the following capabilities:

Table 41: Global Settings

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT from a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>INSERT into a virtual table</td>
<td>No</td>
</tr>
</tbody>
</table>
### Functionality

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>No</td>
</tr>
<tr>
<td>Realtime</td>
<td>No</td>
</tr>
</tbody>
</table>

### Related Information

- MS Excel Adapter Preferences [page 210]
- Microsoft Excel Remote Source Configuration [page 210]
- Access SharePoint Using HTTPS/SSL [page 166]
- Accessing Excel Data Files in a Shared Network Directory [page 216]

### 6.13.1 MS Excel Adapter Preferences

Options for controlling the MS Excel adapter.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access Token</td>
<td>A password. An access token protects the Excel files from access from a different remote source. Use this same password when creating a remote source.</td>
</tr>
</tbody>
</table>

### 6.13.2 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.

**Note**

If you want to use a DP Sergent agent, installed on Linux, to connect to the SharePoint site, enable Basic Authentication on the SharePoint server.
<table>
<thead>
<tr>
<th>Category</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>File Source</td>
<td>File Source Type</td>
<td>• File System: Specifies that the Excel source is located in a file system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SharePoint: Specifies that the Excel source is located on a SharePoint server.</td>
</tr>
<tr>
<td>File System</td>
<td>Folder</td>
<td>The directory of Excel files. This is a relative path.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If you leave this parameter blank, it will be set to <code>&lt;DPAgent_root&gt;/excel</code>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If you set the value to a relative folder name, it will become a sub folder of <code>&lt;DPAgent_root&gt;/excel</code>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For example, if you set the <code>Folder</code> parameter to <code>download/test</code>, the Excel file's folder will be <code>&lt;DPAgent_root&gt;/excel/download/dummy</code>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If you are using a shared network directory, enter the path as follows:</td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>\\&lt;host_name&gt;\&lt;directory&gt;</code></td>
</tr>
<tr>
<td>HANA</td>
<td>HANA Server</td>
<td>The SAP HANA server name</td>
</tr>
<tr>
<td>HANA</td>
<td>HANA Port</td>
<td>The port used to connect to the SAP HANA server</td>
</tr>
<tr>
<td>HANA</td>
<td>HANA Schema</td>
<td>The SAP HANA schema</td>
</tr>
<tr>
<td>SharePoint</td>
<td>Server URL</td>
<td>Enter the URL for the server where the SharePoint source is located.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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 http://&lt;server_name&gt;/ and your new site name is &quot;site1&quot;, your URL would be “http://&lt;server_name&gt;/site1”</td>
</tr>
<tr>
<td>SharePoint</td>
<td>Local Folder Path</td>
<td>The path to the folder that you want to access on the local file system where the DP Agent is deployed.</td>
</tr>
<tr>
<td>Category</td>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Table       | First Row as Header       | Determines whether the first row of the sheet is considered the header. If set to True, each column’s content will be used as the column name of the virtual table in HANA. Values:  
  - True (Default): The columns of first row will be used as column name of virtual table in HANA.  
  - False: The column names of virtual table in HANA will be defined as COL1, COL2, COL3, et cetera. |
|             | Start Row of Data         | Determines which row of the sheet is the first data row the Excel adapter loads into virtual table.  
  The value must be no greater than the max row number of the sheet.  
  If First Row as Header is set to TRUE, its default value is 2.  
  If First Row as Header is set to FALSE, its default value is 1. |
|             | End Row of Data           | Determines which row of the sheet is the last data row the adapter loads into virtual table.  
  The value must be no greater than the max row number of the sheet.  
  By default, all rows of the sheet will be loaded. |
|             | Show Hidden Column and Rows | Determines whether to process the columns which are hidden from the sheet.  
  Values:  
  - True: The hidden columns will be processed as normal columns.  
  - False (Default): The hidden columns will be ignored. |
### Column Filter
The list of columns which will be processed. Any column that does not exist in the list will be ignored. Enter a list of column names separated by semicolon.

#### Note
If the Column Filter option is empty, all columns will be processed. If the Column Filter option is not empty, only the listed columns will be processed.

For example, if you set the option to COL1;COL2;COL3, any other columns than COL1, COL2 and COL3 will be ignored.

Default: All columns will be processed

### Credentials
#### Credentials mode
“technical user” or “secondary user” Select one of the choices, depending on the purpose of the remote source you want to create.

### User Token
#### User Token for Excel Folder Access
The same password as the adapter “Access Token” preference. If this is left blank or is different from the Access Token, the remote source is not allowed to read the Excel files.

### HANA Credential
#### HANA Login
The SAP HANA user name.

#### HANA Password
The SAP HANA password.

### SharePoint Credential
#### SharePoint Login (Domain\UserName)
The domain and user name for the SharePoint account.

#### SharePoint Password
The password for the SharePoint account.

The following sample codes illustrate how to create a remote source using the SQL console.

### Local file system

#### Sample Code

```sql
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>
</ConnectionProperties>
'";
```
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>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING
'CredentialEntry name="usertoken">
<password>mytoken</password>
</CredentialEntry>
' WITH CREDENTIAL TYPE 'SHAREPOINT' USING
'CredentialEntry name="sharePointCredential">
<user>mydomain\mysharepointuser</user>
<password>mypassword</password>
</CredentialEntry>''
Related Information

Accessing Excel Data Files in a Shared Network Directory [page 216]

6.13.3 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 need to 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 -storepwd -keystore cacerts
   Enter keystore password: changeit
   New keystore password: 
   Re-enter new keystore password: 
   ```

   **Note**

   Keytool is in the jre/bin folder. You should 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: 34973632d6cb31934fdfe04352cc5dc
   Valid from: Thu Jan 05 01:29:45 PST 2017 until: Thu Jan 04 16:00:00 PST 2018
   Certificate fingerprints:
   SHA256: 0A:E8:79:0B:91:7E:26:6B: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 step 8.

5. If you are not using the TCP SSL connection between SAP HANA and the DP Agent, un-check 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. SSL configuration will not work until the DP Agent restarts.

6.13.4 Accessing Excel Data Files in a Shared Network Directory

Information about how to use a shared network directory for data files with the Excel adapter. You can access Excel data files in a shared directory, however you’ll need to follow a few rules.

Windows

When using Windows, make sure that you manually access the network folder first (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 DP Agent root install directory.

Excel Adapter Remote Source Parameters

Pay attention to the instructions for the Folder parameter when creating your Excel remote source.
Related Information

Microsoft Excel Remote Source Configuration [page 210]

6.14 Microsoft Outlook

Access Microsoft Outlook data by using the Outlook adapter.
You can access Microsoft Outlook data (PST file) using the Outlook adapter.
This adapter supports the following functionality:
• Virtual table as a source

Related Information

Outlook Adapter Preferences [page 217]
Microsoft Outlook Remote Source Configuration [page 217]

6.14.1 Outlook Adapter Preferences

Configuration parameters for the Outlook adapter.
You can adjust Outlook adapter settings in the Data Provisioning Agent Configuration Tool. (<DPAgent_root>/configTool/dpagentconfigtool.exe)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access Token</td>
<td>A password to access Outlook PST files. This exact value must be used when setting up an Outlook remote source.</td>
<td></td>
</tr>
</tbody>
</table>

6.14.2 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 an Outlook PST file.
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PST File Location</td>
<td>Specifies the path and file name to the PST file the adapter will read from. The user of the DP agent must have permission to access this PST file.</td>
</tr>
<tr>
<td>Ignore Extra Folder</td>
<td>Select True to ignore (not show) any extra folders that are irrelevant when browsing metadata.</td>
</tr>
<tr>
<td>Credentials Mode</td>
<td>Technical user or secondary user. Select one of the choices, depending on the purpose of the remote source you want to create.</td>
</tr>
<tr>
<td>PST File Access Token</td>
<td>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.</td>
</tr>
</tbody>
</table>

### Example

#### Sample Code

```xml
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>'
```

### 6.15 Microsoft SQL Server Log Reader

Use the Microsoft SQL Server Log Reader adapter to batch load, or replicate changed data in real time from a database, to SAP HANA.

The Microsoft SQL Server 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 it for batch loading.

**Note**

Before registering your adapter with the SAP HANA system, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the Product Availability Matrix.

Place your JDBC library in `<DPAgent_root>/lib`, and you will need to manually create the `/lib` folder.
The Log Reader service provider is created as a remote source, and it requires the creation of artifacts like virtual tables and remote subscriptions for each source table to perform replication.

**Note**
The Microsoft SQL Server Log Reader relies on database logs to perform data movement. This means that logs must be available until the data is successfully read and replicated to the target SAP HANA database. You should configure Microsoft SQL Server in Full Recovery Mode to ensure that the data will be replicated to SAP HANA.

**Note**
The user configured during the installation of the Data Provisioning Agent must have read access to the transaction log (the .ldf file).

**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.

### Adapter Functionality

This adapter supports the following functionality:

- With this adapter, you can add multiple remote sources using the same Data Provisioning Agent
- Virtual table as a source
- Realtime change data capture (CDC)

**Note**
- Log Reader adapters do not support the truncate table operation.
- The Microsoft SQL Server Log Reader adapter does not support WRITETEXT and UPDATETEXT.
- 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.

- 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 DATATYPE
- Replication monitoring and statistics
- Search for tables

In addition, this adapter supports the following capabilities:
Table 42: Global Settings

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT from a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>INSERT into a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>No</td>
</tr>
<tr>
<td>Real-time changed data capture (CDC)</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 43: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>Yes</td>
</tr>
<tr>
<td>Add a WHERE clause</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN multiple tables</td>
<td>Yes</td>
</tr>
<tr>
<td>Aggregate data via a GROUP BY clause</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a DISTINCT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a TOP or LIMIT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>ORDER BY</td>
<td>Yes</td>
</tr>
<tr>
<td>GROUP BY</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Related Information

- Microsoft SQL Server Realtime Replication [page 221]
- MssqlLogReaderAdapter Preferences [page 233]
- Microsoft SQL Server Log Reader Remote Source Configuration [page 237]
- Using a Schema Alias [page 245]
- Log Reader Adapter Log Files [page 201]
- Configure SSL for the Microsoft SQL Server Log Reader Adapter [page 247]
6.15.1 Microsoft SQL Server Realtime Replication

Information about setting up your source system and adapter for realtime replication.

Related Information

Remote Database Setup for SQL Server Realtime Replication [page 221]
Remote Database Cleanup for Microsoft SQL Server Realtime Replication [page 232]

6.15.1.1 Remote Database Setup for SQL Server Realtime Replication

The remote database must be set up properly for Log Reader adapters to function correctly when using realtime replication.

This setup process is necessary only when using realtime.

Realtime Replication Limitations

The following limitations exist when performing realtime 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
  - Table with REF constraint
  - Table with a clustered column store index
- WRITETEXT and UPDATETEXT
- Update LOB data types with like keyword
- Big size TEXT data using BCP

Related Information

Create Users and Grant Privileges [page 222]
Enable Remote DAC [page 222]
6.15.1.1 Create Users and Grant Privileges

Follow these steps to create users and grant privileges.

**Procedure**

Create an SQL Server user (for example, DP_USER) for the remote source. Grant the required privileges as follows:

```sql
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
```

6.15.1.2 Enable Remote 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.

   ```sql
   sp_configure 'remote admin connections', 1
   go
   ```

2. Update the remote admin connection setting.

   ```sql
   reconfigure
   go
   ```
3. Verify the remote admin connection string.

```sql
sp_configure 'remote admin connections'
go
```

**Related Information**

*Make Log Files Readable [page 223]*

### 6.15.1.1.2.1 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 `\LogReader\sybfilter\system\<platform>`, where `<DPAgent_root>` is the root directory of Data Provisioning Agent installation, and `<platform>` is winx86 or winx64.
   - winx64 is for 64-bit Windows Server 2008, Windows Server 2008 R2, and Windows 7
2. Right-click the sybfilter.inf 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 `\LogReader\sybfilter\system\<platform>`, create a file named LogPath.cfg.
4. Add a system environment variable named `<RACFGFilePath>`, and set its value to the path and the file name of the configuration file.
5. In Windows Explorer, navigate to `\LogReader\sybfilter\bin\`, and right-click the `sybfiltermgr.exe` file and then select Run as administrator to start 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:
   - User manager – use the add command in the management console. The syntax for this command is as follows. `add serverName dbName logFilePath`. For example, to add log file named pdb1_log.ldf
for the database pdb1 on the data server PVGD50857069A\MSSQLSERVER, use this: add
PVGD50857069A\MSSQLSERVER pdb1 C:\Mssql2012\MSSQL11.MSSQLSERVER\MSSQL\DATA
\pdb1_log.ldf

○ Or, add the following into LogPath.cfg file directly.

```
[PVGD50857069A\MSSQLSERVER, pdb1]
log_file_path=C:\Mssql2012\MSSQL11.MSSQLSERVER\MSSQL\DATA\pdb1_log.ldf
```

8. If you added a log file for your primary database before adding the log file path to the sybfilter driver, restart Microsoft SQL Server to make the log file readable.

9. At the management console, verify that log files are readable. If some log files are unreadable, make sure the files have been created and that Microsoft SQL Server has been restarted, if necessary. Execute check command in sybfilter console screen.

**Related Information**

Microsoft SQL Server Log Reader Remote Source Configuration [page 237]

6.15.1.1.3 Enable TCP/IP

Follow these steps to enable TCP/IP.

**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 SQL Server instance.
2. Right-click TCP/IP, and choose Enable.

6.15.1.1.4 Configure the Primary Data Server for the First Time

Configure the primary data server.

**Context**

Before you can begin, you must configure the primary data server.
**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, just 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 Log On tab, remember the account and then change to a user who has Administrator privileges.
   f. Click Start.

   ➤ **Tip**
   
   You must 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 SQL Server Management Studio, with no other DACs open, on the toolbar, click Database Engine Query.
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.

d. The connection is made. (If the DAC is already in use, the connection will fail with an error indicating it cannot connect.)

4. Execute script <DPAgent_root>\LogReader\scripts\mssql_server_init.sql to initialize the server.

Script <DPAgent_root>\LogReader\scripts\mssql_server_deinit.sql can be used to de-initialize the server if necessary.

5. Open the SQL Server service properties window (See step 2), and revocer the user account to the previous value in the Log On tab.

6. Stop and restart Microsoft SQL Server service back to normal mode.

Related Information

Microsoft SQL Server Log Reader Remote Source Configuration [page 237]

6.15.1.1.5 Installing Data Provisioning Agent and MS SQL Server on Different Servers

Additional steps are necessary when installing the Data Provisioning Agent and MS SQL server on different machines.

Context

The following procedure is an example. The example shows you how to set up an environment with an MS SQL Server database named “mypdb” on machine “A” and a DP Agent installed on a different machine (“B”).

Procedure

1. Install and configure Sybfilter on machine A (<host_name>).

Sybfilter can be copied from the DP Agent install directory on machine B (for example, C:\usr\sap \dataprovagent\LogReader\sybfilter).

2. Run a SQL query to get the exact location of the log files.

```sql
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. **Note**

Grant READ permissions for the shared folders to the DPAGENT user on machine 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 223].

For example, share the folders:
- C:\MSSQL_LOG\mypdb
- C:\Program Files\Microsoft SQL Server\MSSQL11.MSSQL2K12SP1\MSSQL\DATA

4. **Note**

Edit and include the mapping relationship into the mssql_log_path_mapping.props file as shown in the example below. Also, provide the database name, as shown in the example below.
- 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 you have the following scenario:
- User1 creates remote source RS1 and connecting to DB1
- User2 creates remote source RS2 and 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=\machine1\mssql_data
[DB2]
D:\Program Files\Microsoft SQL Server\MSSQL10_50.MSSQLSERVER\MSSQL\DATA=\machine2\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=\machine1\mssql_data
[RS2:DB1]
```
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 237]
- Make Log Files Readable [page 223]

**6.15.1.1.6 Run a Microsoft SQL Server Log Reader Adapter on Linux**

Learn how to set up your environment to run your MS SQL Server database on one machine and run the DP Agent on a separate Linux machine.

**Context**

The following procedure is an example of how to set up an environment with an MS SQL Server database named “mypdb” installed on machine “A” (Windows) and a DP Agent installed on machine “B” (Linux).

**Procedure**

1. Install the DP Agent on machine B (Linux).
2. Configure *Sybfilter* on machine A (Windows machine where the MS SQL Server database is installed). *Sybfilter* can be copied from the DP Agent install directory on machine B (for example, `<DPAgent_root>/LogReader/Sybfilter`).
3. Run the following SQL query to get the exact location of the log files.

   ```sql
   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 machine.

   For example, in the previous step 2, the MS 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 machine A, and then mount the two directories on machine B.

a. Create a directory on machine B where you want to mount the MSSQL log file folder. For example, create directories on machine B named /MSSQL_share_folder1 and /MSSQL_share_folder2.

b. On machine B execute the following command:

For SLES SP 11:

```bash
sudo mount -v -t cifs -o username=<machine_A_login_name>,password=<machine_A_login_password>,domain=<machine_A_login_name_domain>,ro,cache=none,directio <machine_A_share_directory>
```

For SLES SP 12 and above:

```bash
sudo mount -v -t cifs -o username=<machine_A_login_name>,password=<machine_A_login_password>,domain=<machine_A_login_name_domain>,ro,cache=none <machine_A_share_directory>
```

5. **Configure the mssql_log_path_mapping.props file on machine 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 (Assume that database name you use is R01):

```properties
[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 use system/manager to login.

7. Create a MS 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 34]
- Microsoft SQL Server Log Reader Remote Source Configuration [page 237]
Configure a Microsoft SQL Server Log Reader Adapter with Always On Support

Additional steps are necessary when configuring a Microsoft SQL Server Log Reader Adapter to connect to a Microsoft SQL Server host that is using 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 procedure is an example. The example shows you how to set up an environment with an MS SQL Server database named “mypdb” that is configured with an Always On Availability Group that has one secondary database in addition to the primary database.

Procedure

1. Install and configure Sybfilter on each host in the MS SQL Server Always On Availability Group, including primary and secondary databases.
   
   Sybfilter can be copied from the agent installation directory on the Data Provisioning Agent host (for example, C:\usr\sap\dataprovvagent\LogReader\sybfilter).

2. Run a SQL query to get the exact location of the log files.

   ```sql
   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 which contain “mypbd” database log files on each host machine 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 223].

   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 example below. Also, provide the database name, as shown in the example below.

- 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 pathname of each share folder on the right side, separated by semicolons.

For example, suppose you are connecting to the database “mypdb”, with the primary database on machine A and one secondary database on machine B.

```plaintext
[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](image)

**Tip**

We recommend that you also set the **Database Data Capture Mode** to “MS SQL CDC Mode”. If you do not use the MS CDC data capture mode, you need to execute server-level initialization scripts on each host in the Always On Availability Group.

---

### 6.15.1.1.8 Configure a Microsoft SQL Server Log Reader Adapter with Failover Cluster Support

Additional 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. The example shows you how to set up an environment with an MS 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 primary and secondary databases.
   
   Sybfilter can be copied 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.

   ```sql
   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 which contain “mypbd” database log files on the active node of the failover cluster.

**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 223].

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 example below. Also, provide the database name, as shown in the example below.

- 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 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 will try 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 retry interval by changing the lr_reopen_device_times and lr_reopen_device_interval parameters in `<DPAgent_root>\LogReader\config\mssql.cfg`

### 6.15.1.2 Remote Database Cleanup for Microsoft SQL Server Realtime Replication

Run SQL scripts to manually disable replication and clean up objects from the Microsoft SQL Server source database.

Clean-up scripts are used disable replication of a source database and to drop database-level objects. Usually, you do not need to execute a clean-up script after an adapter is dropped, because replication is disabled and database-level objects are dropped automatically by the adapter. However, in some cases, if any errors occur during or before automatically disabling replication dropping these objects, the replication may still be enabled and objects may not be dropped. At that point, you may need to execute the clean-up 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`.

### 6.15.2 MssqlLogReaderAdapter Preferences

Configuration parameters for the MS SQL Log Reader adapter.

**Note**

Log Reader 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.

You can adjust SQL Server Log Reader adapter settings in the Data Provisioning Agent Configuration Tool (`<DPAgent_root>/configTool/dpagentconfigtool.exe`).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum operation queue size</td>
<td>The maximum number of operations permitted in the log reader operation queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum scan queue size</td>
<td>The maximum number of log records permitted in the log reader log scan queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Maximum wait interval between log scans</td>
<td>The maximum wait interval between Log Reader transaction log scans.</td>
<td>2</td>
</tr>
</tbody>
</table>

**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.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seconds to add to each log scan wait interval</td>
<td>The number of seconds to add to each wait interval before scanning the trans-</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>action log, after a previous scan yields no transaction to be replicated.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The value of the parameter is the number of seconds added to each wait</td>
<td></td>
</tr>
<tr>
<td></td>
<td>interval before the LogReader component scans the log for a transaction to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>be replicated, after a previous scan yields no such transaction.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The number of seconds specified by the parameter is added to each wait</td>
<td></td>
</tr>
<tr>
<td></td>
<td>interval, until the wait interval reaches the value specified by the “Maximum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>wait interval between log scans” parameter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• For optimum performance, the value of the parameter should be balanced</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with the average number of operations in the primary database over a period</td>
<td></td>
</tr>
<tr>
<td></td>
<td>of time. In general, better performance results from reading more operations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>from the transaction log during each LogReader scan.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• With a primary database that is less frequently updated, increasing the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>value of the parameter may improve overall performance.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• If the database is continuously updated, the value of the parameter may</td>
<td></td>
</tr>
<tr>
<td></td>
<td>not be significant to performance.</td>
<td></td>
</tr>
<tr>
<td>Replicate LOB columns</td>
<td>Determines whether the agent applies each individual LOB change.</td>
<td>true</td>
</tr>
<tr>
<td>Database connection pool size</td>
<td>Maximum number of connections allowed in the connection pool on a secondary</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>node.</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Number of times to retry to connect if a connections fails</td>
<td>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.</td>
<td>5</td>
</tr>
<tr>
<td>Timeout in seconds to retry connecting</td>
<td>The number of seconds the agent waits between retry attempts to connect to the primary database.</td>
<td>10</td>
</tr>
<tr>
<td>Number of wrapped log files</td>
<td>The maximum size, in 1K blocks, of the agent system log file before wrapping.</td>
<td>3</td>
</tr>
<tr>
<td>Enable verbose trace</td>
<td>Enables or disables additional diagnostic information in the agent system log files.</td>
<td>false</td>
</tr>
<tr>
<td>Maximum log file size</td>
<td>Limit the size of the message log to conserve disk space.</td>
<td>1000</td>
</tr>
<tr>
<td>Turn on asynchronous logging mode</td>
<td>Specifies whether or not Replication Agent should turn on a-synchronized logging mode. (TRUE, FALSE)</td>
<td>TRUE</td>
</tr>
<tr>
<td>Maximum size of work queue for asynchronous logging</td>
<td>The Maximum size of the work queue for asynchronous logging file handler to collect the log records (1-2147483647)</td>
<td>1000</td>
</tr>
<tr>
<td>Discard policy for asynchronous logging file handler</td>
<td>Specifies the discard policy for asynchronous logging file handler when the work queue is saturated.</td>
<td>BLOCKING</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• DISCARD: The log records that cannot be offered into queue are dropped.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 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.).</td>
<td></td>
</tr>
</tbody>
</table>
6.15.3 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.

**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/` will be converted to `AGENT<xxxxx>`. The log file is located at `<DPAgent_root>/log/framework.trc` and will read: “The instance name `<original_name>` exceeds 30 characters and it is converted to `<converted_name>`.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Type Conversion</td>
<td>Always Map Character Types to Unicode</td>
<td>Determines whether a CHAR/VARCHAR/TEXT column in the source database will be mapped to a Unicode column type in SAP HANA when the source database character set is non-ASCII. The default value is “false”. <strong>Note</strong> The value of this parameter can be changed when the remote source is suspended. <strong>Note</strong> Set this parameter to “true” only when the remote database is multibyte character sets, such as UTF-8, GBK, JA16SJIS, and so on.</td>
</tr>
<tr>
<td>Map SQL Server Data Type Time to Timestamp</td>
<td>The value is false by default, which means TIME is mapped to TIME. However, this can lead to the loss of precision. When setting its value to true, TIME will be mapped to TIMESTAMP. The old behavior is that TIME mapped to TIMESTAMP. The new behavior is that TIME maps to TIME by default. This will not impact existing replication tasks. You will see a different data type mapping if you upgrade from an old version. Old subscriptions will replicate TIME as TIMESTAMP and new...</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>subscriptions will replicate TIME as TIME.</td>
</tr>
<tr>
<td>Generic</td>
<td>Load and Replicate LOB columns</td>
<td>When this parameter is set to false, the LOB columns are filtered out when doing an initial load and realtime replication.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>This option is not available for an ECC adapter</td>
</tr>
<tr>
<td>Database</td>
<td>Data Server</td>
<td>The Microsoft SQL Data Server name.</td>
</tr>
<tr>
<td></td>
<td>Port Number</td>
<td>The Microsoft SQL Data Server port number. The value range is 1-65535.</td>
</tr>
<tr>
<td></td>
<td>Database Name</td>
<td>The Microsoft SQL Server database name.</td>
</tr>
<tr>
<td></td>
<td>Database Data Capture Mode</td>
<td>• <strong>Native Mode</strong> (default).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>Microsoft SQL CDC Mode</strong>: The adapter uses the Microsoft SQL CDC API to mark a table for replication, so the first time you use it, server-level initialization (needs to switch to single user mode) is not required. When the Database Data Capture Mode option is set to Microsoft SQL CDC Mode, the adapter does not support replicating the TRUNCATE TABLE operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>To switch to another mode, you will need to reset all of your subscriptions and then alter this mode.</td>
</tr>
</tbody>
</table>
### Microsoft SQL Server CDC does not need to be enabled.

Both of these database data capture modes require the SYSADMIN role to execute. This role is needed so that we can perform the following on SQL Server:

- **Native mode:** We install some procedures into the SQL Server mssqlsystemresource database. These procedures are called every time a user marks a table for replication.
- **Microsoft SQL CDC Mode:** We rely on the SQL Server CDC API to mark tables for replication (for example, sys.sp_cdc_enable_table, sys.sp_cdc_disable_table

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use Remote Database</td>
<td>Set to “true” if you are running the Data Provisioning Agent on a different computer than that of the Microsoft SQL Server database. The default value is “false”.</td>
</tr>
</tbody>
</table>
|          | Include Table/Columns Remarks | • True: Returns a description of the table/column. If you have many tables, setting this parameter to “True” can impede performance.  
• False (Default): Turns off the return of descriptions.  
You can add extended properties for objects (Table/View/Column) to define a description of an MS 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.  
If the parameter Include Table/Columns Remarks is set to “true”, the descriptions of tables/views are returned when |
## Configure Data Provisioning Adapters

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>GET_REMOTE_SOURCE_OBJECTS_LIST is called. The descriptions of tables/views and columns are returned when GET_REMOTE_SOURCE_TABLE_DEFINITIONS is called.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>SQL Server Always On</td>
<td></td>
<td>Specifies whether Microsoft SQL Server is configured for Always On Availability Group support.</td>
</tr>
<tr>
<td>Availability Group Listener Host</td>
<td></td>
<td>The host name of the listener for the Always On Availability Group.</td>
</tr>
<tr>
<td>Availability Group Listener Port</td>
<td></td>
<td>The port used by the listener for the Always On Availability Group.</td>
</tr>
<tr>
<td>Schema Alias Replacements</td>
<td>Schema Alias</td>
<td>Schema name to be replaced with the schema given in Schema Alias Replacement. If given, accessing tables under this alias is considered to be accessing tables under the schema given in Schema Alias Replacement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Schema Alias Replacement</td>
<td>Schema name to use to replace the schema given in Schema Alias.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Security</td>
<td>Use SSL</td>
<td>Specifies whether you are using SSL. The default value is “false”.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>CDC Properties &gt; LogReader</td>
<td>Host Name in Certificate</td>
<td>Enter the host name that is in the SSL certificate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Maintenance User Filter (Case Sensitive)</td>
<td>Optional. Enter a source database user name. Source database transactions (INSERT, UPDATE, DELETE, and DDL changes such as ALTER TABLE) conducted by this user will be filtered out (ignored) and not propagated to the SAP HANA target. For example, if you log in to source database with this maintenance user and delete a row from a source table that is subscribed for replication, this row will not be deleted from the SAP HANA target table. <strong>Note</strong> Do not use the same name as the User Name credential. <strong>Note</strong> The value of this parameter can be changed when the remote source is suspended. <strong>Note</strong> If the S-ID of this user is changed using ALTER USER DDL, Maintenance User Filter will not work. <strong>Note</strong> Specifies whether the Log Reader ignores the errors that occur during log record processing. If set to “true”, the replication will not stop if log record processing errors occur.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>processing errors occur. The default value is “false”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong> The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Maximum operation queue size</td>
<td>The maximum number of operations permitted in the log reader operation queue during replication. The default value is 1000. The value range is 25-2147483647.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong> The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Maximum scan queue size</td>
<td>The maximum number of log records permitted in the log reader log scan queue during replication. The default value is 1000. The value range is 25-2147483647.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong> The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Maximum wait interval between log scans</td>
<td>The default value is 2. The value range is 1-3600.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong> The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Seconds to add to each log scan wait interval</td>
<td>The default value is 0. The value range is 0-3600</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong> The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Database connection pool size</td>
<td>Maximum number of connections allowed in the connection pool on a secondary node. The default value is 15. The value range is 1-64.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Number of times to retry to connect if a connection fails</td>
<td>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. The default value is 5. The value range is 0-2147483647.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Timeout in seconds to retry connecting</td>
<td>The number of seconds the agent waits between retry attempts to connect to the primary database. The default value is 10. The value range is 0-3600.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Credentials</td>
<td>Credentials Mode</td>
<td>Select Technical User or Secondary User depending on the purpose of the remote source you want to create.</td>
</tr>
<tr>
<td></td>
<td>User Name</td>
<td>Microsoft SQL user name.</td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>Microsoft SQL user password.</td>
</tr>
</tbody>
</table>


The value of this parameter can be changed when the remote source is suspended.

The following sample codes illustrate how to create a remote source using the SQL console.

**Basic**

**Example**

**Sample Code**

```sql
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_coversion" displayName="Data Type Coversion">
      <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 processing errors">false</PropertyEntry>
      </PropertyGroup>
    </PropertyGroup>
  </ConnectionProperties>
  'WITH CREDENTIAL TYPE 'PASSWORD' USING
  '<CredentialEntry name="credential">
    <user>myuser</user>
    <password>mypassword</password>
  </CredentialEntry>''
```
Microsoft SQL Server AlwaysOn

Example

Sample Code

```sql
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>
  </PropertyGroup>
  <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>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING '<CredentialEntry name="credential">
  <user>myuser</user>
  <password>mypassword</password>
</CredentialEntry>'
```

Related Information

SAP HANA SQL and System Views Reference: Create Remote Subscription [page 374]
Using a Schema Alias [page 278]
Prepare SSL when SAP HANA is on premise [page 31]
MssqlECCAdapter Preferences [page 313]

6.15.4 Using a Schema Alias

Using a schema alias can help make managing multiple schema, remote sources, and tables easier.

The Schema Alias and Schema Alias Replacement options, available in the remote source configuration parameters for some Data Provisioning adapters allows you too easily switch 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, "DB1"), and then create virtual tables under that remote source. Afterward, you may switch to the production database ("DB2") without needing to create new virtual tables; the same tables exist in both DB1 and DB2, but under different schema and different databases.
During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB1, for example. (Note: OWNER1.MYTABLE is the unique name of the source table.) This 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 (DB2), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name info 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 DB2, while OWNER2 is Schema Alias Replacement.

To use this functionality, both of these options need to be populated.

Related Information

DB2 Log Reader Remote Source Configuration [page 192]
Microsoft SQL Server Log Reader Remote Source Configuration [page 237]
Oracle Log Reader Remote Source Configuration [page 265]
SAP HANA Remote Source Configuration [page 321]

6.15.5 Log Reader Adapter Log Files

You can review processing information in the Log Reader log files.

The following files are available:

<table>
<thead>
<tr>
<th>Log file name and location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;DPAgent_root&gt;/LogReader/admin_logs/admin&lt;instance_name&gt;.log</td>
<td>Log Reader administration log</td>
</tr>
<tr>
<td>&lt;DPAgent_root&gt;/log/&lt;instance_name&gt;.log</td>
<td>Log Reader instance log</td>
</tr>
</tbody>
</table>

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.
6.15.6 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 complete a series of steps, including creating and importing certificates, configuring the source database, and so on.

Procedure

1. On the Microsoft SQL Server host, create a certificate authority (CA) certificate using the sha1 algorithm.
   You can 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.

   i  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.
   b. In the Certificate tab, select the certificate that you imported and click OK.
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 certificates 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 237]
6.16 OData

The 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 OData adapter supports the following functionality:

- Virtual table as a source
- Virtual table as a target using a Data Sink in a flowgraph

Related Information

- OData Adapter [page 249]
- Installation and Deployment [page 250]
- OData Remote Source Configuration [page 251]
- Consume HTTPS OData Services [page 253]

6.16.1 OData Adapter

Get access to the OData service provider and its data and metadata.

The SAP OData Adapter is a data provisioning adapter that provides OData client access to the OData service provider and its data/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. OData data can then be accessed via SAP HANA SQL query. Collections of OData data entries are represented as rows of the virtual table.

The data of the main navigation entities can be accessed via SQL, with the following restrictions:

- Without a Join, selected projection columns will appear in the OData system query “$select”.
- With a Join, columns of the joined table (associated OData entity) can occur in the projection. Selected projection columns will appear in the OData system query “$select”. All joined tables will 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.
6.16.2 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.

6.16.2.1 Set up the SAP HANA Server

Follow these steps to set up the SAP HANA server.

Procedure

1. Ensure that the Data Provisioning server is enabled.
2. If the OData service provider site only supports HTTPS connection.
3. Use SAP’s cryptography tool SAGENPSE delivered with SAP HANA to create a personal security environment (PSE) file and to import the public certificate provided by the server. Refer to Creating a PSE for the Server Using SAPGENPSE for command options.
   Make sure you put the PSE file into the SECUDIR (<HDB_INSTANCE>/<HOST_NAME>/sec) folder.
4. If the OData service provider requires HTTP basic authentication, set up a user and password.

Related Information

Enable the Data Provisioning Server [page 22]
Creating a PSE for the Server Using SAPGENPSE
6.16.2.2 Create an OData Remote Source

Follow these steps to create an OData remote source.

Procedure

1. Make sure the "SYS"."ADAPTERS_" table exists with the ODataAdapter Adapter Type.
   To add the OData adapter to the ADAPTERS table, run the following SQL:
   ```sql
   CREATE ADAPTER "ODataAdapter" PROPERTIES 'display_name=OData Adapter;description=OData Adapter' AT LOCATION DPSERVER;
   ```

2. Create a remote source of ODataAdapter type, 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 the Catalog/<SCHEMA>/Tables to find the added virtual tables to view the table definition or to preview table data.

Related Information

OData Remote Source Configuration [page 251]

6.16.3 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 to configure your connection to an OData source.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>OData service provider URL.</td>
</tr>
<tr>
<td>Proxy Server</td>
<td>Proxy host if URL is outside the firewall.</td>
</tr>
<tr>
<td>Proxy Port</td>
<td>Proxy port if URL is outside the firewall.</td>
</tr>
<tr>
<td>Trust Store</td>
<td>The trust store that contains the OData client’s public certificate, either a file in SECUDIR or a database trust store.</td>
</tr>
<tr>
<td>Is File Trust Store</td>
<td>Enter “true” if the trust store is a file in SECUDIR, or false if the trust store resides in the SAP HANA database. The default value is “true”.</td>
</tr>
<tr>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Support Format Query</td>
<td>If set to true, &quot;$format=json&quot; is appended to get OData entities in JSON format. If set to false, no format query is appended. The default value is “true”.</td>
</tr>
<tr>
<td>Require CSRF Header</td>
<td>Enter true if OData Service requires CSRF Header. The default value is “true”.</td>
</tr>
<tr>
<td>CSRF Header Name</td>
<td>Enter the name used for CSRF Header. The default value is “X-CSRF-Token”.</td>
</tr>
<tr>
<td>CSRF Header Fetch Value</td>
<td>Enter the value used for CSRF Header Fetch. The default value is “Fetch”.</td>
</tr>
<tr>
<td>Support Date Functions</td>
<td>Set the value to “false” if the OData service site does not support date functions hour/minute/month/year. The default value is “true”.</td>
</tr>
<tr>
<td>Show Navigation Properties</td>
<td>Enter “true” or “false” for the OData Service to return Navigation Properties. The default value is “false”.</td>
</tr>
<tr>
<td></td>
<td>If Show Navigation Properties is false, the select * SQL query returns only the regular Properties.</td>
</tr>
<tr>
<td></td>
<td>If Show Navigation Properties is true, the select * SQL query also return the Navigation Properties.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td>Due to an HTTP request maximum length restriction, avoid using the select * query if the total length for all Property names and Navigation Property names exceed the restriction.</td>
</tr>
<tr>
<td>Credentials Mode</td>
<td><strong>technical user</strong> or <strong>secondary user</strong></td>
</tr>
<tr>
<td>User Name</td>
<td>Select one of the choices, depending on the purpose of the remote source you want to create.</td>
</tr>
<tr>
<td>Password</td>
<td>User name for HTTP Basic Authentication in <a href="mailto:username@companyId">username@companyId</a> format.</td>
</tr>
</tbody>
</table>

**Example**

```sql
CREATE REMOTE SOURCE "MyODataSource" ADAPTER "ODataAdapter" AT LOCATION DPSERVER 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>
```
6.16.4 Consume HTTPS OData Services

Consume HTTPS OData services.

Context

If you want to consume HTTPS based OData Services (as opposed to non-secured HTTP based OData Services), the SSL certificate from the OData Services provider needs to get imported into the trust store on your SAP HANA platform in order to establish the connection between the OData adapter and the OData Service.

You will need to use the Trust Manager to successfully consume.

Procedure

1. Obtain the SSL certificate from the OData Service 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 imports the certificate to the sapsrv.pse file in SECUDIR.
   ○ For database trust stores, create a database trust store and import the certificate to the 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”.
4. Use SAP HANA studio or Web Workbench to browse the remote source and create virtual tables.
Related Information

Managing Trust Relationships

6.17 Oracle Log Reader

Use the Oracle Log Reader adapter to connect to an Oracle source to perform realtime change data capture.

The Oracle 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 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.

Note

There are three important tasks that you must perform to set up your Oracle database:

- Before registering your adapter with the SAP HANA system, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the Product Availability Matrix.
  Place your files in `<DPAgent_root>/lib`, and you will need to manually create the `/lib` folder.
- Set up database permissions
- Decide if you want table- (default) or database-level supplemental logging for realtime replication and set it up.

Adapter Functionality

This adapter supports the following functionality:

- Oracle 12c multitenant database support
- Virtual table as a source
- Realtime change data capture (CDC)

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
○ RENAME TABLE
○ RENAME COLUMN
○ ALTER COLUMN DATA TYPE

- Replication monitoring and statistics
- Search for tables
- Connect multiple adapter instances to the same remote source
- LDAP Authentication

**Note**
The Oracle log reader adapter does not support the following LDAP scenarios:
- Oracle multi-tenant architecture
- LDAP + SSL authentication
- LDAP + Kerberos authentication
- LDAP failover mode

In addition, this adapter supports the following capabilities:

Table 44: Global Settings

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT from a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>INSERT into a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>No</td>
</tr>
<tr>
<td>Realtime</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 45: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>Yes</td>
</tr>
<tr>
<td>Add a WHERE clause</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN multiple tables</td>
<td>Yes</td>
</tr>
<tr>
<td>Aggregate data via a GROUP BY clause</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a DISTINCT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a TOP or LIMIT clause in the select</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Related Information

- Oracle Realtime Replication [page 256]
- OracleLogReaderAdapter Preferences [page 262]
- Oracle Log Reader Remote Source Configuration [page 265]
- Using a Schema Alias [page 278]
- Oracle RAC Configuration [page 279]
- Log Reader Adapter Log Files [page 201]
- Synchronize the Oracle and DP Agent Timestamp [page 281]
- Configure SSL for the Oracle Log Reader Adapter [page 281]
- Connecting Multiple Oracle Log Reader Adapter Instances To The Same Remote Source [page 261]

## 6.17.1 Oracle Realtime Replication

Information about setting up your source system and adapter for realtime replication.

**Note**

We have found that the Oracle Log Miner maximum throughput is approximately 1 TB/day. Anything more than that and Oracle Log Miner begins to lag behind.

Therefore, no matter the amount of overage, if the replication volume is > 1 TB/day there will be a delay in replication.

### Related Information

- Remote Database Setup for Oracle Realtime [page 257]
- Connecting Multiple Oracle Log Reader Adapter Instances To The Same Remote Source [page 261]
- Remote Database Cleanup for Oracle Realtime Replication [page 262]
6.17.1.1 Remote Database Setup for Oracle Realtime

The remote Oracle database must be set up properly for this adapter to function correctly when using realtime replication.

This setup process is necessary only when using realtime.

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 source configuration, permissions, and cleanup.

LOB replication

When attempting LOB replication, be sure to have the `db_securefile` parameter set to “PERMITTED” in the Oracle system. Depending on the Oracle version you are using, the parameter may be set to a different value.

To do this, you can uncomment the following in the `oracle_init_example.sql` file:

```
ALTER SYSTEM SET db_securefile='PERMITTED';
```

**Note**

SecureFiles LOB replication is not supported.

Oracle to SAP HANA replication limitation

During realtime (CDC) replication for Oracle to SAP HANA, if the table in Oracle has a BLOB column as the first column, the replication will fail due to NullPointerException, which LogMiner returns as an invalid SQL statement. This occurs on Oracle 11.2.0.3 and 11.2.0.4.

Other Realtime Replication Limitations

The following limitations exist when performing realtime 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
### 6.17.1.1 Oracle Database Permissions

Database users need to have certain permissions granted to them.

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 (`<DPAgent_root>\LogReader\scripts`).

**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>` in line 85 to the password of the database user.

Also, be sure that you 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.

**Note**

- 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 following permission is required: LOGMINING
- The GRANT SELECT ON SYS.DEFERRED_STG$ TO LR_USER permission is not required for Oracle versions below 11gR2.

```
GRANT CREATE SESSION TO LR_USER;
GRANT CREATE TRIGGER TO LR_USER;
GRANT CREATE SEQUENCE TO LR_USER;
GRANT CREATE TABLE TO LR_USER;
```
GRANT CREATE PROCEDURE TO LR_USER;
GRANT ALTER ANY TABLE TO LR_USER;
GRANT SELECT ON SYS.TABPART$ TO LR_USER;
GRANT SELECT ON SYS.INDCOMPART$ TO LR_USER;
GRANT SELECT ON SYS.LOBCOMPPART$ TO LR_USER;
GRANT SELECT ON SYS.ATTRIBUTE$ TO LR_USER;
GRANT SELECT ON SYS.TABCOMPART$ TO LR_USER;
GRANT SELECT ON SYS.CDEF$ TO LR_USER;
GRANT SELECT ON SYS.NTAB$ TO LR_USER;
GRANT SELECT ON SYS.LOBFRAG$ TO LR_USER;
GRANT SELECT ON SYS.MLOG$ TO LR_USER;
GRANT SELECT ON SYS.OBJ$ TO LR_USER;
GRANT SELECT ON SYS.COLTYPE$ TO LR_USER;
GRANT SELECT ON SYS.COLLECTION$ TO LR_USER;
GRANT SELECT ON SYS.IND$ TO LR_USER;
GRANT SELECT ON SYS.TS$ TO LR_USER;
GRANT SELECT ON SYS.USER$ TO LR_USER;
GRANT SELECT ON SYS.SEG$ TO LR_USER;
GRANT SELECT ON SYS.TYPE$ TO LR_USER;
GRANT SELECT ON SYS.LOB$ TO LR_USER;
GRANT SELECT ON V_$LOGMNR_CONTENTS TO LR_USER;
GRANT SELECT ON SYS.DEFERRED_STG$ TO LR_USER;
GRANT SELECT ON SYS.INDPART$ TO LR_USER;
GRANT SELECT ON V_$LOGMNR_LOGS TO LR_USER;
GRANT SELECT ON SYS_TAB$ TO LR_USER;
GRANT SELECT ON SYS.COL$ TO LR_USER;
GRANT SELECT ON SYS.CCOL$ TO LR_USER;
GRANT SELECT ON SYS.INDSUBPART$ TO LR_USER;
GRANT SELECT ON SYS.TABSUBPART$ TO LR_USER;
GRANT SELECT ON SYS.ICOL$ TO LR_USER;
GRANT SELECT ON SYS.SNAP$ TO LR_USER;
GRANT SELECT ON V_$DATABASE TO LR_USER;
GRANT SELECT ON SYS.INDPART$ TO LR_USER;
GRANT SELECT ON V_$LOGMNR_LOGS TO LR_USER;
GRANT SELECT ON SYS_TAB$ TO LR_USER;
GRANT SELECT ON SYS.COL$ TO LR_USER;
GRANT SELECT ON SYS.CCOL$ TO LR_USER;
GRANT ADMINISTER DATABASE TRIGGER TO LR_USER;
GRANT EXECUTE_CATALOG_ROLE TO LR_USER;
GRANT SELECT_CATALOG_ROLE TO LR_USER;
GRANT SELECT ANY TRANSACTION TO LR_USER;

It is not necessary to grant the EXECUTE CATALOG ROLE or the SELECT CATALOG ROLE. Instead, you can grant the following specific permissions that are part of those roles:

<table>
<thead>
<tr>
<th>Role</th>
<th>Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXECUTE CATALOG ROLE</td>
<td>• GRANT EXECUTE ON SYS.DBMS_LOGMNR TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT EXECUTE ON SYS.DBMS_LOGMNR_D TO LR_USER;</td>
</tr>
<tr>
<td>Role</td>
<td>Permissions</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SELECT CATALOG ROLE</td>
<td>• GRANT SELECT ON SYS.DBA_ERRORS TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.DBA_LIBRARIES TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.DBA_LOG_GROUPS TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.DBA_OBJECTS TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.DBA_SYNONYMS TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.DBA_TABLES TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.DBA_TRIGGERS TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.GV_$INSTANCE TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.GV_$SESSION TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.GV_$ARCHIVE_DEST TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.GV_$ARCHIVED_LOG TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.V_$DATABASE TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.V_$DATABASE_INCARNATION TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.V_$LOG TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.V_$LOGFILE TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.V_$LOGMNR_CONTENTS TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.V_$LOGMNR_LOGS TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.V_$PARAMETER TO LR_USER;</td>
</tr>
<tr>
<td></td>
<td>• GRANT SELECT ON SYS.V_$TRANSACTION TO LR_USER;</td>
</tr>
</tbody>
</table>

## 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 apply to this script as above, concerning `<LR_USER>`, 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`

## Related Information

[Oracle Log Reader Remote Source Configuration](#) [page 265]
6.17.1.2 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`.

**Note**

Be aware that the oracle_init_example.sql file is a template script. You may need to alter the following:

- Uncomment line 38 and comment line 42-84 and 89-90, if you want database-level supplemental logging.

**Table-level Logging**

We recommend table-level logging, which turns on supplemental logging for subscribed tables and some required system tables. Run the scripts located in the oracle_init_example.sql file on your Oracle client to set this up.

**Database-level Logging**

Database level turns on supplemental logging for all tables, including system tables. Execute the following DDL statements, which are located in the oracle_init_example.sql file. Then, set the Oracle supplemental logging level Adapter Preferences option to “Database”.

```sql
ALTER DATABASE ADD SUPPLEMENTAL LOG DATA;
ALTER DATABASE ADD SUPPLEMENTAL LOG DATA (PRIMARY KEY, UNIQUE) COLUMNS;
```

**Related Information**

OracleLogReaderAdapter Preferences [page 262]

6.17.1.2 Connecting Multiple Oracle Log Reader Adapter Instances To The Same Remote Source

You can connect multiple Oracle Log Reader adapter instances to the same database, providing that you meet certain conditions.

The Oracle Log Reader adapter supports multiple instances connecting to same remote database when the following conditions are met:
Each remote source uses a unique user to connect to the database
- A different source table is marked for replication; the same table cannot be marked for replication by different remote sources.

### 6.17.1.3 Remote Database Cleanup for Oracle Realtime Replication

Run SQL scripts to manually clean objects 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 database-level objects are dropped automatically by the adapter. 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 Oracle cleanup script file at `<DPAgent_root>\LogReader\scripts\oracle_logreader_cleanup.sql`.

### 6.17.2 OracleLogReaderAdapter Preferences

Configuration parameters for the Oracle Log Reader adapter.

**i Note**

*Log Reader 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.*

You can adjust Oracle Log Reader adapter settings in the Data Provisioning Agent Configuration Tool. (`<DPAgent_root>/configTool/dpagentconfigtool.exe`)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distinguished Name (DN) in Certificate</td>
<td>The distinguished name (DN) of the primary data server certificate.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- This parameter is only valid if Use SSL is set to “true”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 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.</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Oracle supplemental logging level</td>
<td>Specifies the level of supplemental logging.</td>
<td>table</td>
</tr>
<tr>
<td></td>
<td>• Table: Table level turns on supplemental logging for subscribed tables and some required system tables.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Database: Database level turns on supplemental logging for all tables, including system tables.</td>
<td></td>
</tr>
<tr>
<td>Maximum operation queue size</td>
<td>The maximum number of operations permitted in the log reader operation queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum scan queue size</td>
<td>The maximum number of log records permitted in the log reader log scan queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum session cache size</td>
<td>The maximum number of Oracle sessions to be cached in memory during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Enable parallel scanning</td>
<td>Specifies whether to turn on parallel scanning.</td>
<td>false</td>
</tr>
<tr>
<td></td>
<td>To achieve better performance for high-volume log throughput, set the parameter to true to enable parallel scanning.</td>
<td></td>
</tr>
<tr>
<td>Queue size of parallel scan tasks</td>
<td>Specifies the number of tasks in the queue.</td>
<td>0</td>
</tr>
<tr>
<td>Parallel scan SCN range</td>
<td>The maximum number of system change numbers (SCN) processed by each Oracle LogMiner scanner, when parallel scan is enabled, that is, when lr_parallel_scan is true.</td>
<td>1024</td>
</tr>
<tr>
<td>Number of parallel scanners</td>
<td>Specifies the number of parallel scanners.</td>
<td>4</td>
</tr>
<tr>
<td>Number of log record rows fetched by the scanner at a time</td>
<td>Specifies the number of log record rows fetched by the scanner.</td>
<td>1</td>
</tr>
<tr>
<td>Ignore log record processing errors</td>
<td>Determines whether to ignore log record processing errors.</td>
<td>false</td>
</tr>
<tr>
<td>Replicate LOB columns</td>
<td>Oracle logs all LOB data (except for BFILE datatypes) in the Oracle redo log. This allows the agent to apply each individual LOB change. However, for BFILE data, the same technique is used.</td>
<td>true</td>
</tr>
<tr>
<td>Ignore data of unsupported types stored in ANYDATA</td>
<td>Specifies whether you want to ignore data with unsupported types housed in ANYDATA wrapper.</td>
<td>false</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Database connection pool size</td>
<td>Maximum number of connections allowed in the connection pool on a secondary node.</td>
<td>15</td>
</tr>
<tr>
<td>Number of times to retry to connect if a connections fails</td>
<td>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.</td>
<td>5</td>
</tr>
<tr>
<td>Timeout in seconds to retry connecting</td>
<td>The number of seconds the agent waits between retry attempts to connect to the primary database.</td>
<td>10</td>
</tr>
<tr>
<td>Number of wrapped log files</td>
<td>The maximum size, in 1K blocks, of the agent system log file before wrapping.</td>
<td>3</td>
</tr>
<tr>
<td>Enable verbose trace</td>
<td>Enables or disables additional diagnostic information in the agent system log files.</td>
<td>false</td>
</tr>
<tr>
<td>Maximum log file size</td>
<td>Limit the size of the message log to conserve disk space.</td>
<td>1000</td>
</tr>
<tr>
<td>Turn on asynchronous logging mode</td>
<td>Specifies whether or not Replication Agent should turn on a-synchronized logging mode. (TRUE, FALSE)</td>
<td>TRUE</td>
</tr>
<tr>
<td>Maximum size of work queue for asynchronous logging</td>
<td>The Maximum size of the work queue for asynchronous logging file handler to collect the log records (1-2147483647)</td>
<td>1000</td>
</tr>
<tr>
<td>Discard policy for asynchronous logging file handler</td>
<td>Specifies the discard policy for asynchronous logging file handler when the work queue is saturated.</td>
<td>BLOCKING</td>
</tr>
<tr>
<td></td>
<td>- 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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- DISCARD: The log records that cannot be offered into queue are dropped.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 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.).</td>
<td></td>
</tr>
</tbody>
</table>

**Related Information**

Oracle Database Permissions [page 258]
6.17.3 Oracle Log Reader Remote Source Configuration

Configure the following options for a connection to an Oracle remote source. Also included is sample code for creating a remote source using the SQL console.

**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/` will be converted to `AGENT<xxxxx>`. The log file is located at `<DPAgent_root>/log/framework.trc`, and will read: “The instance name `<original_name>` exceeds 30 characters and it is converted to `<converted_name>`.”

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| Generic  |              | Always Map Character Types to Unicode | Determines whether a CHAR/VARCHAR2/CLOB column in the source database will be mapped to a Unicode column type in SAP HANA when the source database character set is non-ASCII. The default value is “false”.

**Note**

The value of this parameter can be changed when the remote source is suspended.

**Note**

Set this parameter to “true” only when the remote database is multibyte character sets, such as UTF-8, GBK, JA16SJIS, and so on.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Load and Replicate LOB columns</th>
<th>When this parameter is set to false, the LOB columns are filtered out when doing an initial load and realtime replication.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Sub-category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>------------</td>
<td>--------------</td>
<td>----------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Database</td>
<td></td>
<td>Multitenant Database</td>
<td>Specifies whether to enable multitenant support.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• true: Replicate multitenant database</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• false: Replicate normal database</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use Oracle TNS NAMES File</td>
<td>Specifies whether to use the connection information from the Oracle tnsnames.ora file to connect to the Oracle database. If set it to “false”, you must configure the Host, Port Number, and Database Name options. If set to “true”, configure the Oracle TNS NAMES File and Oracle TNS NAMES Connection options. The default value is “false”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Host</td>
<td>The host name or IP address on which the remote Oracle database is running</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Port Number</td>
<td>The Oracle database server port number</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Database Name</td>
<td>The Oracle database name</td>
</tr>
<tr>
<td>Category</td>
<td>Sub-category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------</td>
<td>--------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Service Name</td>
<td>Specifies the service name of Oracle database. When creating remote source, you can set one of the parameters Database Name and Service Name. If you set both, the DP agent will connect to Oracle by the service name as the first choice.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Container Database Service Name</td>
<td>The service name of the container database</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pluggable Database Service Name</td>
<td>The service name of the pluggable database</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oracle TNSNAMES File</td>
<td>The full path of the Oracle tnsnames.ora file. For example, C:\usr\sap\dataprovagent\lib</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oracle TNSNAMES Connection</td>
<td>The Oracle connection name that identifies the primary database connection in the Oracle tnsnames.ora file.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Container Database TNSNAMES Connection</td>
<td>The Oracle connection name that identifies the container database connection in the Oracle tnsnames.ora file.</td>
</tr>
</tbody>
</table>

**Note**

The tnsnames.ora file must be local to the DP Agent machine (or accessible by the DP Agent). You will need to copy the file from the Oracle location to the agent machine.

The tnsnames.ora file is typically located at $ORACLE_HOME\NETWORK\ADMIN\tnsnames.ora on the Oracle database machine.
<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pluggable Database</td>
<td></td>
<td>TNSNAMES Connection</td>
<td>The Oracle connection name that identifies the pluggable database connection in the Oracle tnsnames.ora file.</td>
</tr>
<tr>
<td>LDAP Authentication</td>
<td></td>
<td>Use LDAP Authentication</td>
<td>Set to “true” to enable LDAP authentication for the Oracle database. The default is “false”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LDAP Server</td>
<td>The host name or IP address of the LDAP server</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LDAP Port</td>
<td>The port number of the LDAP server</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Database Service Name</td>
<td>The service name of the Oracle database</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Base Distinguished Name</td>
<td>The base distinguished name of a directory user on the LDAP server for authentication</td>
</tr>
<tr>
<td>Schema Alias Replacements</td>
<td></td>
<td>Schema Alias</td>
<td>Schema name to be replaced with the schema given in Schema Alias Replacement. If given, accessing tables under this alias is considered to be accessing tables under the schema given in Schema Alias Replacement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schema Alias Replacement</td>
<td>Schema name to be used to replace the schema given in Schema Alias.</td>
</tr>
</tbody>
</table>

**Note**

The value of this parameter can be changed when the remote source is suspended.
<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security</td>
<td></td>
<td>Use SSL</td>
<td>Specifies whether you are using SSL. The default value is “false”. Note: The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Distinguished Name (DN) in Certificate</td>
<td>The distinguished name (DN) of the primary data server certificate. Note: This parameter is only valid if Use SSL is set to “true”. 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. The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Require Client Authentication</td>
<td>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’s certificate was signed by a trusted CA. Note: The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Category</td>
<td>Sub-category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| JDBC Driver Configuration     |                               | Include Table/Columns                       | • True: Returns a description of the table/column. If you have many tables, setting this parameter to “True” can impede performance.  
• False (Default): Turns off the return of descriptions. |
|                               |                               | Remarks                                     | Note The value of this parameter can be changed when the remote source is suspended. |
| CDC Properties                | Database Configuration        | Oracle Supplemental logging level           | Specifies the level of supplemental logging.  
• “Table”: Enables supplemental logging for subscribed tables and some required system tables.  
• “Database”: Enables supplemental logging for all tables including system tables.  
The default value is “Table”. |
|                               |                               | Enable parallel scanning                    | Specifies whether to enable parallel scanning.  
To achieve better performance for high-volume log throughput, set the parameter to “true” to enable parallel scanning.  
The default value is “false”. |
<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number of parallel scanners</td>
<td>Specifies the number of parallel scanners.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Queue size of parallel scan tasks</td>
<td>Specifies the number of tasks in the queue.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enable parallel scanning by archived log</td>
<td>Determines whether the Replication Agent should run parallel Oracle LogMiner scanners by archived log. This will take effect when Enable parallel scanning is set to “true”, Enable parallel scanning by archived log is set to “true”, and when the value in SCN range of parallel scan tasks makes no sense. The default value is “false”.</td>
</tr>
</tbody>
</table>

**Note**

The value of this parameter can be changed when the remote source is suspended.

**Note**

The value of this parameter can be changed when the remote source is suspended.

**Note**

This parameter is not supported for an Oracle RAC remote source.
<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>i Note Use this option only after consultation with SAP support.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>i Note The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SCN range of parallel scan tasks The maximum number of system change numbers (SCN) processed by each Oracle LogMiner scanner (when the Enable parallel scanning parameter is set to “true”).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>i Note The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>LogReader</td>
<td></td>
<td>Maintenance User Filter (Case Sensitive) Optional. Enter a source database user name. Source database transactions (INSERT, UPDATE, DELETE, and DDL changes such as ALTER TABLE) conducted by this user will be 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 will not be deleted from the SAP HANA target table.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>i Note Do not use the same name as the Oracle User Name.</td>
</tr>
<tr>
<td>Category</td>
<td>Sub-category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignore Log Record Processing Errors</td>
<td>Specifies whether the Log Reader should ignore the errors that occur during log record processing. If set to “true”, the replication will not stop if log record processing errors occur. The default value is “false”.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use database link to query pluggable database</td>
<td>Indicates whether the Replication Agent uses database link instead of the CONTAINERS clause to query the pluggable database. The default value is “true”. This parameter takes effect only when the Multitenant Database parameter is set to true.</td>
</tr>
</tbody>
</table>

**Note**

The value of this parameter can be changed when the remote source is suspended.

**Note**

You will need to make sure 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.
<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Maximum operation queue size</td>
<td></td>
<td></td>
<td>The maximum number of operations permitted in the log reader operation queue during replication.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Maximum scan queue size</td>
<td></td>
<td></td>
<td>The maximum number of log records permitted in the log reader log scan queue during replication.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Maximum session cache size</td>
<td></td>
<td></td>
<td>The maximum number of Oracle sessions to be cached in memory during replication.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Number of log record rows fetched by the scanner at a time</td>
<td></td>
<td></td>
<td>Specifies the number of log record rows fetched by the scanner.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Category</td>
<td>Sub-category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ignore data of unsupported types stored in ANYDATA</td>
<td>Specifies whether you want to ignore data with unsupported types contained in the ANYDATA wrapper.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Database connection pool size</td>
<td>Maximum number of connections allowed in the connection pool on a secondary node.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Number of times to retry to connect if a connection fails</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Timeout in seconds to retry connecting</td>
<td>The number of seconds the Data Provisioning Agent waits between retry attempts to connect to the primary database.</td>
</tr>
<tr>
<td>Category</td>
<td>Sub-category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>--------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
|          |              | Keep supplemental logging on table | Determines whether the DP Agent drops the supplemental logging when dropping the subscription of a table.  
  ● “True”: Keeps the supplemental logging.  
  ● “False”: Drops the supplemental logging.  
  (Default value) |

**Note**  
The value of this parameter can be changed when the remote source is suspended.

<table>
<thead>
<tr>
<th>Credentials</th>
<th></th>
<th>Credentials Mode</th>
<th>Select “Technical User” or “Secondary User” depending on the purpose of the remote source you want to create.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Connection Credential</td>
<td>User Name</td>
<td>User Name</td>
<td>Oracle user name (case sensitive)</td>
</tr>
<tr>
<td>Password</td>
<td></td>
<td></td>
<td>Oracle user password</td>
</tr>
</tbody>
</table>

**Note**  
The value of this parameter can be changed when the remote source is suspended.

<table>
<thead>
<tr>
<th>Oracle Multitenant Credential</th>
<th>Common User Name</th>
<th>The common user name in the container database (case sensitive)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common User Password</td>
<td></td>
<td>The common user password in the container database</td>
</tr>
</tbody>
</table>

**Note**  
The value of this parameter can be changed when the remote source is suspended.

The following sample codes illustrate how to create a remote source using the SQL console.
Basic

Example

Sample Code

```
CREATE REMOTE SOURCE "MyOracleSource" ADAPTER "OracleLogReaderAdapter" 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="cdc" displayName="CDC Properties">
    <PropertyGroup name="parallelscan" displayName="Parallel Scan">
      <PropertyEntry name="lr_parallel_scan" displayName="Enable parallel scanning">true</PropertyEntry>
      <PropertyEntry name="lr_parallel_scanner_count" displayName="Number of parallel scanners">4</PropertyEntry>
    </PropertyGroup>
  </PropertyGroup>
  ' WITH CREDENTIAL TYPE 'PASSWORD' USING
  '<CredentialEntry name="credential">
    <user>myuser</user>
    <password>mypassword</password>
  </CredentialEntry>'
```

Oracle 12c multitenant with parallel scan enabled

Example

Sample Code

```
CREATE REMOTE SOURCE "MyOracleSource" ADAPTER "OracleLogReaderAdapter" AT
LOCATION AGENT "MyAgent"
CONFIGURATION
'<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ConnectionProperties name="configurations">
  <PropertyGroup name="database" displayName="Database">
    <PropertyEntry name="cdb_enabled" displayName="Enable Multitenant">true</PropertyEntry>
    <PropertyGroup name="cdbc_host_name" displayName="Container Database Host">myhost.sjc.sap.corp</PropertyGroup>
    <PropertyEntry name="pds_port_number" displayName="Container Database Port Number">1521</PropertyEntry>
    "<PropertyEntry name="pds_database_name" displayName="Container Database Service Name">mycdb</PropertyEntry>
    <PropertyEntry name="pds_service_name" displayName="Pluggable Database Service Name">mypdb</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="cdb" displayName="CDC Properties">
    <PropertyGroup name="parallelscan" displayName="Parallel Scan">
      <PropertyEntry name="lr_parallel_scan" displayName="Enable parallel scanning">true</PropertyEntry>
      <PropertyEntry name="lr_parallel_scanner_count" displayName="Number of parallel scanners">4</PropertyEntry>
    </PropertyGroup>
  </PropertyGroup>
  ' WITH CREDENTIAL TYPE 'PASSWORD' USING
  '<CredentialEntry name="credential">
    <user>myuser</user>
    <password>mypassword</password>
  </CredentialEntry>'
```
Related Information

SAP HANA SQL and System Views Reference: Create Remote Subscription [page 374]
Using a Schema Alias [page 278]
Prepare SSL when SAP HANA is on premise [page 31]

6.17.4 Using a Schema Alias

Using a schema alias can help make managing multiple schema, remote sources, and tables easier.

The **Schema Alias** and **Schema Alias Replacement** options, available in the remote source configuration parameters for some Data Provisioning adapters allows you too easily switch 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, "DB1"), and then create virtual tables under that remote source. Afterward, you may switch to the production database ("DB2") without needing to create new virtual tables; the same tables exist in both DB1 and DB2, but under different schema and different databases.

During the development phase, you may create a virtual table for a source table OWNER1.MYTABLE in DB1, for example. (Note: OWNER1.MYTABLE is the unique name of the source table.) This 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 (DB2), there is no OWNER1.MYTABLE, only OWNER2.MYTABLE. The unique name info 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 DB2, while OWNER2 is **Schema Alias Replacement**.

To use this functionality, both of these options need to be populated.
6.17.5 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 only requires 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.

6.17.5.1 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. (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 accessible by the DP 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.

### 6.17.6 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.

### 6.17.7 Synchronize the Oracle and DP Agent Timestamp

**Context**

If there is timestamp with a local time zone column in an Oracle table, the DP agent needs to have the same time zone. To achieve this, follow the procedure below before starting the DP agent.

**Procedure**

1. Find the Oracle server time zone (for example, use “date -R” in linux), for example, -04:00.
2. Open the dpagent.ini file in DP agent install root directory.
3. Add “-Duser.timezone=GMT-4” to the dpagent.ini file.
4. Start the DP agent.

### 6.17.8 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 complete a series of steps, including creating and importing certificates, configuring the source database, and so on.
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=PVGN50869480A.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=PVGN50869480A.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 = PVGN50869480A.SAP.COM)(PORT = 1521))
   (ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROC1521))
   (ADDRESS = (PROTOCOL = TCPS)(HOST = PVGN50869480A.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 = PVGN50869480A.SAP.COM)(PORT = 2484))
   (CONNECT_DATA =
   (SERVER = DEDICATED)
   (SERVICE_NAME = ORCL)
   )
   (SSL_SERVER_CERT_DN ="CN=PVGN50869480A.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. Create private/public key pairs.

```
keytool -genkey -alias ora_cli_cert -dname "CN=PVGN50869480A.SAP.COM, C=US" -storepass changeit -storetype JKS -keystore C:\Users\<user_name>\eclipse\ssl\cacerts -keyalg RSA
```

b. Copy and import the CA certificate.

```
keytool -importcert -keystore C:\Users\<user_name>\eclipse\ssl\cacerts -storepass changeit -file c:\ssl\oracle\root\cacert.cer -noprompt -alias ora_ca_cert
```

c. Copy and import the server certificate.

```
keytool -importcert -keystore C:\Users\<user_name>\eclipse\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 265]

**6.18 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

SDI ABAPAdapter is a client to functions delivered via modules that are delivered via PI_BASIS.

Additional coding was required in order for these functions to support RAW and/or STRING data types.

The valid PI_BASIS release(s) are listed in the Support Packages and Patches section of this SAP Note [https://launchpad.support.sap.com/#/notes/2166986](https://launchpad.support.sap.com/#/notes/2166986).

Please note, these functions were originally developed for SAP Data Services product.

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.

Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Change data capture for ODP extractors.

In addition, this adapter supports the following capabilities:

Table 46: Global Settings

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT from a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>INSERT into a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>Yes</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>No</td>
</tr>
<tr>
<td>Realtime</td>
<td>Yes (through ODP extractors only)</td>
</tr>
</tbody>
</table>

Table 47: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>Yes</td>
</tr>
<tr>
<td>Add a WHERE clause</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN multiple tables</td>
<td>No</td>
</tr>
</tbody>
</table>
### Functionality Supported?

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate data via a GROUP BY clause</td>
<td>No</td>
</tr>
<tr>
<td>Support a DISTINCT clause in the select</td>
<td>No</td>
</tr>
<tr>
<td>Support a TOP or LIMIT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>ORDER BY</td>
<td>No</td>
</tr>
<tr>
<td>GROUP BY</td>
<td>No</td>
</tr>
</tbody>
</table>

### Related Information

- Authorizations [page 286]
- Using RFC Streaming With Tables [page 292]
- SAP ABAP Adapter Remote Source Configuration [page 293]
- 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

### 6.18.1 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, or blank values for authorization fields, especially in a production environment. Enter more specific values that are appropriate to your business applications.

**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

- S_SDSPGMCK [page 287]
- S_SDSDEV [page 287]
- S_SDSAUTH [page 288]
- S_USER_GRP [page 288]
6.18.1.1 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

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTVT: Activity</td>
<td>16 (Execute)</td>
</tr>
<tr>
<td>PROGRAM: ABAP program name</td>
<td>Program names that are allowed to be executed in a production environment</td>
</tr>
</tbody>
</table>

**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.

6.18.1.2 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

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package</td>
<td>List of packages for tables that a user is allowed to access</td>
</tr>
<tr>
<td>Object type</td>
<td>VIEW, TABL, and TTYP</td>
</tr>
<tr>
<td>Object name</td>
<td>DD objects that a user is allowed to access</td>
</tr>
</tbody>
</table>
### 6.18.1.3 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

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTVT: Activity</td>
<td>16 (Execute)</td>
</tr>
</tbody>
</table>

**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.

### 6.18.1.4 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

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>User group in user master maintenance</td>
<td>User group for Data Services user</td>
</tr>
</tbody>
</table>

**Note**

In previous SAP Data Services versions, this authorization was named ZDAUTH 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.
6.18.1.5 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

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transaction Code</td>
<td>SE37, SE38, SU53</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transaction Code</td>
<td>RSA1</td>
</tr>
</tbody>
</table>

6.18.1.6 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

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>03</td>
</tr>
<tr>
<td>Authorization group</td>
<td>Table groups that a user is allowed to access</td>
</tr>
</tbody>
</table>

6.18.1.7 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

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language Key</td>
<td>List of language keys that a user is allowed to access</td>
</tr>
<tr>
<td>Text ID</td>
<td>List of text IDs that a user is allowed to access</td>
</tr>
<tr>
<td>Name</td>
<td>List of text names that a user is allowed to access</td>
</tr>
<tr>
<td>Activity</td>
<td>SHOW</td>
</tr>
</tbody>
</table>

#### 6.18.1.8 S_RFC_ADM

Authorization for RFC streaming.

**Use:** DEV, PROD

**Text (Description):** Administration for RFC Destination

**Class:** Cross-application

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>03</td>
</tr>
<tr>
<td>Type of Entry in RFCDES</td>
<td>Not used</td>
</tr>
<tr>
<td>Logical Destination (Specified in Function Call)</td>
<td>RFC destination</td>
</tr>
<tr>
<td>Internet Communication Framework Values</td>
<td>Not used</td>
</tr>
</tbody>
</table>

#### 6.18.1.9 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

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>16</td>
</tr>
<tr>
<td>Name of RFC to be protected</td>
<td>BAPI, CADR, RFC1, SCAT, SDIF, SLST, SUNI, SUTL, SUTX, SYST, /SAPDS/</td>
</tr>
<tr>
<td></td>
<td>SAPDS, RSAB, SDIFRUNTIME, and any other required function group</td>
</tr>
<tr>
<td>Type of RFC object to be protected</td>
<td>FUGR</td>
</tr>
</tbody>
</table>
### 6.18.1.10 S_DEVELOP

Authorization for SAP Data Services to perform a column search.

**Use:** DEV, PROD

**Text (Description):** ABAP Workbench

**Class:** Basis - Development Environment

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package</td>
<td>List of packages for tables that a user is allowed to access</td>
</tr>
<tr>
<td>Object type</td>
<td>TABL</td>
</tr>
<tr>
<td>Object name</td>
<td>List of tables that a user is allowed to access</td>
</tr>
<tr>
<td>Authorization group ABAP/4 program</td>
<td>Not used</td>
</tr>
<tr>
<td>Activity</td>
<td>03</td>
</tr>
</tbody>
</table>

**Purpose:** This authorization allows Data Services to run generated programs on the SAP server.

**Use:** DEV

**Text (Description):** ABAP Workbench

**Class:** Basis - Development Environment

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package</td>
<td>$TMP</td>
</tr>
<tr>
<td>Object type</td>
<td>PROG</td>
</tr>
<tr>
<td>Object name</td>
<td>List of temporary program names that are allowed to be generated</td>
</tr>
<tr>
<td>Authorization group ABAP/4 program</td>
<td>Not used</td>
</tr>
<tr>
<td>Activity</td>
<td>01 and 02</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package</td>
<td>List of packages for tables that a user is allowed to access</td>
</tr>
<tr>
<td>Object type</td>
<td>VIEW, TABL and TTYP</td>
</tr>
<tr>
<td>Object name</td>
<td>List of tables and views that a user is allowed to access</td>
</tr>
<tr>
<td>Authorization group ABAP/4 program</td>
<td>Not used</td>
</tr>
<tr>
<td>Activity</td>
<td>03</td>
</tr>
</tbody>
</table>
6.18.1.11  S_BTCH_JOB

Authorization that checks privileges for releasing batch jobs.

**Use:** DEV, PROD

**Text (Description):** Batch processing

**Class:** Basis

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job operation</td>
<td>RELE</td>
</tr>
<tr>
<td>Summary of jobs for a group</td>
<td>Not used</td>
</tr>
</tbody>
</table>

6.18.1.12  S_BTCH_ADM

Authorization that checks background processing privileges.

**Use:** DEV, PROD

**Text (Description):** Background Processing: background Administrator

**Class:** Basis

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Background administrator ID</td>
<td>Y</td>
</tr>
</tbody>
</table>

6.18.1.13  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

<table>
<thead>
<tr>
<th>Field</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorization group</td>
<td>Not used</td>
</tr>
<tr>
<td>Activity</td>
<td>03</td>
</tr>
</tbody>
</table>

6.18.2  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 is anywhere between 0.1s and 10 seconds faster (depends on the SAP ECC response) than the RFC streaming in case of small batches.
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 DP 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 (small queries, large queries, 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 additional configuration, including on the ECC side.

To activate RFC streaming, you must configure the following ABAP adapter remote source parameters:

- Streaming Read: This 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

**Related Information**

SAP ABAP Adapter Remote Source Configuration [page 293]

### 6.18.3 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.

**Note**

Depending on the values you choose for the remote source configuration parameters, different parameters will appear. Thus, some of the following parameters will not appear.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectioninfo</td>
<td>Connection Type</td>
<td>Message Server and Custom Application Server</td>
</tr>
<tr>
<td></td>
<td>Authentication Type</td>
<td>SNC or Password</td>
</tr>
<tr>
<td></td>
<td>Application Server</td>
<td>The name of the host to which you want to connect.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Client</td>
<td>The SAP ECC client number</td>
<td></td>
</tr>
<tr>
<td>Instance Number</td>
<td>The SAP ECC instance number.</td>
<td></td>
</tr>
<tr>
<td>Message Server</td>
<td>Enter the name of the message server or its IP address. SAP logon attempts to connect to this server to load the available Group Server selection.</td>
<td></td>
</tr>
<tr>
<td>Message Server Port</td>
<td>(Optional) If the message server isn’t on the default port, enter the port to use to connect to the message server.</td>
<td></td>
</tr>
<tr>
<td>Server Group</td>
<td>If SAP Logon could reach the specified message server, you can now select an appropriate server group entry for your connection.</td>
<td></td>
</tr>
<tr>
<td>Streaming Read</td>
<td>Set to “On” to expose the necessary parameters to enable RFC streaming. Set to “Off” to use non-RFC streaming.</td>
<td></td>
</tr>
<tr>
<td>Gateway Host</td>
<td>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 will be the same as the target ECC system host.</td>
<td></td>
</tr>
<tr>
<td>Gateway Server</td>
<td>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 will have the value sapgw&lt;target_ECC_system_instance_number&gt;.</td>
<td></td>
</tr>
<tr>
<td>RFC Destination</td>
<td>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”, and then leave the “Program ID” field empty.</td>
<td></td>
</tr>
<tr>
<td>Batch Size</td>
<td>(Optional) The size (in MB) of the data packet sent by ECC in one callback. On the DP agent, upon receiving, the batch will be copied into a queue to be sent to DP server, and thus the memory requirements for that process is “2 x batchsize”. The default value is 1 MB.</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>RFC Trace</td>
<td>(Optional) Set to “On” to turn RFC tracing on. By default, this parameter is set to “Off”.</td>
</tr>
<tr>
<td></td>
<td>Batch Receive Timeout</td>
<td>(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 DP server. It wouldn’t make sense for this value to be larger than the value of the “framework.messageTimeout” parameter of DP server (for example, the timeout for DP server to wait for a response from the agent). Thus, the default value is the same as the default value of the DP server’s property (600 seconds).</td>
</tr>
<tr>
<td></td>
<td>Connections Pool Size</td>
<td>Maximum number of idle connections kept open for the remote source. The default value of 0 has the effect that there is no connection pooling; that is, connections will be closed after each request.</td>
</tr>
<tr>
<td></td>
<td>Connections Limit</td>
<td>Maximum number of active connections that can be created for a remote source simultaneously.</td>
</tr>
<tr>
<td><strong>Credentials</strong></td>
<td><strong>Credentials Mode</strong></td>
<td>technical user or secondary user</td>
</tr>
<tr>
<td></td>
<td>User Name</td>
<td>The user name that is used to connect to the SAP ECC system.</td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>The user password.</td>
</tr>
</tbody>
</table>

After you have created the remote source, the directory structure will look similar to this, depending on the structure of the source system.
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>
</CredentialEntry>
<password>mypassword</password>
</CredentialEntry>';
6.19 SAP ASE

The SAP ASE adapter provides realtime replication and change data capture functionality to SAP HANA or back to a virtual table.

The SAP ASE Adapter is a data provisioning adapter that receives the data stream from SAP ASE database, reformats the data and then sends the data change to the downstream Data Provisioning Server component to provide real-time change data capture capability in order to replicate change data from SAP ASE to SAP HANA in real-time manner.

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.

**Note**

Be sure that after you have upgraded to the SPS 10 Data Provisioning agent you finish completing the setup of the SAP ASE adapter by following the instructions found in the topic “Update the SAP ASE Adapter Preferences”.

**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.

**Adapter Functionality**

The SAP ASE adapter supports the following functionality:

- Virtual table as a source
- Realtime change data capture
- Loading options for target tables
- Search for a table
- Replication monitoring and statistics

**Realtime Replication Limitations**

The following limitations exist when performing realtime 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

Set Up Your SAP ASE Database [page 298]
SAP ASE Remote Source Configuration [page 299]
SAP ASE Adapter Preferences [page 301]
Update the SAP ASE Adapter Preferences [page 115]

6.19.1 Set Up 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 other utility and create a database you're going to replicate (if it doesn't already exist).
2. Create the primary user and grant permissions.

   **Sample Code**
   ```sql
   SQL> use master
   SQL> go
   SQL> create login <login_name> with password <password> default database <database_name>
   SQL> go
   SQL> use <database_name>
   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
   SQL> use master
   SQL> go
   SQL> create login <login_name> with password <password> default database <database_name>
   SQL> go
   SQL> use <database_name>
   SQL> sp_adduser <login_name>
   SQL> go
   ```

4. Add a new entry for the SAP ASE adapter in the interface file of the SAP ASE data server. For example:
5. Reboot the SAP ASE data server.

### Related Information

- SAP ASE Remote Source Configuration [page 299]
- SAP ASE Adapter Preferences [page 301]

### 6.19.2 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.

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Server Information</td>
<td>Data Server Name</td>
<td>The SAP ASE data server name.</td>
</tr>
<tr>
<td></td>
<td>Data Server Host</td>
<td>Host name or IP address on which the remote SAP ASE data server is running.</td>
</tr>
<tr>
<td></td>
<td>Data Server Port Number</td>
<td>The SAP ASE data server port number.</td>
</tr>
<tr>
<td></td>
<td>Database Name</td>
<td>The SAP ASE database name.</td>
</tr>
<tr>
<td>Security Properties</td>
<td>Enable SSL Encryption</td>
<td>Specifies whether you will be using SSL encryption between the source SAP ASE data server and SAP ASE adapter.</td>
</tr>
<tr>
<td></td>
<td>Common Name in Server Certificate</td>
<td>The common name in SAP ASE Adapter certificate file.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Adapter Properties</td>
<td>Adapter Instance Name</td>
<td>The SAP ASE adapter instance name, which needs to be specified when creating remote source and will be shown in HANA studio after the remote source is created. The adapter instance name can be determined by you, and it should be unique in the same HANA server.</td>
</tr>
<tr>
<td></td>
<td>Data Transfer Protocol</td>
<td>The protocol the SAP ASE data server and SAP ASE adapter will be using to transfer data. Only CI or LTL is allowed. The default value is CI.</td>
</tr>
<tr>
<td></td>
<td>Maintenance User</td>
<td>The maintenance user that will be used by the ASE Replication Agent Thread to filter transactions applied by this user.</td>
</tr>
<tr>
<td>Credential Properties</td>
<td>Credentials Mode</td>
<td>Select one of the choices, depending on the purpose of the remote source you want to create.</td>
</tr>
<tr>
<td></td>
<td>User Name</td>
<td>The SAP ASE database user which ASE adapter needs to log on to SAP ASE database to configure the SAP ASE Replication Agent, query data for initial load, and write back data into SAP ASE when updating a virtual table in HANA.</td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>SAP ASE database user password.</td>
</tr>
</tbody>
</table>

**LTL mode with SSL**

**Example**

```sql
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>
  </PropertyGroup>
</ConnectionProperties>
```
Related Information

Prepare SSL when SAP HANA is on premise [page 31]

6.19.3 SAP ASE Adapter Preferences

Options to control the SAP ASE adapter.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter Server Name</td>
<td>The name of the SAP ASE adapter server that receives data changes from the SAP ASE data server.</td>
</tr>
<tr>
<td>Adapter Server Port</td>
<td>The port number for the SAP ASE adapter server.</td>
</tr>
<tr>
<td>Enable SSL for Adapter Server</td>
<td>Specifies whether to use SSL for the adapter server.</td>
</tr>
<tr>
<td>SSL Certificate File Path</td>
<td>Location of the SSL certificate file.</td>
</tr>
<tr>
<td>SSL Certificate File Password</td>
<td>The password for accessing the SSL certificate file.</td>
</tr>
</tbody>
</table>

6.20 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. The following are currently supported:
• IBM DB2
• Oracle

**Note**

We have found that the Oracle Log Miner maximum throughput is approximately 1 TB/day. Anything more than that and Oracle Log Miner begins to lag behind.

Therefore, no matter the amount of overage, if the replication volume is >1 TB/day there will be a delay in replication.

• Microsoft SQL Server
• SAP ASE

These adapters provide additional 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.

**Note**

Before registering your adapter with the SAP HANA system, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the [Product Availability Matrix](#). You will also find information about supported ECC versions.

Place your files in `<DPAgent_root>/lib`, and you will need to manually create the `/lib` folder.

**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.

### Adapter Functionality

The ECC adapters support the following functionality:

- Realtime change data capture
- Loading options for target tables
- DDL propagation (transparent tables only)
- Search for tables

In addition, this adapter supports the following capabilities:

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT from a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>INSERT into a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Functionality</td>
<td>Supported?</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>Yes</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>Yes</td>
</tr>
<tr>
<td>Realtime</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 49: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>Yes</td>
</tr>
<tr>
<td>Add a WHERE clause</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN multiple tables</td>
<td>Yes</td>
</tr>
<tr>
<td>Aggregate data via a GROUP BY clause</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a DISTINCT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a TOP or LIMIT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>ORDER BY</td>
<td>Yes</td>
</tr>
<tr>
<td>GROUP BY</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Limitations

There is a 30000 column limit for records.

Related Information

- Terminology [page 304]
- Installation and Setup [page 304]
- Permissions for ECC Dictionary Tables [page 305]
- Create an ECC Remote Source [page 305]
- ECC Remote Source Configuration [page 306]
- Loading Metadata for Cluster and Pooled Tables [page 308]
- Data Type Mapping [page 309]
- Adapter Preferences [page 311]
6.20.1 Terminology

Setting up ECC adapters requires an understanding of certain SAP ERP and ECC concepts.

Here are some key terms and concepts that will help understand how to set up your ECC adapters.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP ERP</td>
<td>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.</td>
</tr>
<tr>
<td>SAP ECC (SAP ERP Central Component)</td>
<td>The central technical component of SAP ERP system.</td>
</tr>
<tr>
<td>Cluster table</td>
<td>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.</td>
</tr>
<tr>
<td>Pooled table</td>
<td>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.</td>
</tr>
</tbody>
</table>

Related Information

Loading Metadata for Cluster and Pooled Tables [page 308]

6.20.2 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 297]

6.20.3 Permissions for ECC Dictionary Tables

To replicate SAP ECC dictionary tables, you’ll need specific permissions, depending on the database you are using.

Table 50:

| 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 oracle_init_example.sql file, which is located in the Scripts folder of the Data Provisioning Agent installation (<DPAgent_root>\LogReader\Scripts). |

6.20.4 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.
3. Enter the required information for your particular database and ECC information.
4. Click the Save the Editor icon in the upper right-hand corner of the screen.
6.20.5 ECC Remote Source Configuration

Configuration settings for accessing a ECC remote sources. Also included are sample codes for creating remote sources using the SQL console.

The following are the ECC-specific parameters for creating a remote source. You can find information about database-specific parameter information in the remote source parameter topics for Log Reader adapters.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERP Additional Info  Owner/Schema</td>
<td>The owner of the ECC tables or the schema where the ECC tables are located.</td>
</tr>
<tr>
<td>ERP Additional Info  Dictionary Schema</td>
<td>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.</td>
</tr>
</tbody>
</table>

**Example**

IBM DB2 ECC Adapter

```
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_databasesource_name" displayname="Database SourceName">mydb</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="erpadditionalinfo" displayname="ERP Additional Info">
    <PropertyEntry name="schema" displayname="Owner/Schema">SAPSR3</PropertyEntry>
  </PropertyGroup>
  <PropertyGroup name="dictionarySchema" displayname="Dictionary Schema">SYSTEM</PropertyGroup>
</ConnectionProperties>
' WITH CREDENTIAL TYPE 'PASSWORD' USING '<CredentialEntry name="credential">
  <user>myuser</user>
  <password>mypassword</password>
```
Example

Microsoft SQL Server ECC Adapter

Sample Code

```sql
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 Coversion">
      <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 processing errors">false</PropertyEntry>
      </PropertyGroup>
      <PropertyGroup name="erpadditionalinfo" displayName="ERP Additional Info">
        <PropertyEntry name="schema" displayName="Owner/Schema">SAPSR3</PropertyEntry>
        <PropertyEntry name="dictionarySchema" displayName="Dictionary Schema">SYSTEM</PropertyEntry>
      </PropertyGroup>
    </PropertyGroup>
  </ConnectionProperties>
WITH CREDENTIAL TYPE 'PASSWORD' USING
  <CredentialEntry name="credential">
    <user>myuser</user>
    <password>mypassword</password>
  </CredentialEntry>
```

Example

Oracle ECC Adapter

Sample Code

```sql
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>
    </PropertyGroup>
    <PropertyGroup name="database" displayName="Database">
      <PropertyEntry name="pds_port_number" displayName="Port Number">1521</PropertyEntry>
      <PropertyEntry name="pds_database_name" displayName="Database Name">mydb</PropertyEntry>
    </PropertyGroup>
    <PropertyGroup name="erpadditionalinfo" displayName="ERP Additional Info">
      <PropertyEntry name="schema" displayName="Owner/Schema">SAPSR3</PropertyEntry>
      <PropertyEntry name="dictionarySchema" displayName="Dictionary Schema">USER</PropertyEntry>
    </PropertyGroup>
  </ConnectionProperties>
WITH CREDENTIAL TYPE 'PASSWORD' USING
  <CredentialEntry name="credential">
    <user>myuser</user>
    <password>mypassword</password>
  </CredentialEntry>
```
6.20.6 Loading Metadata for Cluster and Pooled Tables

Load cluster and pooled table metadata.

Before working with 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 `replication_dictionary.sql` script, and execute the stored procedures that it creates.

**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.

1. In SAP HANA studio, choose `File > Open` and navigate to `<DPAgent_root>/LogReader/scripts`.
2. Select `replication_dictionary.sql`.
3. Right click on the text screen, and click `Choose Connection`. Select your connection, and click `OK`.
4. Click `Execute`. This creates the stored procedure `materialize_dictionary_table`.
5. Call this stored procedure with the following parameters, after making appropriate replacements for `<HANA_SCHEMA>` and `<remote_source_name>` in `replicate_dictionary.sql`:

   **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');`

   **Note**

   Use this procedure to initial load the DD03L table if your SAP HANA system has plenty of free memory.
6.20.7 Data Type Mapping

Data type mapping is determined by the kind of table used.

For transparent tables, the mapping is taken from the underlying database. For cluster and pooled tables, the following table shows the ABAP data types and the corresponding SAP HANA data types.

<table>
<thead>
<tr>
<th>ABAP Data Type</th>
<th>Data Type in ABAP Dictionary</th>
<th>SAP HANA Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAR</td>
<td>NVARCHAR</td>
<td></td>
</tr>
<tr>
<td>CLNT</td>
<td>NVARCHAR</td>
<td></td>
</tr>
<tr>
<td>CUKY</td>
<td>NVARCHAR</td>
<td></td>
</tr>
<tr>
<td>LANG</td>
<td>NVARCHAR</td>
<td></td>
</tr>
<tr>
<td>SSTR</td>
<td>NVARCHAR</td>
<td></td>
</tr>
<tr>
<td>STRG</td>
<td>NVARCHAR</td>
<td></td>
</tr>
<tr>
<td>UNIT</td>
<td>NVARCHAR</td>
<td></td>
</tr>
<tr>
<td>VARC</td>
<td>NVARCHAR</td>
<td></td>
</tr>
<tr>
<td>ACCP</td>
<td>VARCHAR</td>
<td></td>
</tr>
<tr>
<td>NUMC</td>
<td>VARCHAR</td>
<td></td>
</tr>
<tr>
<td>DATS</td>
<td>VARCHAR</td>
<td></td>
</tr>
<tr>
<td>TIMS</td>
<td>VARCHAR</td>
<td></td>
</tr>
<tr>
<td>LCHR</td>
<td>NCLOB</td>
<td></td>
</tr>
<tr>
<td>D16D</td>
<td>DECIMAL</td>
<td></td>
</tr>
</tbody>
</table>

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.
<table>
<thead>
<tr>
<th>ABAP Data Type</th>
<th>Data Type in ABAP Dictionary</th>
<th>SAP HANA Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>D34D</td>
<td>DECIMAL</td>
<td></td>
</tr>
<tr>
<td>CURR</td>
<td>DECIMAL</td>
<td></td>
</tr>
<tr>
<td>QUAN</td>
<td>DECIMAL</td>
<td></td>
</tr>
<tr>
<td>DEC</td>
<td>DECIMAL</td>
<td></td>
</tr>
<tr>
<td>PREC</td>
<td>DECIMAL</td>
<td></td>
</tr>
<tr>
<td>D16R</td>
<td>VARBINARY</td>
<td></td>
</tr>
<tr>
<td>D16S</td>
<td>VARBINARY</td>
<td></td>
</tr>
<tr>
<td>D34R</td>
<td>VARBINARY</td>
<td></td>
</tr>
<tr>
<td>D34S</td>
<td>VARBINARY</td>
<td></td>
</tr>
<tr>
<td>RAW</td>
<td>VARBINARY</td>
<td></td>
</tr>
<tr>
<td>FLTP</td>
<td>DOUBLE</td>
<td></td>
</tr>
<tr>
<td>INT1</td>
<td>SMALLINT</td>
<td></td>
</tr>
<tr>
<td>INT2</td>
<td>SMALLINT</td>
<td></td>
</tr>
<tr>
<td>INT4</td>
<td>INTEGER</td>
<td></td>
</tr>
<tr>
<td>LRAW</td>
<td>BLOB</td>
<td></td>
</tr>
<tr>
<td>RSTR</td>
<td>BLOB</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>DOUBLE</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>DECIMAL</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>VARCHAR</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>VARCHAR</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>VARCHAR</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>NVARCHAR</td>
<td></td>
</tr>
</tbody>
</table>

If a data type is not defined in the table above, it is imported as VARBINARY. The order in the table determines the order of mapping; for example, an LCHR field will be imported as VARBINARY even though it has ABAP data type of C.
6.20.8 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. (<DPAgent_root>/configTool/dpagentconfigtool.exe)

Use these settings to tune performance, enhance security, and so on.

Related Information

DB2ECCAdapter Preferences [page 311]
MssqlECCAdapter Preferences [page 313]
OracleECCAdapter Preferences [page 316]
SAP ASE ECC Adapter Preferences [page 318]

6.20.8.1 DB2ECCAdapter Preferences

Configuration parameters for the DB2 ECC adapter.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum operation queue size</td>
<td>The maximum number of operations permitted in the log reader operation queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum scan queue size</td>
<td>The maximum number of log records permitted in the log reader log scan queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Ignore log record processing errors</td>
<td>Determines whether to ignore log record processing errors.</td>
<td>false</td>
</tr>
<tr>
<td>Replicate LOB columns</td>
<td>Determines whether the agent applies each individual LOB change.</td>
<td>true</td>
</tr>
<tr>
<td>Database connection pool size</td>
<td>Maximum number of connections allowed in the connection pool on a secondary node.</td>
<td>15</td>
</tr>
</tbody>
</table>

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.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of times to retry to connect if a connections fails</td>
<td>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.</td>
<td>5</td>
</tr>
<tr>
<td>Timeout in seconds to retry connecting</td>
<td>The number of seconds the agent waits between retry attempts to connect to the primary database.</td>
<td>10</td>
</tr>
<tr>
<td>Number of wrapped log files</td>
<td>The maximum size, in 1K blocks, of the Replication Agent system log file before wrapping.</td>
<td>3</td>
</tr>
<tr>
<td>Enable verbose trace</td>
<td>Enables or disables additional diagnostic information in the agent system log files.</td>
<td>false</td>
</tr>
<tr>
<td>Maximum log file size</td>
<td>Limit the size of the message log to conserve disk space.</td>
<td>1000</td>
</tr>
<tr>
<td>Turn on asynchronous logging mode</td>
<td>Specifies whether or not Replication Agent should turn on a-synchronized logging mode. (TRUE, FALSE)</td>
<td>TRUE</td>
</tr>
<tr>
<td>Maximum size of work queue for asynchronous logging</td>
<td>The Maximum size of the work queue for asynchronous logging file handler to collect the log records (1-2147483647)</td>
<td>1000</td>
</tr>
<tr>
<td>Discard policy for asynchronous logging file handler</td>
<td>Specifies the discard policy for asynchronous logging file handler when the work queue is saturated.</td>
<td>BLOCKING</td>
</tr>
</tbody>
</table>
## 6.20.8.2 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum operation queue size</td>
<td>The maximum number of operations permitted in the log reader operation queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum scan queue size</td>
<td>The maximum number of log records permitted in the log reader log scan queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum wait interval between log scans</td>
<td>The maximum wait interval between Log Reader transaction log scans.</td>
<td>60</td>
</tr>
</tbody>
</table>

### 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.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seconds to add to each log scan wait interval</td>
<td>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.</td>
<td>5</td>
</tr>
</tbody>
</table>

**Note**
- 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.
- 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.
- 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.
- With a primary database that is less frequently updated, increasing the value of the parameter may improve overall performance.
- If the database is continuously updated, the value of the parameter may not be significant to performance.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replicate LOB columns</td>
<td>Determines whether the agent applies each individual LOB change.</td>
<td>true</td>
</tr>
<tr>
<td>Database connection pool size</td>
<td>Maximum number of connections allowed in the connection pool on a secondary node.</td>
<td>15</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Number of times to retry to connect if a connections fails</td>
<td>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.</td>
<td>5</td>
</tr>
<tr>
<td>Timeout in seconds to retry connecting</td>
<td>The number of seconds the agent waits between retry attempts to connect to the primary database.</td>
<td>10</td>
</tr>
<tr>
<td>Number of wrapped log files</td>
<td>The maximum size, in 1K blocks, of the agent system log file before wrapping.</td>
<td>3</td>
</tr>
<tr>
<td>Enable verbose trace</td>
<td>Enables or disables additional diagnostic information in the agent system log files.</td>
<td>false</td>
</tr>
<tr>
<td>Maximum log file size</td>
<td>Limit the size of the message log to conserve disk space.</td>
<td>1000</td>
</tr>
<tr>
<td>Turn on asynchronous logging mode</td>
<td>Specifies whether or not Replication Agent should turn on a-synchronized logging mode. (TRUE, FALSE)</td>
<td>TRUE</td>
</tr>
<tr>
<td>Maximum size of work queue for asynchronous logging</td>
<td>The Maximum size of the work queue for asynchronous logging file handler to collect the log records (1-2147483647)</td>
<td>1000</td>
</tr>
</tbody>
</table>
| Discard policy for asynchronous logging file handler | Specifies the discard policy for asynchronous logging file handler when the work queue is saturated.  
- 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.  
- DISCARD: The log records that cannot be offered into queue are dropped.  
- 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.). | BLOCKING |
6.20.8.3 OracleECCAdapter Preferences

Configuration parameters for the Oracle 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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directory containing Oracle archive redo log files</td>
<td>Specifies the location of the archived redo log files. If the LogReader cannot find an expected log record in the Oracle online redo logs, it will search this directory for the archived log file containing the required record.</td>
<td></td>
</tr>
<tr>
<td>Distinguished Name (DN) in Certificate</td>
<td>The distinguished name (DN) of the primary data server certificate.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● This parameter is only valid if Use SSL is set to &quot;true&quot;.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● 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.</td>
<td></td>
</tr>
<tr>
<td>Oracle supplemental logging level</td>
<td>Specifies the level of supplemental logging.</td>
<td>table</td>
</tr>
<tr>
<td></td>
<td>● Table: Table level turns on supplemental logging for subscribed tables and some required system tables.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>● Database: Database level turns on supplemental logging for all tables, including system tables.</td>
<td></td>
</tr>
<tr>
<td>Maximum operation queue size</td>
<td>Specifies the maximum number of operations permitted in the log reader operation queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum scan queue size</td>
<td>The maximum number of log records permitted in the log reader log scan queue during replication.</td>
<td>1000</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Default value</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Maximum session cache size</td>
<td>The maximum number of Oracle sessions to be cached in memory during replication</td>
<td>1000</td>
</tr>
<tr>
<td>Enable parallel scanning</td>
<td>Specifies whether to turn on parallel scanning.</td>
<td>false</td>
</tr>
<tr>
<td></td>
<td>To achieve better performance for high-volume log throughput, set the parameter to <strong>true</strong> to enable parallel scanning.</td>
<td></td>
</tr>
<tr>
<td>Queue size of parallel scan tasks</td>
<td>Specifies the number of tasks in the queue.</td>
<td>0</td>
</tr>
<tr>
<td>Parallel scan SCN range</td>
<td>The maximum number of system change numbers (SCN) processed by each Oracle LogMiner scanner, when parallel scan is enabled, that is, when lr_parallel_scan is true.</td>
<td>1024</td>
</tr>
<tr>
<td>Number of parallel scanners</td>
<td>Specifies the number of parallel scanners.</td>
<td>4</td>
</tr>
<tr>
<td>Number of log record rows fetched by the scanner at a time</td>
<td>Specifies the number of log record rows fetched by the scanner.</td>
<td>1</td>
</tr>
<tr>
<td>Ignore log record processing errors</td>
<td>Determines whether to ignore log record processing errors.</td>
<td>false</td>
</tr>
<tr>
<td>Replicate LOB columns</td>
<td>Oracle logs all LOB data (except for BFILE datatypes) in the Oracle redo log. This allows the agent to apply each individual LOB change. However, for BFILE data, the same technique is used.</td>
<td>true</td>
</tr>
<tr>
<td>Ignore data of unsupported types stored in ANYDATA</td>
<td>Specifies whether you want to ignore data with unsupported types housed in ANYDATA wrapper.</td>
<td>false</td>
</tr>
<tr>
<td>Database connection pool size</td>
<td>Maximum number of connections allowed in the connection pool on a secondary node.</td>
<td>15</td>
</tr>
<tr>
<td>Number of times to retry to connect if a connections fails</td>
<td>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.</td>
<td>5</td>
</tr>
<tr>
<td>Timeout in seconds to retry connecting</td>
<td>The number of seconds the agent waits between retry attempts to connect to the primary database.</td>
<td>10</td>
</tr>
<tr>
<td>Number of wrapped log files</td>
<td>The maximum size, in 1K blocks, of the agent system log file before wrapping.</td>
<td>3</td>
</tr>
<tr>
<td>Enable verbose trace</td>
<td>Enables or disables additional diagnostic information in the agent system log files.</td>
<td>false</td>
</tr>
</tbody>
</table>
### Related Information

Oracle Database Permissions [page 258]
Oracle Supplemental Logging [page 261]

### 6.20.8.4 SAP ASE ECC Adapter Preferences

Options to control the SAP ASE ECC adapter.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter Server Name</td>
<td>The name of the SAP ASE adapter server that receives data changes from the SAP ASE data server.</td>
</tr>
<tr>
<td>Adapter Server Port</td>
<td>The port number for the SAP ASE adapter server.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Enable SSL for Adapter Server</td>
<td>Specifies whether to use SSL for the adapter server.</td>
</tr>
<tr>
<td>SSL Certificate File Path</td>
<td>Location of the SSL certificate file.</td>
</tr>
<tr>
<td>SSL Certificate File Password</td>
<td>The password for accessing the SSL certificate file.</td>
</tr>
</tbody>
</table>

### 6.20.9 SQL Pushdown for Pooled and Cluster Tables

There are limitations for SQL pushdown operations to SAP ECC pooled and cluster tables.

These 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 which 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 3 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 *.

### 6.21 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 LogReader adapters, which read a remote database’s log to get change data, the SAP HANA adapter is trigger-based: change data is captured by triggers, and the adapter needs to continuously query the target database to get the change data. When a table is subscribed to replicate, the adapter creates three triggers on the table for capturing INSERT, UPDATE, and DELETE, respectively.
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 change 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 change data and replicate them to target HANA database.

**User permissions**

Be sure that the following permissions are configured:

- For realtime 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.

**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.
- Realtime change data capture
- Replication monitoring and statistics

In addition, this adapter supports the following capabilities:

<table>
<thead>
<tr>
<th>Table 51: Global Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functionality</strong></td>
</tr>
<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>SELECT from a virtual table</td>
</tr>
<tr>
<td>INSERT into a virtual table</td>
</tr>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
</tr>
<tr>
<td>Different capabilities per table</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
</tr>
<tr>
<td>Realtime</td>
</tr>
</tbody>
</table>
### Table 52: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>Yes</td>
</tr>
<tr>
<td>Add a WHERE clause</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN multiple tables</td>
<td>Yes</td>
</tr>
<tr>
<td>Aggregate data via a GROUP BY clause</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a DISTINCT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a TOP or LIMIT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>ORDER BY</td>
<td>Yes</td>
</tr>
<tr>
<td>GROUP BY</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Related Information

- SAP HANA Remote Source Configuration [page 321]
- SAP HANA DDL Propagation [page 330]
- SAP HANA Adapter Preferences [page 331]
- SAP HANA (Remote) to SAP HANA (Target) Data Type Mapping [page 331]
- Use a Shadow Remote Source [page 332]

### 6.21.1 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 realtime 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.
# Remote Source Parameters

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database</td>
<td>Host Auto-Failover</td>
<td>Enable auto failover for scale-out HANA. The default is “false”.</td>
</tr>
<tr>
<td></td>
<td>Host</td>
<td>The host name or IP address on which the remote SAP HANA server is running.</td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Port Number</td>
<td>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 Database Name 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 Database Name parameter.</td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>Use an arbitrary port like 1234. Do not put 1433 or 1434 as the instance number.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Execute the following query to obtain the system database’s SQL port.</td>
</tr>
</tbody>
</table>
|                |                               | ```sql
SELECT DATABASE_NAME, SQL_PORT FROM SYS_DATABASES.M_SERVICES WHERE DATABASE_NAME='SYSTEMDB' and SERVICE_NAME='nameserver' and COORDINATOR_TYPE= 'MASTER';
``` |
<p>|                | Database Name                 | The database name, if the remote database is a tenant database. Leave this parameter empty if the remote database is not a tenant database.    |
|                | Auto-Failover Hosts Connection| The connection string for scale-out HANA auto failover, format is <code>host1:port1:host2:port2:host3:port3</code>. This parameter is configurable if Host Auto-Failover is “true”. |
|                | Note                          | The value of this parameter can be changed when the remote source is suspended.                                                              |</p>
<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
|                               | Schema                        | **Note**  
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 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. |
|                               | Schema Alias Replacements     | **Note**  
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.  
**Note**  
The value of this parameter can be changed when the remote source is suspended. |
|                               | Schema Alias Replacement      | **Note**  
Schema name to be used to replace the schema given in Schema Alias.  
**Note**  
If the schema alias is not configured, leave this blank.  
**Note**  
The value of this parameter can be changed when the remote source is suspended. |
<p>|                               | 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_. |</p>
<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserve System Sequences</td>
<td>Set to “true” (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. If you don’t want to use this remote source any more and want to remove the environment, first set this parameter to “false”, then drop the subscription, drop the remote source, and so on.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Connection Pool Size</td>
<td>Maximum number of connections allowed in the connection pool. The default value is 4.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Minimum Scan Interval in Seconds</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Maximum Scan Interval in Seconds</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note</td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>DDL Scan Interval in Minutes</td>
<td>The interval for detecting DDL changes in the source. A zero or negative integer disables this parameter. The default value is 10 (minutes). <strong>Note</strong> The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Maximum Batch Size</td>
<td>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. <strong>Note</strong> The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Batch Queue Size</td>
<td>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. <strong>Note</strong> The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Maximum Scan Size</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>Maintenance User Filter (Case Sensitive)</td>
<td></td>
<td>Optional. Enter a source database user name. Source database transactions (INSERT, UPDATE, and DELETE) conducted by this user will be filtered out (ignored) and not propagated to the SAP HANA target. For example, if you log in to source database with this maintenance user and delete a row from a source table that is subscribed for replication, this row will not be deleted from the SAP HANA target table.</td>
</tr>
</tbody>
</table>
| | | **i Note**  
| | | Do not use the same name as the SAP HANA database username. |
| | | **i Note**  
| | | 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 will be still using the old value. |
| Manage System Objects Lifecycle | | - Create and Clear Normally: Normal behavior in system objects life-cycle (Default). Support for dropping and creating system objects.  
| | | - Clear Only: Support for dropping system objects, if they exist. This is normally used in unsubscribing tables and cleaning up the environment.  
| | | - Create and Reuse: Support for creating system objects, if they don't exist. For the existing objects, the SAP HANA adapter will reuse them.  
<p>| | | - Reuse Only: No support for dropping or creating system objects. For the existing objects, the SAP HANA adapter will reuse them. This is normally used in a shadow remote source that wants to retrieve the subscription in a remote source and replicate continuously. |</p>
<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
|                          | Last Committed Sequence Id      | Last Committed Sequence Id is required only when Manage System Objects Life-Cycle is “Reuse Only”.  
If you set this to 0, the HANA adapter will scan new cached data without re-scanning.  
You can get its value by executing the following SQL statement in your target system:  
```sql
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')
``` |
| Connection Security      | Enable SSL Encryption           | Specifies whether to enable SSL encryption on connections to a remote SAP HANA database. The default value is "false".  
To use SSL encryption with a remote SAP HANA database, the Data Provisioning Agent must already be correctly configured for SSL support:  
- Prepare SSL when SAP HANA is on premise [page 31]  
- Configure SSL when SAP HANA is On Premise [Command Line] [page 54]  
  
**Note**  
The value of this parameter can be changed when the remote source is suspended. |
| Validate Server Certificate |                                 | Specifies whether to validate the certificate of a remote SAP HANA server.  
This configuration is only meaningful if Enable SSL Encryption is set to "true". The default value is Enable SSL encryption "false".  
  
**Note**  
The value of this parameter can be changed when the remote source is suspended. |
<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Host Name in Server Certificate</td>
<td>Controls the verification of the host name field of the server certificate:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● 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 &quot;localhost&quot; is unlikely to work.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● If set to a string,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ If the string is &quot;*&quot;, any name matches.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ If the string starts with &quot;CN=&quot;, it is treated as a common name, and the textual representation of the common name entry in the certificate must be exactly the same.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ Enable SSLOtherwise, the host name in the server certificate must match this string (case insensitive).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Credentials Mode</td>
<td>technical user or secondary user</td>
</tr>
<tr>
<td></td>
<td>User</td>
<td>Select one of the choices, depending on the purpose of the remote source you want to create.</td>
</tr>
<tr>
<td></td>
<td>Database user name (case sensitive)</td>
<td>Note The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Password</td>
<td>The appropriate corresponding password</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
</tbody>
</table>

The following sample codes illustrate how to create a remote source using the SQL console.
Basic

Example

Sample Code

```sql
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

```sql
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>''
Related Information

SAP HANA DDL Propagation [page 330]
Using a Schema Alias [page 199]
Prepare SSL when SAP HANA is on premise [page 31]
Use a Shadow Remote Source [page 332]

6.21.2 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 will propagate 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 need 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 will prevent the HANA adapter from querying metadata from the source database periodically.

Limitation

Be aware 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. This is because
replicating DDL changes would trigger the SAP HANA adapter to update (drop and then recreate) 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 321]

6.21.3 SAP HANA Adapter Preferences

Set the thread pool size when executing jobs of querying shadow tables to get change data.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread Pool Size</td>
<td>The size of the SAPHANA adapter global thread pool. The thread pool is shared by the SAP HANA adapter remote sources. The thread pool is used to execute jobs of querying shadow tables to get change data. We recommend that you configure the thread pool size to the number of available processors in the system, if possible.</td>
</tr>
</tbody>
</table>

6.21.4 SAP HANA (Remote) to SAP HANA (Target) Data Type Mapping

The following table shows the data type conversion between a remote SAP HANA source and an SAP HANA target.

<table>
<thead>
<tr>
<th>Remote SAP HANA Data Type</th>
<th>Target SAP HANA Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALPHANUM</td>
<td>ALPHANUM</td>
</tr>
<tr>
<td>BIGINT</td>
<td>BIGINT</td>
</tr>
<tr>
<td>BINARY</td>
<td>VARBINARY</td>
</tr>
<tr>
<td>BINTEXT</td>
<td>NCLOB</td>
</tr>
<tr>
<td>BLOB</td>
<td>BLOB</td>
</tr>
<tr>
<td>BOOLEAN</td>
<td>TINYINT</td>
</tr>
<tr>
<td>CHAR</td>
<td>VARCHAR</td>
</tr>
<tr>
<td>CLOB</td>
<td>CLOB</td>
</tr>
</tbody>
</table>
### 6.21.5 Use a Shadow Remote Source

Use a shadow remote source to reduce maintenance while performing realtime replication.

**Context**

During realtime replication, if there are exceptions that prevent replicating under a current remote source, and these exceptions cannot be ignored, you can only drop and recreate replication tasks. This can be very

<table>
<thead>
<tr>
<th>Remote SAP HANA Data Type</th>
<th>Target SAP HANA Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECIMAL</td>
<td>DECIMAL</td>
</tr>
<tr>
<td>DOUBLE</td>
<td>DOUBLE</td>
</tr>
<tr>
<td>DATE</td>
<td>DATE</td>
</tr>
<tr>
<td>INTEGER</td>
<td>INTEGER</td>
</tr>
<tr>
<td>NCHAR</td>
<td>NVARCHAR</td>
</tr>
<tr>
<td>NCLOB</td>
<td>NCLOB</td>
</tr>
<tr>
<td>NVARCHAR</td>
<td>NVARCHAR</td>
</tr>
<tr>
<td>REAL</td>
<td>REAL</td>
</tr>
<tr>
<td>SECONDDATE</td>
<td>SECONDDATE</td>
</tr>
<tr>
<td>SHORTTEXT</td>
<td>NVARCHAR</td>
</tr>
<tr>
<td>SMALLDECIMAL</td>
<td>DECIMAL</td>
</tr>
<tr>
<td>SMALLINT</td>
<td>SMALLINT</td>
</tr>
<tr>
<td>TEXT</td>
<td>NCLOB</td>
</tr>
<tr>
<td>TIME</td>
<td>TIME</td>
</tr>
<tr>
<td>TIMESTAMP</td>
<td>TIMESTAMP</td>
</tr>
<tr>
<td>TINYINT</td>
<td>TINYINT</td>
</tr>
<tr>
<td>VARBINARY</td>
<td>VARBINARY</td>
</tr>
<tr>
<td>VARCHAR</td>
<td>VARCHAR</td>
</tr>
</tbody>
</table>

**Note**

An exception of the DECIMAL type mapping is that DECIMAL(34, 0) is always mapped to floating-point DECIMAL data type.
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 will create system objects when setting up the environment, such as triggers, shadow tables, trigger_queue table, and so on. Every remote source has a trigger_queue table, and every table has a relevant shadow table. A shadow remote source will continue to replicate, so all the subscriptions under it will 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 will check 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 321]
6.22 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 as it closely relates to how the operation is invoked.

The SOAP adapter supports the following functionality:

- Virtual function as a source

Related Information

SOAP Adapter Remote Source Configuration [page 334]

6.22.1 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.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSDL File</td>
<td>The location of the WSDL file. Enter a URL or a path to the local file.</td>
</tr>
<tr>
<td>Use System Proxy</td>
<td>If set to yes, the adapter will use the proxy information saved in the dpagentconfig.ini or that is set up in the DP Agent Configuration Tool.</td>
</tr>
<tr>
<td>Treat WebServiceError (SOAP Fault) as failure</td>
<td>If set to True, fail web services call in case of failure. The default value is No. By default, the SOAP Adapter will write 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, suppose the proxy was incorrectly configured.</td>
</tr>
</tbody>
</table>

Sample Code

```sql
Select * from getWeatherByZip(...94403....)
```

- If set to No, the select call is a success and the actual error is populated in SOAP_FAULT column.
- If set to Yes, the select call will fail itself and write the error to a caller.
Example

Sample Code

```
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://mo-01c1660f5.mo.sap.corp:8080/DataServices/servlet/webservices?ver=2.1&amp;wsdlxml</PropertyEntry>
    <PropertyEntry name="useProxy">No</PropertyEntry>
    <PropertyEntry name="axisFault">No</PropertyEntry>
  </ConnectionProperties>'
  WITH CREDENTIAL TYPE 'PASSWORD' USING
  '<CredentialEntry name="basicAuth">
    <user>testUser</user>
    <password>testPassword</password>
  </CredentialEntry>';```

6.23 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.

Note

Before registering your adapter with the SAP HANA system, be sure that you have downloaded and installed the correct JDBC libraries. For information about the proper JDBC library for your source, see the Product Availability Matrix.

Place your files in <DPAgent_root>/lib, and you will need to manually create the /lib folder.

Adapter Functionality

This adapter supports the following functionality:

- Virtual table as a source
- Realtime 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 53: Global Settings

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT from a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>INSERT into a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>No</td>
</tr>
<tr>
<td>Realtime</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 54: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>Yes</td>
</tr>
<tr>
<td>Add a WHERE clause</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN multiple tables</td>
<td>Yes</td>
</tr>
<tr>
<td>Aggregate data via a GROUP BY clause</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a DISTINCT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>Support a TOP or LIMIT clause in the select</td>
<td>Yes</td>
</tr>
<tr>
<td>ORDER BY</td>
<td>Yes</td>
</tr>
<tr>
<td>GROUP BY</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Authentication**

You can set up authentication by using TD2, LDAP, or Kerberos.

If you are using LDAP, you will need to provide a user name and password when setting up your remote source.

If you are using Kerberos, the adapter will use the default Kerberos settings of the machine it is deployed on. If the Kerberos configuration file (`krb5.conf`) is in a non-standard location, the path has to be specified via the `java.security.krb5.conf` system property (by adding it to `dpagent.ini`). The Realm and KDC connection parameters in the remote source are now optional. Both have to be specified in order to override the machine’s default `krb5.conf` settings. To use Kerberos, use the Kerberos principal name for the username 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. The user needs SELECT access on the following dbc tables:

- "DBC"."UDTInfo"
- "DBC"."DBase"
- "DBC"."AccessRights"
- "DBC"."TVM"
- "DBC"."TVFields"

The following privileges are needed to support realtime replication (CDC):

- CREATE TABLE
- DROP TABLE
- CREATE TRIGGER
- DROP TRIGGER
- CREATE PROCEDURE
- DROP PROCEDURE

Related Information

Teradata Adapter Preferences [page 337]
Teradata Remote Source Configuration [page 338]
Permissions for Accessing Multiple Schemas [page 343]
Update JCE Policy Files for Stronger Encryption [page 352]

6.23.1 Teradata Adapter Preferences

Options for controlling the Teradata adapter.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread Pool Size</td>
<td>The size of the Teradata global thread pool. The thread pool is shared by the Teradata adapter remote sources. The thread pool is used to execute jobs of querying shadow tables to get change data.</td>
</tr>
</tbody>
</table>
### 6.23.2 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

<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connection</strong></td>
<td>Host</td>
<td>Host name or IP address on which the remote Teradata data server is running</td>
</tr>
<tr>
<td></td>
<td>Port Number</td>
<td>The Teradata data server port number</td>
</tr>
<tr>
<td></td>
<td>Encoding</td>
<td>Session encoding between the adapter and Teradata. Some restrictions apply to UTF-8. For example, character columns with Graphic encoding are not supported.</td>
</tr>
<tr>
<td></td>
<td>Encrypt traffic</td>
<td>Controls whether the traffic between the adapter and the database is encrypted.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If turned off, data exchanged between the adapter and the database is unencrypted and can be read by anyone with access to the network. Login data is not affected by this setting, because this data is always sent encrypted by the Teradata JDBC driver.</td>
</tr>
<tr>
<td><strong>Logon mechanism</strong></td>
<td></td>
<td>Controls the authentication (+authorization) method used, and which username and password values to enter in the credentials field below.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• TD2 (Teradata Method 2): Use the database username and password</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• LDAP: Directory authentication. Use credentials of users defined and configured via LDAP (Database has to be configured to use external LDAP authentication)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Kerberos (KRB5): Use Kerberos principal and its username (Database has to be configured to use Kerberos external authentication)</td>
</tr>
<tr>
<td></td>
<td>Realm</td>
<td>(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.</td>
</tr>
<tr>
<td></td>
<td>KDC</td>
<td>(Optional when using Kerberos) address of KDC (Key Distribution Center) to be used with the specified Realm (has to be used together with Realm)</td>
</tr>
<tr>
<td>Category</td>
<td>Option</td>
<td>Description</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>JDBC FastExport</td>
<td>Speeds up retrieving large amounts of data from Teradata (disabled when using Kerberos authentication)</td>
</tr>
<tr>
<td></td>
<td>Transaction Mode</td>
<td>Specifies the transaction mode for the connection.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ANSI: Uses American National Standards Institute (ANSI) transaction semantics. This mode is recommended. This is the default value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• TERA: Uses legacy Teradata transaction semantics. This mode is only recommended for legacy applications that require Teradata transaction semantics.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• DEFAULT: Uses the default transaction mode configured for the Teradata Database, which may be either ANSI or TERA mode.</td>
</tr>
<tr>
<td></td>
<td>Additional Connection Parame-</td>
<td>Additional Teradata JDBC connection options. The parameters must be specified in the following format: key=value,key=value,...</td>
</tr>
<tr>
<td>Additional Conn-</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Connection Parameters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Database</td>
<td>Name of the database.</td>
</tr>
<tr>
<td></td>
<td>System Object Prefix</td>
<td>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_.</td>
</tr>
<tr>
<td></td>
<td>Shadow Table Prefix</td>
<td>The prefix of the names of the Teradata adapter shadow tables created in the source Teradata database by the adapter. The default value is “SHADOW_”.</td>
</tr>
<tr>
<td></td>
<td>Stored Procedure Suffix</td>
<td>The prefix of the names of the Teradata adapter stored procedures created in the source Teradata database by the adapter. The default value is “PROC”</td>
</tr>
<tr>
<td></td>
<td>Trigger Suffix</td>
<td>The suffix of the names of the Teradata adapter triggers created in the source Teradata database by the adapter. The default value is “TRIG”</td>
</tr>
</tbody>
</table>

**Note**

The value of this parameter can be changed when the remote source is suspended.
<table>
<thead>
<tr>
<th>Category</th>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Connection Pool Size</td>
<td>Maximum number of connections allowed in the connection pool on a secondary node. The default value is 8.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Minimum Scan Interval inSeconds</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Maximum Scan Interval inSeconds</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>DDL Scan Interval inMinutes</td>
<td>The interval for detecting DDL changes in the source. A zero or negative integer disables this parameter. The default value is 10 (minutes).</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The value of this parameter can be changed when the remote source is suspended.</td>
</tr>
<tr>
<td></td>
<td>Scan Retry Max Attempts</td>
<td>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 will not retry any scans when encountering deadlock exceptions.</td>
</tr>
</tbody>
</table>
## Scan Retry Wait Time in Seconds

The number of seconds for the scanner to wait before trying again to query the trigger queue table. This applies only when you encounter a “deadlock exception”. The default value is 30 seconds.

**Note**

The value of this parameter can be changed when the remote source is suspended.

### Credentials

#### Credentials Mode

*technical user* or *secondary user*

Select one of the choices, depending on the purpose of the remote source you want to create.

#### Username

Database user name (or LDAP username/Kerberos principal name when using logon mechanisms other than TD2)

**Note**

The value of this parameter can be changed when the remote source is suspended.

#### Password

The appropriate corresponding password

**Note**

The value of this parameter can be changed when the remote source is suspended.

---

### Example

**Sample Code**

```sql
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>
    </PropertyGroup>
  </ConnectionProperties>

Installation and Configuration Guide
Configure Data Provisioning Adapters
PUBLIC 341
Related Information

Using Prefix and Suffix Options to Manage System Object Name Lengths [page 342]
Permissions for Accessing Multiple Schemas [page 343]
Teradata DDL Propagation Scan Interval [page 343]

6.23.2.1 Using Prefix and Suffix Options to Manage System Object Name Lengths

The Teradata adapter needs to create a number of system objects on the source database, in order for it to manage realtime 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 will add up to 12 extra characters, meaning that only tables with names of up to 18 characters are fully supported in this scenario.

To maximize the number of table name characters supported, edit the 4 system object prefix and suffix properties to 1 character each (they cannot be empty). This will ensure that the Teradata adapter uses at most 5 additional 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

**Note**

When upgrading, if the Teradata adapter tries to read those properties and they’re not present (i.e. not part of the previous remote source before the upgrade), then the adapter will use the default values. When the user edits the remote source after the upgrade, they’ll see those default values in the remote source description.
6.23.2.2 Permissions for Accessing Multiple Schemas

Grant the necessary permissions before accessing multiple schemas in a Teradata source

To access multiple schemas, you will need the following permissions assigned to you. In the following example, you are USER2, and you are accessing tables, creating procedures, executing procedures, etc., 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

**Note**
The EXECUTE PROCEDURE permission allows USER1 to execute the procedures in database USER2.

6.23.2.3 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 will propagate 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 need 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 will prevent the Teradata adapter from querying metadata from the source database periodically.
Related Information

Teradata Remote Source Configuration [page 338]

6.24  Twitter

The Twitter adapter provides access to Twitter data via the Data Provisioning Agent.

Twitter is a social media website which 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.

The Twitter adapter supports the following functionality:

Adapter Functionality

This adapter supports the following functionality:

- Virtual table or function as a source
- Realtime change data capture (flowgraph only)

In addition, this adapter supports the following capabilities:

Table 55: Global Settings

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECT from a virtual table</td>
<td>Yes</td>
</tr>
<tr>
<td>INSERT into a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute UPDATE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Execute DELETE statements on a virtual table</td>
<td>No</td>
</tr>
<tr>
<td>Different capabilities per table</td>
<td>Yes</td>
</tr>
<tr>
<td>Different capabilities per table column</td>
<td>Yes</td>
</tr>
<tr>
<td>Realtime</td>
<td>Yes (flowgraph only)</td>
</tr>
</tbody>
</table>

Table 56: Select Options

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Supported?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select individual columns</td>
<td>No</td>
</tr>
<tr>
<td>Functionality</td>
<td>Supported?</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Add a WHERE clause</td>
<td>Yes</td>
</tr>
<tr>
<td>JOIN multiple tables</td>
<td>No</td>
</tr>
<tr>
<td>Aggregate data via a GROUP BY clause</td>
<td>No</td>
</tr>
<tr>
<td>Support a DISTINCT clause in the select</td>
<td>No</td>
</tr>
<tr>
<td>Support a TOP or LIMIT clause in the select</td>
<td>No</td>
</tr>
<tr>
<td>ORDER BY</td>
<td>No</td>
</tr>
<tr>
<td>GROUP BY</td>
<td>No</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>Column name</th>
<th>SQL Data Type</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id</td>
<td>BIGINT</td>
<td></td>
</tr>
<tr>
<td>ScreenName</td>
<td>NVARCHAR</td>
<td>256</td>
</tr>
<tr>
<td>Tweet</td>
<td>NVARCHAR</td>
<td>256</td>
</tr>
<tr>
<td>Source</td>
<td>NVARCHAR</td>
<td>256</td>
</tr>
<tr>
<td>Truncated</td>
<td>TINYINT</td>
<td></td>
</tr>
<tr>
<td>InReplyToStatusId</td>
<td>BIGINT</td>
<td></td>
</tr>
<tr>
<td>InReplyToUserId</td>
<td>BIGINT</td>
<td></td>
</tr>
<tr>
<td>InReplyToScreenName</td>
<td>NVARCHAR</td>
<td>256</td>
</tr>
<tr>
<td>Favorited</td>
<td>TINYINT</td>
<td></td>
</tr>
<tr>
<td>Retweeted</td>
<td>TINYINT</td>
<td></td>
</tr>
<tr>
<td>FavoriteCount</td>
<td>INTEGER</td>
<td></td>
</tr>
<tr>
<td>Retweet</td>
<td>TINYINT</td>
<td></td>
</tr>
<tr>
<td>RetweetCount</td>
<td>INTEGER</td>
<td></td>
</tr>
<tr>
<td>RetweetedByMe</td>
<td>TINYINT</td>
<td></td>
</tr>
</tbody>
</table>
### Related Information

**Twitter Terminology [page 346]**

**Installation and Deployment [page 347]**

### 6.24.1 Twitter Terminology

Understanding Twitter terminology helps you get the most out of Twitter data.

The following is a brief list of relevant Twitter terms:

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home timeline</td>
<td>The home timeline is the tweets that appear in your home page when you log in. It returns a collection of the most recent tweets and retweets posted by the authenticating user and the users they follow. It will contain tweets that you follow, or those that you have tweeted, retweeted, replied to, favorited, mentioned, and so on.</td>
</tr>
<tr>
<td>User timeline</td>
<td>User timeline returns a collection of the most recent Tweets posted by the user indicated by the screen_name. The timeline returned is the equivalent of the one seen when you view a user’s profile on twitter.com. When you specify a different user (other than authenticating user), user timeline returns the tweets that are posted by...</td>
</tr>
</tbody>
</table>
Term | Definition
--- | ---
some other user. This is similar to that user’s profile on Twitter.com. Each user has a user name or in Twitter it is known as ScreenName. This is the same name that appears after @, used to refer/mention a user.

Search tweets | Search tweets (formerly known as Public Timeline) allows you to query for all tweets posted by all the users of Twitter. It returns a collection of relevant tweets matching a specified query.

User stream | User streams provide a way for a single user to be streamed the equivalent of their home timeline (the tweets authored by the users they follow) and mentions timeline (the tweets authored by users @mentioning that user).

Public stream | This stream returns public statuses (public data flowing through Twitter) that match one or more filter predicates.

For more information, see the Twitter documentation.

### 6.24.2 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

You must 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 348]
Create a Twitter Remote Source [page 348]
Twitter Remote Source Configuration [page 349]
Twitter Adapter Capabilities [page 350]
6.24.2.1 Set Up a Twitter Account

Follow these steps to set up a Twitter account.

Procedure

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 setup authentication.

6.24.2.2 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.
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.
Remote source configuration options for the Twitter adapter. Also included is sample code for creating a remote source using the SQL console.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>API Key</td>
<td>Consumer Key</td>
</tr>
<tr>
<td>API Secret</td>
<td>Consumer Secret</td>
</tr>
<tr>
<td>Access Token</td>
<td>Oauth Token</td>
</tr>
<tr>
<td>Access Token Secret</td>
<td>Oauth Secret</td>
</tr>
</tbody>
</table>

### Example

Sample Code

```sql
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
```
6.24.2.4 Twitter Adapter Capabilities

The Twitter adapter supports the following capabilities.

<table>
<thead>
<tr>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAP_NON_TRANSACTIONAL_CDC</td>
</tr>
<tr>
<td>CAP_WHERE</td>
</tr>
<tr>
<td>CAP_LIKE</td>
</tr>
<tr>
<td>CAP_SIMPLE_EXPR_IN_WHERE</td>
</tr>
<tr>
<td>CAP_OR</td>
</tr>
<tr>
<td>CAP_SELECT</td>
</tr>
<tr>
<td>CAP_BIGINT_BIND</td>
</tr>
<tr>
<td>CAP_TABLE_CAP</td>
</tr>
<tr>
<td>CAP_COLUMN_CAP</td>
</tr>
<tr>
<td>CAP_METADATA_ATTRIBUTE</td>
</tr>
</tbody>
</table>

See the description of these capabilities in the Javadoc documentation, which can be found in `<DPAgent_root>/doc/javadoc`.
7 Security

The SAP HANA smart data integration option adds new database objects and communication channels to the SAP HANA security landscape.

Some aspects of the SAP HANA smart data integration option require specific security-related considerations, such as the communication channel between SAP HANA and the Data Provisioning Agent. However, in general, the SAP HANA smart data integration option follows standard SAP HANA security concepts. For complete information, refer to the SAP HANA Security Guide.

Related Information

Authentication [page 351]
Update JCE Policy Files for Stronger Encryption [page 352]
Authorizations [page 353]
Communication Channel Security [page 355]
Auditing Activity on SAP HANA Smart Data Integration Objects [page 356]
SAP HANA Security Guide

7.1 Authentication

The identity of database users accessing SAP HANA is verified through a process called authentication. 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 as required.
Kerberos Limitation for Some Data Provisioning Adapters

Some Data Provisioning adapters, such as the Hive, Teradata, and Impala adapters, support Kerberos authentication. When using Kerberos authentication, only encryption types whose key length is less than 256 are supported.

This limitation comes from the SAP JVM packaged with the DP Agent. If you need to use strong encryption, you will need to replace the SAP JCE policy files.

Related Information

SAP HANA Security Guide
Update JCE Policy Files for Stronger Encryption [page 352]

7.2 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 JCE policy files.

Context

Some TLS/SSL (for either DP Agent to SAP HANA or DP Agent to remote source connections) or Kerberos implementations require stronger encryption than what our SAP JVM is capable of providing. If you require more than 128 bit key length encryption, you will want to update your JCE policy files to the latest Oracle JCE policy files.

You can find those files on the Oracle download web site.

Procedure

1. Download the latest Oracle JCE lib files (local_policy.jar and US_export_policy.jar).
2. After you obtain the JCE package, decompress it, backup, and replace the jar files for the SAP JVM used.

You can find the SAP JVM (JCE) files under <DPAgent_root>/sapjvm/lib/security

Related Information

Authentication [page 351]
7.3 Authorizations

The SAP HANA smart data integration option adds new 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 the SAP HANA smart data integration option and its associated catalog objects.

### System Privileges

<table>
<thead>
<tr>
<th>System Privilege</th>
<th>Privilege Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADAPTER ADMIN</td>
<td>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.</td>
</tr>
<tr>
<td>AGENT ADMIN</td>
<td>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.</td>
</tr>
</tbody>
</table>

### Source Privileges

<table>
<thead>
<tr>
<th>Source Privilege</th>
<th>Privilege Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREATE REMOTE SUBSCRIPTION</td>
<td>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 changed data.</td>
</tr>
<tr>
<td>PROCESS REMOTE SUBSCRIPTION EXCEPTION</td>
<td>This privilege allows processing exceptions on this source entry. Exceptions that are relevant for all remote subscriptions are created for a remote source entry.</td>
</tr>
</tbody>
</table>
Object Privileges

<table>
<thead>
<tr>
<th>Object Privilege</th>
<th>Privilege Purpose</th>
<th>Command Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGENT MESSAGING</td>
<td>Authorizes the user with which the agent communicates with the data provisioning server using HTTP protocol. For example: GRANT AGENT MESSAGING ON AGENT “CloudAgent” TO HANA_USER;</td>
<td>DDL</td>
</tr>
<tr>
<td>PROCESS REMOTE SUBSCRIPTION EXCEPTION</td>
<td>Authorizes processing exceptions of a remote subscription.</td>
<td>DDL</td>
</tr>
</tbody>
</table>

Related Information

Activating and Executing Task Flowgraphs and Replication Tasks [page 354]
SAP HANA Security Guide
SAP HANA SQL and System Views Reference

7.3.1 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 AFL: 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;
```
7.4 Communication Channel Security

The security of communication channels 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 and encrypted with SSL.

The agent listens on a port and the Data Provisioning Server connects to it. 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

Because passwords for remote systems accessed by adapters are sent in plain text over this communication channel, 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
7.5 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 Enterprise Information Management 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:

<table>
<thead>
<tr>
<th>Audit Action Name</th>
<th>Group Number</th>
<th>Audit Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREATE AGENT</td>
<td>17</td>
<td>Registering a Data Provisioning Agent</td>
</tr>
<tr>
<td>ALTER AGENT</td>
<td>17</td>
<td>Altering a Data Provisioning Agent registration</td>
</tr>
<tr>
<td>DROP AGENT</td>
<td>17</td>
<td>Dropping a Data Provisioning Agent registration</td>
</tr>
<tr>
<td>CREATE ADAPTER</td>
<td>17</td>
<td>Registering a Data Provisioning Adapter</td>
</tr>
<tr>
<td>ALTER ADAPTER</td>
<td>17</td>
<td>Altering the registration of a Data Provisioning Adapter</td>
</tr>
<tr>
<td>DROP ADAPTER</td>
<td>17</td>
<td>Dropping the registration of a Data Provisioning Adapter</td>
</tr>
<tr>
<td>CREATE REMOTE SUBSCRIPTION</td>
<td>17</td>
<td>Creating a subscription to a remote source</td>
</tr>
<tr>
<td>ALTER REMOTE SUBSCRIPTION</td>
<td>17</td>
<td>Altering a subscription to a remote source</td>
</tr>
<tr>
<td>DROP REMOTE SUBSCRIPTION</td>
<td>17</td>
<td>Dropping a subscription to a remote source</td>
</tr>
<tr>
<td>PROCESS REMOTE SUBSCRIPTION EX-</td>
<td>17</td>
<td>Processing exceptions raised by a subscribed remote source</td>
</tr>
<tr>
<td>CEPTION</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Related Information

SAP HANA Security Guide
SAP HANA SQL and System Views Reference
# 8 SQL and System Views Reference

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 options, see the 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.

**Smart Data Integration: ALTER ADAPTER [page 358]**

The ALTER ADAPTER statement alters an adapter. Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

**Smart Data Integration: ALTER AGENT [page 360]**

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.

**Smart Data Integration: ALTER REMOTE SOURCE [page 361]**

The ALTER REMOTE SOURCE statement modifies the configuration of an external data source connected to the SAP HANA database.

**Smart Data Integration: ALTER REMOTE SUBSCRIPTION [page 365]**

The ALTER REMOTE SUBSCRIPTION statement allows the QUEUE command to initiate real-time data processing, and the DISTRIBUTE command applies the changes.

**Smart Data Integration: CANCEL TASK [page 366]**

Cancels a task that was started with START TASK.

**Smart Data Integration: CREATE ADAPTER [page 368]**

The CREATE ADAPTER statement creates an adapter that is deployed at the specified location.

**Smart Data Integration: CREATE AGENT [page 369]**

The CREATE AGENT statement registers connection properties of an agent that is installed on another host.

**Smart Data Integration: CREATE AGENT GROUP [page 371]**

The CREATE AGENT GROUP statement creates an agent clustering group to which individual agents can be assigned.

**Smart Data Integration: CREATE AUDIT POLICY [page 372]**

**SQL Statements [page 357]**

**System Views [page 389]**

System views allow you to query for various information about the system state using SQL commands. The results appear as tables.
The CREATE AUDIT POLICY statement creates a new audit policy, which can then be enabled and cause the specified audit actions to occur.

Smart Data Integration: CREATE REMOTE SOURCE [page 373]
The CREATE REMOTE SOURCE statement defines an external data source connected to SAP HANA database.

Smart Data Integration: CREATE REMOTE SUBSCRIPTION [page 374]
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.

Smart Data Integration: DROP ADAPTER [page 378]
The DROP ADAPTER statement removes an adapter from all locations.

Smart Data Integration: DROP AGENT [page 379]
The DROP AGENT statement removes an agent.

Smart Data Integration: DROP AGENT GROUP [page 380]
The DROP AGENT GROUP statement removes an agent clustering group.

Smart Data Integration: DROP REMOTE SUBSCRIPTION [page 381]
The DROP REMOTE SUBSCRIPTION statement drops an existing remote subscription.

Smart Data Integration: GRANT [page 382]
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.

Smart Data Integration: PROCESS REMOTE SUBSCRIPTION EXCEPTION [page 384]
The PROCESS REMOTE SUBSCRIPTION EXCEPTION statement allows the user to indicate how an exception should be processed.

Smart Data Integration: SESSION_CONTEXT [page 385]
Returns the value of session_variable assigned to the current user.

Smart Data Integration: START TASK [page 386]
Starts a task.

8.1.1 Smart Data Integration: ALTER ADAPTER

The ALTER ADAPTER statement alters an adapter. Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Syntax

```
ALTER ADAPTER <adapter_name> [PROPERTIES <properties>]
ALTER ADAPTER <adapter_name> {ADD | REMOVE} LOCATION {DPSERVER | AGENT <agent_name>}
```
ALTER ADAPTER <adapter_name> REFRESH AT LOCATION {DPSERVER | AGENT <agent_name>}

Syntax Elements

<adapter_name> ::= <identifier>
<agent_name> ::= <identifier>

The name of the adapter to be altered and the agent name if the adapter is set up on the agent.

<properties> ::= <string_literal>

This specifies optional properties of the adapter such as display_name. When display_name is not specified, then adapter_name appears in the user interface.

Description

The ALTER ADAPTER statement alters an adapter. Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

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 DPSERVER;

Remove an existing adapter TEST_ADAPTER at Data Provisioning Server:

ALTER ADAPTER TEST_ADAPTER REMOVE LOCATION DPSERVER;
8.1.2 Smart Data Integration: ALTER AGENT

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.

**Caution**

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

### Syntax

```
ALTER AGENT <agent_name> HOST <agent_hostname> [ PORT <agent_port_number> ]
   [ {ENABLE | DISABLE} SSL ]
ALTER AGENT <agent_name> PORT <agent_port_number> [ {ENABLE | DISABLE} SSL ]
ALTER AGENT <agent_name> {ENABLE | DISABLE} SSL
ALTER AGENT <agent_name> SET AGENT GROUP <agent_group_name>
ALTER AGENT <agent_name> UNSET AGENT GROUP <agent_group_name>
```

### Syntax Elements

- `<agent_name>` ::= `<identifier>`
  
  The name of the agent to be altered.

- `<agent_hostname>` ::= `<string_literal>`
  
  Specifies if agent’s TCP listener on the specified port uses SSL.

- `<agent_port_number>` ::= `<integer_literal>`
  
  Specifies if agent’s TCP listener on the specified port uses SSL.

- `<agent_group_name>` ::= `<identifier>`
The name of the agent clustering group to which the agent should be attached.

**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.

**Examples**

- Alter TEST_AGENT’s hostname test_host and port to 5051, if it uses ‘TCP’ protocol
  
  ```sql
  ALTER AGENT TEST_AGENT HOST 'test_host' PORT 5051;
  ```

- Alter TEST_AGENT’s hostname test_host, if it uses ‘TCP’ protocol
  
  ```sql
  ALTER AGENT TEST_AGENT HOST 'test_host';
  ```

- Alter TEST_AGENT’s port to 5051, if it uses ‘TCP’ protocol
  
  ```sql
  ALTER AGENT TEST_AGENT PORT 5051;
  ```

- Assign TEST_AGENT to agent group TEST_GROUP
  
  ```sql
  ALTER AGENT TEST_AGENT SET AGENT GROUP TEST_GROUP;
  ```

- Remove TEST_AGENT from agent group TEST_GROUP
  
  ```sql
  ALTER AGENT TEST_AGENT UNSET AGENT GROUP TEST_GROUP;
  ```

**8.1.3 Smart Data Integration: ALTER REMOTE SOURCE**

The ALTER REMOTE SOURCE statement modifies the configuration of an external data source connected to the SAP HANA database.

⚠️ **Caution**

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.
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. The information below is specific to smart data integration functionality.

### Syntax

```
ALTER REMOTE SOURCE <remote_source_name> <adapter_clause> [<credential_clause>]
ALTER REMOTE SOURCE <remote_source_name> { SUSPEND | RESUME } { CAPTURE | DISTRIBUTION }
ALTER REMOTE SOURCE <remote_source_name> {CLEAR OBJECTS | REFRESH OBJECTS | CANCEL REFRESH OBJECTS}
ALTER REMOTE SOURCE <remote_source_name> START LATENCY MONITORING
<latency_ticket_name> [INTERVAL <interval_in_seconds>]
ALTER REMOTE SOURCE <remote_source_name> STOP LATENCY MONITORING
<latency_ticket_name>
ALTER REMOTE SOURCE <remote_source_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 are not specific to smart data integration, refer to the ALTER REMOTE SOURCE topic.

- `<adapter_clause>` ::=
  ```
  [ADAPTER <adapter_name> [AT LOCATION { DPSERVER | AGENT <agent_name> | AGENT GROUP <agent_group_name>]}] <configuration_clause>
  ```

  Adapter configuration.

- `<agent_name>` ::= <identifier>
- `<agent_group_name>` ::= <identifier>

  Refer to CREATE ADAPTER for a description of the AT LOCATION clause.

- `<configuration_clause>` ::= CONFIGURATION '<configuration_xml_string>'

  XML-formatted configuration string for the remote source.

- 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 RESUME CAPTURE

  Resumes the suspended adapter to read changed data from source system.

- ALTER REMOTE SOURCE SUSPEND DISTRIBUTION
Suspends the application of real-time changes in SAP HANA tables but collects changed data from the source system.

**ALTER REMOTE SOURCE RESUME DISTRIBUTION**

Resumes applying real-time changes in SAP HANA tables.

**CLEAR OBJECTS**

Clears all the data received from the adapter for this remote source from HANA tables.

**REFRESH OBJECTS**

Starts building HANA dictionary tables that contain remote source objects.

**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.

**START LATENCY MONITORING**

Starts the collection of latency statistics one time or at regular intervals. The user specifies a target latency ticket in the monitoring view.

**STOP LATENCY MONITORING**

Stops the collection of latency statistics into the given latency ticket.

**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 or the system privilege DATA ADMIN may alter remote sources.

### Examples

The configuration clause must be a structured XML string that defines the settings for the remote source. For example, the following string configures a remote source for an Oracle database.

```xml
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>
    </PropertyGroup>
  </ConnectionProperties>
```
<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>
   </PropertyGroup>
   <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_parallel_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>
</PropertyGroup>
<PropertyEntry name="pds_sql_connection_pool_size">15</PropertyEntry>
<PropertyEntry name="pds_retry_count">5</PropertyEntry>
<PropertyEntry name="pds_retry_timeout">10</PropertyEntry>
</PropertyGroup>
</ConnectionProperties>
8.1.4 Smart Data Integration: ALTER REMOTE SUBSCRIPTION

The ALTER REMOTE SUBSCRIPTION statement allows the QUEUE command to initiate real-time data processing, and the DISTRIBUTE command applies the changes.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Syntax

```
ALTER REMOTE SUBSCRIPTION [\<schema_name>\.]\<subscription_name> < QUEUE | DISTRIBUTE | RESET >
```

Syntax Elements

```
\<subscription_name> ::= \<identifier>
```

The name of the remote subscription.

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.

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.

```sql
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.

```sql
ALTER REMOTE SUBSCRIPTION TEST_SUB RESET;
ALTER REMOTE SUBSCRIPTION TEST_SUB QUEUE;
```

Perform initial load of data using INSERT-SELECT or a TASK.

```sql
INSERT INTO TGT_MARA SELECT * FROM MARA_VT;
ALTER REMOTE SUBSCRIPTION TEST_SUB DISTRIBUTE;
```

### 8.1.5 Smart Data Integration: CANCEL TASK

Cancels a task that was started with START TASK.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

#### 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.

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

Smart Data Integration: START TASK [page 386]

8.1.6 Smart Data Integration: CREATE ADAPTER

The CREATE ADAPTER statement creates an adapter that is deployed at the specified location.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Syntax

```
CREATE ADAPTER <adapter_name> [PROPERTIES <properties>] AT LOCATION
{DPSERVER | AGENT <agent_name>}
```

Syntax Elements

```
<adapter_name> ::= <identifier> <agent_name> ::= <identifier>
```

The name of the adapter to be created and the agent name if the adapter is set up on the agent.

```
<properties> ::= <string_literal>
```

Specifies optional properties of the adapter such as display_name. When display_name is not specified, then adapter_name displays in the user interface.

```
AT LOCATION DPSERVER
```

The adapter runs inside the Data Provisioning Server process in SAP HANA.

```
AT LOCATION AGENT<agent_name>
```

The adapter runs inside the agent that is set up outside of SAP HANA.
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.

Examples

Create adapter at Data Provisioning Server

Create an adapter TEST_ADAPTER running in the Data Provisioning Server.

```
CREATE ADAPTER TEST_ADAPTER AT LOCATION DPSERVER;
```

Create adapter at 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 Smart Data Integration: CREATE AGENT

The CREATE AGENT statement registers connection properties of an agent that is installed on another host.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Syntax

```
CREATE AGENT <agent_name> PROTOCOL { {'HTTP'} | {'TCP' HOST <agent_hostname> PORT <agent_port_number>} } [AGENT GROUP <agent_group_name>] [ENABLE | DISABLE] SSL
```
Syntax Elements

<agent_name> ::= <identifier>

The name of the agent to be created and its protocol.

PROTOCOL 'HTTP'

Agent uses HTTP protocol for communication with DP server. Use this protocol when the SAP HANA database is on the cloud.

PROTOCOL 'TCP' HOST <agent_hostname> PORT <agent_port_number>

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.

{ENABLE | DISABLE} SSL

Specifies if agent’s TCP listener on the specified port uses SSL.

<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.

<agent_group_name> ::= <identifier>

The name of the agent clustering group to which the agent should belong.

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.

Examples

Create 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 agent with HTTP protocol
Create an agent TEST_AGENT that uses HTTP.

```sql
CREATE AGENT TEST_AGENT PROTOCOL 'HTTP';
```

Create agent with HTTP protocol in an agent group
Create an agent TEST_AGENT that uses HTTP and belongs to agent clustering group TEST_GROUP.

```sql
CREATE AGENT TEST_AGENT PROTOCOL 'HTTP' AGENT GROUP TEST_GROUP;
```

### 8.1.8 Smart Data Integration: CREATE AGENT GROUP

The CREATE AGENT GROUP statement creates an agent clustering group to which individual agents can be assigned.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

**Syntax**

```sql
CREATE AGENT GROUP <agent_group_name>
```

**Syntax Elements**

```sql
<agent_group_name> ::= <identifier>
```

The name of the agent group to create.

**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.
Examples

Create agent group named TEST_GROUP

CREATE AGENT GROUP TEST_GROUP;

Related Information

Smart Data Integration: ALTER AGENT [page 360]
Smart Data Integration: CREATE AGENT [page 369]

8.1.9 Smart Data Integration: CREATE AUDIT POLICY

The CREATE AUDIT POLICY statement creates a new audit policy, which can then be enabled and cause the specified audit actions to occur.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

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 ADAPTER | ALTER ADAPTER
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.

8.1.10 Smart Data Integration: CREATE REMOTE SOURCE

The CREATE REMOTE SOURCE statement defines an external data source connected to SAP HANA database.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

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> ::= ADAPTER <adapter_name>
                [AT LOCATION {DPSERVER | AGENT <agent_name> | AGENT GROUP <agent_group_name>}] ]
CONFIGURATION <connection_info_string>
```

Adapter configuration.

```
<agent_name> ::= <identifier>
<agent_group_name> ::= <identifier>
```

Refer to CREATE ADAPTER for description on AT LOCATION.

```
<object_privilege> ::= PROCESS REMOTE SUBSCRIPTION EXCEPTION
```

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.

8.1.11 Smart Data Integration: CREATE REMOTE SUBSCRIPTION

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.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.
Syntax

CREATE REMOTE SUBSCRIPTION [<schema_name>.]<subscription_name> ( { ON [{<schema_name>.}<virtual_table_name>] | {AS [<subquery>]} } | TARGET {TABLE [{<schema_name>.}<table_name>] | {TASK [{<schema_name>.}<task_name>[(<var_list>)]} [PROCEDURE PARAMETERS(<param_list>)]} | {PROCEDURE [{<schema_name}.<proc_name>[(<param_list>)]})
change type column <column_name>
change time column <column_name>
change seq column <column_name>
<load_behavior>

Syntax Elements

<subscription_name> ::= <identifier>

The name of the remote subscription.

<var_list> ::= <start_task_var>[{, <start_task_var}>...]

Specifies one or more start task variables.

<start_task_var> ::= <var_name> => <var_value>

Specifies the name and value for a start task variable. A task plan can contain variables that allow for dynamic replacement of task plan variables. Variable values provided in this section will be used at runtime (for example, when executing the task using START TASK).

<var_name> ::= <identifier>

Name of variable that was defined within the task plan.

<var_value> ::= <string_literal>

Value that should be used in place of the variable name specified when executing the task.

<param_list> ::= <start_task_param>[{, <start_task_param}>...]

Specifies one or more start task parameters.

<start_task_param> ::= <identifier>

Task parameters.

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).

change type 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 seq 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).

```sql
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.

```sql
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 seq column "CHANGE_SEQUENCE"
insert;
```

**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 a 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.
Remote subscription for TARGET TASK 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 using AS Clause

```
CREATE REMOTE SUBSCRIPTION ["<schema_name>"."<subscription_name>"
AS <subquery>
TARGET TASK ["<schema_name>"."<task_name>"[({"<var_list>"})] [PROCEDURE
PARAMETERS({"<param_list>"})]
```

`<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 remote subscription from virtual table to real-time task

Create a remote subscription on a virtual table and apply changes using real-time task.

```sql
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;
```

8.1.12 Smart Data Integration: DROP ADAPTER

The DROP ADAPTER statement removes an adapter from all locations.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Syntax

```sql
DROP ADAPTER <adapter_name> [ <drop_option> ]
```
Syntax Elements

\[<\text{adapter\_name}> ::= <\text{identifier}>\]

The name of the adapter to be dropped.

\[<\text{drop\_option}> ::= \text{CASCADE} | \text{RESTRICT}\]

When \(<\text{drop\_option}>\) is not specified, a restrict drop will be performed.

\text{CASCADE}

Drops the adapter and dependent objects.

Description

The DROP ADAPTER statement removes an adapter from all locations.

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;
```

8.1.13 Smart Data Integration: DROP AGENT

The DROP AGENT statement removes an agent.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Syntax

\[\text{DROP AGENT} \ <\text{agent\_name}> \ [\text{drop\_option}]\]
Syntax Elements

\[ \text{<agent_name>} ::= \text{<identifier>} \]

The name of the agent to be dropped.

\[ \text{<drop_option>} ::= \text{CASCADE | RESTRICT} \]

When \text{<drop_option>} is not specified, a restrict drop is performed.

- **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.

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;
```

8.1.14 Smart Data Integration: DROP AGENT GROUP

The DROP AGENT GROUP statement removes an agent clustering group.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.
Syntax

```plaintext
DROP AGENT GROUP <agent_group_name>
```

Syntax Elements

```plaintext
<agent_group_name> ::= <identifier>
```

The name of the agent group to be dropped.

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.

Example

Create an agent group TEST_GROUP.

```sql
CREATE AGENT GROUP TEST_GROUP;
```

Drop the agent called TEST_GROUP.

```sql
DROP AGENT GROUP TEST_GROUP;
```

8.1.15 Smart Data Integration: DROP REMOTE SUBSCRIPTION

The DROP REMOTE SUBSCRIPTION statement drops an existing remote subscription.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.
Syntax

DROP SUBSCRIPTION [<schema_name>.]<subscription_name>

Syntax Elements

<subscription_name> ::= <identifier>

The name of the remote subscription.

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.

Example

Drop the remote subscription test_sub.

DROP REMOTE SUBSCRIPTION TEST_SUB;

8.1.16 Smart Data Integration: GRANT

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.

Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

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.

\[
\text{<system\_privilege>} ::= \text{ADAPTER ADMIN} | \text{AGENT ADMIN}
\]

System privileges are used to restrict administrative tasks. The table below describes the supported system privileges.

<table>
<thead>
<tr>
<th>System Privilege</th>
<th>Privilege Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADAPTER ADMIN</td>
<td>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.</td>
</tr>
<tr>
<td>AGENT ADMIN</td>
<td>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.</td>
</tr>
</tbody>
</table>

\[
\text{<source\_privilege>} ::= \text{CREATE REMOTE SUBSCRIPTION} | \text{PROCESS REMOTE SUBSCRIPTION EXCEPTION}
\]

Source privileges are used to restrict the access and modifications of a source entry.

<table>
<thead>
<tr>
<th>Source Privilege</th>
<th>Privilege Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREATE REMOTE SUBSCRIPTION</td>
<td>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 changed data.</td>
</tr>
<tr>
<td>PROCESS REMOTE SUBSCRIPTION EXCEPTION</td>
<td>This privilege allows processing exceptions on this source entry. Exceptions that are relevant for all remote subscriptions are created for a remote source entry.</td>
</tr>
</tbody>
</table>

\[
\text{<object\_privilege>} ::= \text{AGENT MESSAGING} | \text{PROCESS REMOTE SUBSCRIPTION EXCEPTION}
\]

Object privileges are used to restrict the access and modifications on database objects. Database objects are tables, views, sequences, procedures, and so on. The table below describes the supported object privileges.

<table>
<thead>
<tr>
<th>Object Privilege</th>
<th>Privilege Purpose</th>
<th>Command Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGENT MESSAGING</td>
<td>Authorizes the user with which the agent communicates with the data provisioning server using HTTP protocol. For example: GRANT AGENT MESSAGING ON AGENT “CloudAgent” TO HANA_USER;</td>
<td>DDL</td>
</tr>
</tbody>
</table>
Object Privilege | Privilege Purpose | Command Types
--- | --- | ---
PROCESS REMOTE SUBSCRIPTION EXCEPTION | 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.

<table>
<thead>
<tr>
<th>Privilege</th>
<th>Schema</th>
<th>Table</th>
<th>View</th>
<th>Sequence</th>
<th>Function / Procedure</th>
<th>Remote Subscription</th>
<th>Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGENT MESSAGING</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>YES</td>
</tr>
<tr>
<td>PROCESS REMOTE SUBSCRIPTION EXCEPTION</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>YES</td>
<td>--</td>
</tr>
</tbody>
</table>

### 8.1.17 Smart Data Integration: PROCESS REMOTE SUBSCRIPTION EXCEPTION

The PROCESS REMOTE SUBSCRIPTION EXCEPTION statement allows the user to indicate how an exception should be processed.

⚠️ **Caution**

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

#### Syntax

```
PROCESS REMOTE SUBSCRIPTION EXCEPTION <exception_id> {RETRY|IGNORE}
```

#### Syntax Elements

```
<exception_id> ::= <integer_literal>
```

The exception ID for remote subscription or remote source.

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.

Example

Ignore exception 101.

```
PROCESS REMOTE SUBSCRIPTION EXCEPTION 101 IGNORE;
```

8.1.18 Smart Data Integration: SESSION_CONTEXT

Returns the value of session_variable assigned to the current user.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

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 variable that is set by the server and is read-only (cannot be SET or UNSET) is ‘TASK_EXECUTION_ID’.
8.1.19 Smart Data Integration: START TASK

Starts a task.

⚠️ Caution
This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Syntax

START TASK <task_name> [ASYNC] [(<var_list>)] [PROCEDURE PARAMETERS(<param_list>)]

Syntax Elements

/task_name/ ::= [schema_name].[identifier]
schema_name ::= <identifier>

The identifier of the task to be called, with optional schema name.

/var_list/ ::= <start_task_var>[:<start_task_var>][,...]

Specifies one or more start task variables. Variables passed to a task are scalar constants. Scalar parameters are assumed to be NOT NULL.

/start_task_var/ ::= <var_name> => <var_value>

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.

/var_name/ ::= <identifier>

Name of variable that was defined.

/var_value/ ::= <string_literal>

Value that should be used in place of the variable name specified when executing the task.

/param_list/ ::= <start_task_param>[:<start_task_param>][,...]

Specifies one or more start task parameters.

/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.

**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) ;
```

The TASK performCleansing was already created, and the task plan used had a variable defined as CASING.

You call the performCleansing task using a variable that will set the CASING variable to have the value of 'mixed'.

```
START TASK performCleansing (CASING => 'mixed');
```

The TASK performCleansing was already created, and the task plan used had a variable defined as CASING. You call the performCleansing task using a variable that will set the CASING variable to have the value of 'mixed'.

By adding the ASYNC text, execution of the task will also be asynchronous.

```
START TASK performCleansing ASYNC (CASING => 'mixed');
```
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 57: Examples

<table>
<thead>
<tr>
<th>Action</th>
<th>SQL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtain the last task execution ID</td>
<td><code>SELECT SESSION_CONTEXT('TASK_EXECUTION_ID') FROM dummy;</code></td>
</tr>
<tr>
<td>See monitoring information for the last task that was executed (with type casting)</td>
<td><code>SELECT * FROM M_TASKS WHERE TASK_EXECUTION_ID = CAST (SESSION_CONTEXT('TASK_EXECUTION_ID') AS BIGINT);</code></td>
</tr>
<tr>
<td>Cancel the last task that was executed (with type casting)</td>
<td><code>CANCEL TASK CAST(SESSION_CONTEXT('TASK_EXECUTION_ID') AS BIGINT);</code></td>
</tr>
</tbody>
</table>

### 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_DATABASSEs, which contains views for monitoring the system as a whole. The views in the SYS_DATABASSEs 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.

- **Smart Data Integration: ADAPTER_CAPABILITIES** [page 392]
  - Specifies the SQL capabilities of the adapters stored in the system.
- **Smart Data Integration: ADAPTER_LOCATIONS** [page 392]
  - Specifies the location of adapters.
- **Smart Data Integration: ADAPTERS** [page 393]
  - Stores adapters available in the SAP HANA system.
- **Smart Data Integration: AGENT_CONFIGURATION** [page 393]
  - Agent configuration
- **Smart Data Integration: AGENT_GROUPS** [page 394]
  - Lists active data provisioning agent groups in the system.
- **Smart Data Integration: AGENTS** [page 394]
  - Lists active data provisioning agents in the system.
- **Smart Data Integration: M_AGENTS** [page 395]
  - Provides the status of all agents registered in the SAP HANA database.
- **Smart Data Integration: M_REMOTE_SOURCES** [page 395]
Stores dictionary status information, remote source owner information, and the status of data collection.

**Smart Data Integration: M_REMOTE_SUBSCRIPTION_COMPONENTS [page 396]**
Provides the status of a remote subscription for each internal component.

**Smart Data Integration: M_REMOTE_SUBSCRIPTION_STATISTICS [page 397]**
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).

**Smart Data Integration: M_REMOTE_SUBSCRIPTIONS [page 398]**
Provides the status and run-time information of a remote subscription.

**Smart Data Integration: M_SESSION_CONTEXT [page 399]**
Session variables for each connection

**Smart Data Integration: REMOTE_SOURCE_OBJECT_DESCRIPTIONS [page 400]**
Stores description of browsable node in different languages.

**Smart Data Integration: REMOTE_SOURCE_OBJECTS [page 400]**
Stores browsable nodes as well as importable objects (virtual tables).

**Smart Data Integration: REMOTE_SOURCES [page 401]**
Remote sources

**Smart Data Integration: REMOTE_SUBSCRIPTION_EXCEPTIONS [page 401]**
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.

**Smart Data Integration: REMOTE_SUBSCRIPTIONS [page 402]**
Lists all the remote subscriptions created for a remote source.

**Smart Data Integration: TASK_CLIENT_MAPPING [page 403]**
Provides the client mapping when a task is created by the ABAP API.

**Smart Data Integration: TASK_COLUMN_DEFINITIONS [page 403]**
Defines the columns present in a particular table.

**Smart Data Integration: TASK_EXECUTIONS [page 404]**
Task-level run-time statistics generated when START TASK is run.

**Smart Data Integration: TASK_LOCALIZATION [page 405]**
Contains localized values for the task framework tables.

**Smart Data Integration: TASK_OPERATIONS [page 406]**
Contains all operations that exist for a given task, as well as details about those operations.

**Smart Data Integration: TASK_OPERATIONS_EXECUTIONS [page 406]**
Operations-level task statistics generated when START TASK is run.

**Smart Data Integration: TASK_PARAMETERS [page 407]**
Details about the task parameters view

**Smart Data Integration: TASK_TABLE_DEFINITIONS [page 408]**
Contains all of the tables used by the various side-effect producing operation.

**Smart Data Integration: TASK_TABLE_RELATIONSHIPS [page 409]**
Defines the relationships, if any, between tables within an operation.

**Smart Data Integration: TASKS [page 409]**
Details about tasks.

**Smart Data Integration: VIRTUAL_COLUMN_PROPERTIES [page 411]**
Lists the properties of the columns in a virtual table sent by the adapter via CREATE VIRTUAL TABLE SQL statement.

**Smart Data Integration: VIRTUAL_TABLE_PROPERTIES (page 411)**
Lists the properties of a virtual table sent by the adapter via the CREATE VIRTUAL TABLE SQL statement.

**Smart Data Quality: BEST_RECORD_GROUP_MASTER_STATISTICS (page 412)**
Contains a summary of Best Record group master statistics.

**Smart Data Quality: BEST_RECORD_RESULTS (page 413)**
Contains governance information for every column in every record that is updated in the best record process.

**Smart Data Quality: BEST_RECORD_STRATEGIES (page 414)**
Contains information on which strategies are used in each strategy group and in which order.

**Smart Data Quality: CLEANSE_ADDRESS_RECORD_INFO (page 415)**
Describes how well an address was assigned as well as the type of address.

**Smart Data Quality: CLEANSE_CHANGE_INFO (page 416)**
Describes the changes made during the cleansing process.

**Smart Data Quality: CLEANSE_COMPONENT_INFO (page 417)**
Identifies the location of parsed data elements in the input and output.

**Smart Data Quality: CLEANSE_INFO_CODES (page 418)**
Contains one row per info code generated by the cleansing process.

**Smart Data Quality: CLEANSE_STATISTICS (page 419)**
Contains a summary of Cleanse statistics.

**Smart Data Quality: GEOCODE_INFO_CODES (page 420)**
Contains one row per info code generated by the geocode transformation process.

**Smart Data Quality: GEOCODE_STATISTICS (page 421)**
Contains a summary of Geocode statistics.

**Smart Data Quality: MATCH_GROUP_INFO (page 421)**
Contains one row for each match group.

**Smart Data Quality: MATCH_RECORD_INFO (page 422)**
Contains one row for each matching record per level.

**Smart Data Quality: MATCH_SOURCE_STATISTICS (page 423)**
Contains counts of matches within and between data sources.

**Smart Data Quality: MATCH_STATISTICS (page 424)**
Contains statistics regarding the run of the transformation operation.

**Smart Data Quality: MATCH_TRACING (page 425)**
Contains one row for each match decision made during the matching process.
8.2.1 Smart Data Integration: ADAPTER_CAPABILITIES

Specifies the SQL capabilities of the adapters stored in the system.

⚠️ Caution
This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADAPTER_NAME</td>
<td>NVARCHAR(64)</td>
<td>Adapter name</td>
</tr>
<tr>
<td>SOURCE_VERSION</td>
<td>NVARCHAR(64)</td>
<td>Source versions supported by the adapter</td>
</tr>
</tbody>
</table>

8.2.2 Smart Data Integration: ADAPTER_LOCATIONS

Specifies the location of adapters.

⚠️ Caution
This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADAPTER_NAME</td>
<td>NVARCHAR(64)</td>
<td>Adapter name</td>
</tr>
<tr>
<td>LOCATION</td>
<td>VARCHAR(11)</td>
<td>Location of the adapter: 'indexserver', 'dpserver', 'agent'</td>
</tr>
<tr>
<td>AGENT_NAME</td>
<td>NVARCHAR(256)</td>
<td>Agent name</td>
</tr>
</tbody>
</table>
8.2.3 Smart Data Integration: ADAPTERS

Stores adapters available in the SAP HANA system.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADAPTER_NAME</td>
<td>NVARCHAR(64)</td>
<td>Adapter name</td>
</tr>
<tr>
<td>PROPERTIES</td>
<td>NVARCHAR(1000)</td>
<td>Optional properties of the adapter such as display_name and description</td>
</tr>
<tr>
<td>CONFIGURATION</td>
<td>NCLOB</td>
<td>UI properties that must be displayed when configuring remote data source</td>
</tr>
<tr>
<td>IS_SYSTEM_ADAPTER</td>
<td>VARCHAR(5)</td>
<td>Specifies whether the adapter is a system adapter: 'TRUE'/‘FALSE'</td>
</tr>
<tr>
<td>IS_ESS_DEFINITION_SUPPORTED</td>
<td>VARCHAR(5)</td>
<td>Specifies if the procedure GET_REMOTE_SOURCE_TABLE_ESS_DEFINITIONS is enabled for remote sources created using this adapter: 'TRUE'/‘FALSE'</td>
</tr>
</tbody>
</table>

8.2.4 Smart Data Integration: AGENT_CONFIGURATION

Agent configuration

Structure

<table>
<thead>
<tr>
<th>Column name</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGENT_NAME</td>
<td>NVARCHAR(256)</td>
<td>Agent name</td>
</tr>
<tr>
<td>KEY</td>
<td>VARCHAR(128)</td>
<td>Agent property key</td>
</tr>
<tr>
<td>VALUE</td>
<td>NCLOB</td>
<td>Agent property value</td>
</tr>
</tbody>
</table>
8.2.5 Smart Data Integration: AGENT_GROUPS

Lists active data provisioning agent groups in the system.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

**Structure**

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGENT_GROUP_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the agent group.</td>
</tr>
</tbody>
</table>

8.2.6 Smart Data Integration: AGENTS

Lists active data provisioning agents in the system.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

**Structure**

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGENT_NAME</td>
<td>NVARCHAR(256)</td>
<td>Agent name</td>
</tr>
<tr>
<td>PROTOCOL</td>
<td>VARCHAR(4)</td>
<td>Protocol for communication with SAP HANA database: 'TCP', 'HTTP'</td>
</tr>
<tr>
<td>AGENT_HOST</td>
<td>NVARCHAR (64)</td>
<td>Agent host specified when using TCP</td>
</tr>
<tr>
<td>AGENT_PORT</td>
<td>INTEGER</td>
<td>Agent port specified when using TCP</td>
</tr>
<tr>
<td>IS_SSL_ENABLED</td>
<td>VARCHAR(5)</td>
<td>Specifies whether the agent listening on TCP port uses SSL</td>
</tr>
<tr>
<td>AGENT_GROUP_NAME</td>
<td>NVARCHAR(256)</td>
<td>Agent clustering group to which the agent belongs.</td>
</tr>
</tbody>
</table>
8.2.7 Smart Data Integration: M_AGENTS

Provides the status of all agents registered in the SAP HANA database.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGENT_NAME</td>
<td>NVARCHAR(256)</td>
<td>Agent name</td>
</tr>
<tr>
<td>FREE_PHYSICAL_MEMORY</td>
<td>BIGINT</td>
<td>Free physical memory on the host</td>
</tr>
<tr>
<td>FREE_SWAP_SPACE</td>
<td>BIGINT</td>
<td>Free swap memory on the host</td>
</tr>
<tr>
<td>LAST_CONNECT_TIME</td>
<td>TIMESTAMP</td>
<td>The last time the session cookie was used for success­ful re-connection</td>
</tr>
<tr>
<td>SYS_TIMESTAMP</td>
<td>TIMESTAMP</td>
<td>Host timestamp in local time zone</td>
</tr>
<tr>
<td>USED_PHYSICAL_MEMORY</td>
<td>BIGINT</td>
<td>Used physical memory on the host</td>
</tr>
<tr>
<td>USED_SWAP_SPACE</td>
<td>BIGINT</td>
<td>Used swap memory on the host</td>
</tr>
<tr>
<td>UTC_TIMESTAMP</td>
<td>TIMESTAMP</td>
<td>Host timestamp in UTC</td>
</tr>
<tr>
<td>AGENT_VERSION</td>
<td>VARCHAR(32)</td>
<td>Agent version</td>
</tr>
<tr>
<td>AGENT_STATUS</td>
<td>VARCHAR(16)</td>
<td>Agent status</td>
</tr>
</tbody>
</table>

8.2.8 Smart Data Integration: M_REMOTE_SOURCES

Stores dictionary status information, remote source owner information, and the status of data collection.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.
### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>USER_NAME</td>
<td>NVARCHAR(256)</td>
<td>User name</td>
</tr>
<tr>
<td>REMOTE_SOURCE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote source name</td>
</tr>
<tr>
<td>LAST_REFRESH_TIME</td>
<td>TIMESTAMP</td>
<td>The successful completion timestamp of the refresh operation</td>
</tr>
<tr>
<td>REFRESH_START_TIME</td>
<td>TIMESTAMP</td>
<td>The timestamp of when the refresh operation was executed</td>
</tr>
<tr>
<td>REFRESH_STATUS</td>
<td>VARCHAR(32)</td>
<td>Refresh operation status:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● STARTED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● COMPLETED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● RUNNING (GET OBJECTS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● RUNNING (GET OBJECT DETAILS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● FAILED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● CANCELLED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● CLEARED</td>
</tr>
<tr>
<td>REFRESH_ERROR_MESSAGE</td>
<td>NVARCHAR(2000)</td>
<td>Exception message that occurred during refresh operation</td>
</tr>
</tbody>
</table>

### 8.2.9 Smart Data Integration: M_REMOTE_SUBSCRIPTION_COMPONENTS

Provides the status of a remote subscription for each internal component.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote subscription schema name</td>
</tr>
<tr>
<td>SUBSCRIPTION_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote subscription name</td>
</tr>
<tr>
<td>COMPONENT</td>
<td>VARCHAR(10)</td>
<td>• DP.SERVER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ADAPTER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• RECEIVER</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• APPLIER</td>
</tr>
<tr>
<td>Column</td>
<td>Data type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>STATUS</td>
<td>VARCHAR</td>
<td>Component status</td>
</tr>
<tr>
<td>MESSAGE</td>
<td>VARCHAR</td>
<td>Additional information</td>
</tr>
</tbody>
</table>

### 8.2.10 Smart Data Integration: M_REMOTE_SUBSCRIPTION_STATISTICS

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).

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

#### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote subscription schema name</td>
</tr>
<tr>
<td>SUBSCRIPTION_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote subscription name</td>
</tr>
<tr>
<td>RECEIVED_MESSAGE_COUNT</td>
<td>BIGINT</td>
<td>Total message/transaction count received by the current connection</td>
</tr>
<tr>
<td>RECEIVED_MESSAGE_SIZE</td>
<td>BIGINT</td>
<td>Total size of messages/transactions received by the current connection</td>
</tr>
<tr>
<td>APPLIED_MESSAGE_COUNT</td>
<td>BIGINT</td>
<td>Total number of messages/transactions applied</td>
</tr>
<tr>
<td>APPLIED_MESSAGE_SIZE</td>
<td>BIGINT</td>
<td>Total size of messages/records applied</td>
</tr>
<tr>
<td>REJECTED_MESSAGE_COUNT</td>
<td>BIGINT</td>
<td>Total number of messages/records rejected</td>
</tr>
<tr>
<td>LAST_MESSAGE_RECEIVED</td>
<td>TIMESTAMP</td>
<td>Time at which the last message/transaction is received</td>
</tr>
<tr>
<td>LAST_MESSAGE_APPLIED</td>
<td>TIMESTAMP</td>
<td>Time at which the last message/transaction is applied</td>
</tr>
<tr>
<td>RECEIVER_LATENCY</td>
<td>BIGINT</td>
<td>Receiver latency in microseconds</td>
</tr>
<tr>
<td>APPLIER_LATENCY</td>
<td>BIGINT</td>
<td>Applier latency in microseconds</td>
</tr>
</tbody>
</table>
8.2.11 Smart Data Integration: M_REMOTE_SUBSCRIPTIONS

Provides the status and run-time information of a remote subscription.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote subscription schema name</td>
</tr>
<tr>
<td>SUBSCRIPTION_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote subscription name</td>
</tr>
<tr>
<td>STATE</td>
<td>VARCHAR(256)</td>
<td>State of event</td>
</tr>
<tr>
<td>OPTIMIZED_QUERY_STRING</td>
<td>NCLOB</td>
<td>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.</td>
</tr>
<tr>
<td>OPTIMIZED_QUERY_HASH</td>
<td>VARCHAR(128)</td>
<td>Hash is used to query the match for optimized query string</td>
</tr>
<tr>
<td>INTERNAL_DISTRIBUTION_ID</td>
<td>BIGINT</td>
<td>Generated integer to identify if multiple target tables are interested in the changes from same source SQL or virtual table</td>
</tr>
<tr>
<td>OPTIMIZED_QUERY_RESULTSET_TYPE</td>
<td>TINYINT</td>
<td>0 - REGULAR 1 - CLUSTER 2 - POOL</td>
</tr>
<tr>
<td>REMOTE_SUBSCRIPTION</td>
<td>NVARCHAR(256)</td>
<td>An optional subscription name registered by the adapter in the remote source system</td>
</tr>
<tr>
<td>VOLUME_ID</td>
<td>INTEGER</td>
<td>Persistence Volume ID</td>
</tr>
<tr>
<td>BEGIN_MARKER</td>
<td>VARCHAR(64)</td>
<td>Generated begin marker in the format B&lt;remote_source_oid&gt;_ &lt;remote_subscription_oid&gt;_ &lt;YYYYMMDDHH24MMSSFF7&gt; when QUEUE command is called.</td>
</tr>
<tr>
<td>END_MARKER</td>
<td>VARCHAR(64)</td>
<td>Generated end marker in the format E&lt;remote_source_oid&gt;_ &lt;remote_subscription_oid&gt;_ &lt;YYYYMMDDHH24MMSSFF7&gt; when DISTRIBUTE command is called.</td>
</tr>
<tr>
<td>BEGIN_MARKER_TIME</td>
<td>TIMESTAMP</td>
<td>Timestamp when QUEUE request is received.</td>
</tr>
</tbody>
</table>
### 8.2.12 Smart Data Integration: M_SESSION_CONTEXT

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_SESSIONCONTEXT 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>
<thead>
<tr>
<th>Variable Name (M_SESSIONCONTEXT.KEY)</th>
<th>Value Constraint</th>
<th>Set by Client or Server</th>
<th>Shown in M_SESSIONCONTEXT</th>
<th>Server Usage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>bigint</td>
<td>server</td>
<td>yes</td>
<td>START TASK</td>
<td>Shows unique task execution ID</td>
</tr>
</tbody>
</table>
8.2.13 Smart Data Integration: REMOTE_SOURCE_OBJECT_DESCRIPTIONS

Stores description of browsable node in different languages.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

**Structure**

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>USER_NAME</td>
<td>NVARCHAR(256)</td>
<td>User name</td>
</tr>
<tr>
<td>REMOTE_SOURCE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote source name</td>
</tr>
<tr>
<td>OBJECT_NAME</td>
<td>NVARCHAR(5000)</td>
<td>Unique name to identify remote source object</td>
</tr>
<tr>
<td>LANGUAGE_CODE</td>
<td>VARCHAR(2)</td>
<td>Language code</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>NVARCHAR(5000)</td>
<td>Description of this object</td>
</tr>
</tbody>
</table>

8.2.14 Smart Data Integration: REMOTE_SOURCE_OBJECTS

Stores browsable nodes as well as importable objects (virtual tables).

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

**Structure**

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>USER_NAME</td>
<td>NVARCHAR(256)</td>
<td>User name</td>
</tr>
<tr>
<td>REMOTE_SOURCE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote source name</td>
</tr>
<tr>
<td>OBJECT_NAME</td>
<td>NVARCHAR(5000)</td>
<td>Unique name to identify remote source object</td>
</tr>
<tr>
<td>DISPLAY_NAME</td>
<td>NVARCHAR(256)</td>
<td>Display name for this object</td>
</tr>
</tbody>
</table>
### 8.2.15 Smart Data Integration: REMOTE_SOURCES

Remote sources

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

#### Structure

<table>
<thead>
<tr>
<th>Column name</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>REMOTE_SOURCE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote source name</td>
</tr>
<tr>
<td>ADAPTER_NAME</td>
<td>NVARCHAR(256)</td>
<td>Adapter name</td>
</tr>
<tr>
<td>CONNECTION_INFO</td>
<td>NVARCHAR(256)</td>
<td>Connection information</td>
</tr>
<tr>
<td>AGENT_GROUP_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the agent group name</td>
</tr>
</tbody>
</table>

### 8.2.16 Smart Data Integration: REMOTE_SUBSCRIPTION.Exceptions

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.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.
8.2.17 Smart Data Integration: REMOTE_SUBSCRIPTIONS

Lists all the remote subscriptions created for a remote source.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

---

### 8.2.17 Smart Data Integration: REMOTE_SUBSCRIPTIONS

Lists all the remote subscriptions created for a remote source.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

---

#### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote subscription schema name</td>
</tr>
<tr>
<td>SUBSCRIPTION_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote subscription name</td>
</tr>
<tr>
<td>OWNER_NAME</td>
<td>NVARCHAR(256)</td>
<td>Owner name</td>
</tr>
<tr>
<td>REMOTE_SOURCE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Remote source name</td>
</tr>
<tr>
<td>IS_VALID</td>
<td>VARCHAR(5)</td>
<td>Specifies whether the remote subscription is valid or not. This becomes FALSE when its source or target objects are changed or dropped.</td>
</tr>
<tr>
<td>SUBSCRIPTION_TYPE</td>
<td>VARCHAR(13)</td>
<td>Remote subscription type</td>
</tr>
<tr>
<td>VIRTUAL_TABLE_SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Virtual table schema name</td>
</tr>
<tr>
<td>VIRTUAL_TABLE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Virtual table name</td>
</tr>
<tr>
<td>Column</td>
<td>Data type</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SUBSCRIPTION_QUERY_STRING</td>
<td>NCLOB</td>
<td>Select statement specified in the subscription when subscription type is SQL</td>
</tr>
<tr>
<td>TARGET_OBJECT_TYPE</td>
<td>VARCHAR(9)</td>
<td>Remote subscription target object type: 'TABLE', 'PROCEDURE', 'TASK'</td>
</tr>
<tr>
<td>TARGET_OBJECT_SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Target object schema name</td>
</tr>
<tr>
<td>TARGET_OBJECT_NAME</td>
<td>NVARCHAR(256)</td>
<td>Target object name</td>
</tr>
<tr>
<td>TARGET_OTHER_PARAM_STRING</td>
<td>NVARCHAR(4000)</td>
<td>Constant parameter string to pass at execution when target object type is PROCEDURE or TASK</td>
</tr>
<tr>
<td>TASKPROCEDURE_PARAMETERS</td>
<td>NVARCHAR(5000)</td>
<td>A comma-separated list of task parameters.</td>
</tr>
</tbody>
</table>

### 8.2.18 Smart Data Integration: TASK_CLIENT_MAPPING

Provides the client mapping when a task is created by the ABAP API.

⚠️ **Caution**

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

#### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>CLIENT</td>
<td>NVARCHAR(128)</td>
<td>Name of the client that created the task with the ABAP API</td>
</tr>
</tbody>
</table>

### 8.2.19 Smart Data Integration: TASK_COLUMN_DEFINITIONS

Defines the columns present in a particular table.

⚠️ **Caution**

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.
**Structure**

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the table defined in the task plan for the operation</td>
</tr>
<tr>
<td>COLUMN_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the column used in the task plan within a table</td>
</tr>
<tr>
<td>MAPPED_NAME</td>
<td>NVARCHAR(128)</td>
<td>Mapped name of the column used in a task plan within a table</td>
</tr>
</tbody>
</table>

**8.2.20 Smart Data Integration: TASK_EXECUTIONS**

Task-level run-time statistics generated when START TASK is run.

⚠️ **Caution**

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

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**

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOST</td>
<td>VARCHAR(64)</td>
<td>Host name</td>
</tr>
<tr>
<td>PORT</td>
<td>INTEGER</td>
<td>Internal port</td>
</tr>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Schema name used in the task</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>CONNECTION_ID</td>
<td>INTEGER</td>
<td>Connection identifier</td>
</tr>
<tr>
<td>TRANSACTION_ID</td>
<td>INTEGER</td>
<td>Transaction identifier used for the task execution</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Task execution unique identifier</td>
</tr>
</tbody>
</table>
### 8.2.21 Smart Data Integration: TASK_LOCALIZATION

Contains localized values for the task framework tables.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

#### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOC_TYPE_ID</td>
<td>INTEGER</td>
<td>Identifier of the type of the entity being localized</td>
</tr>
<tr>
<td>LOC_ID</td>
<td>NVARCHAR(64)</td>
<td>Identifier of the entity being localized</td>
</tr>
<tr>
<td>LANGUAGE</td>
<td>NVARCHAR(1)</td>
<td>One-character code of the localized language</td>
</tr>
<tr>
<td>DESCRIPTION</td>
<td>NVARCHAR(1024)</td>
<td>Localized description</td>
</tr>
</tbody>
</table>
8.2.22 Smart Data Integration: TASK_OPERATIONS

Contains all operations that exist for a given task, as well as details about those operations.

Caution
This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>COMMENTS</td>
<td>NVARCHAR(512)</td>
<td>Comments made on the operation</td>
</tr>
<tr>
<td>HAS_SIDE_EFFECTS</td>
<td>TINYINT</td>
<td>Specifies whether the operation has side-effect data</td>
</tr>
<tr>
<td>OPERATION_TYPE</td>
<td>NVARCHAR(128)</td>
<td>Type of operation in the task plan</td>
</tr>
</tbody>
</table>

8.2.23 Smart Data Integration: TASK_OPERATIONS_EXECUTIONS

Operations-level task statistics generated when START TASK is run.

Caution
This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

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

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOST</td>
<td>VARCHAR(64)</td>
<td>Host name</td>
</tr>
<tr>
<td>PORT</td>
<td>INTEGER</td>
<td>Internal port</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Task identifier</td>
</tr>
<tr>
<td>CONNECTION_ID</td>
<td>INTEGER</td>
<td>Connection identifier</td>
</tr>
<tr>
<td>TRANSACTION_ID</td>
<td>INTEGER</td>
<td>Transaction identifier used for the task execution</td>
</tr>
<tr>
<td>CURRENT_OPERATION</td>
<td>NVARCHAR</td>
<td>Name of operation</td>
</tr>
<tr>
<td>OPERATION_TYPE</td>
<td>NVARCHAR(128)</td>
<td>Type of operation</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Internal name of operation</td>
</tr>
<tr>
<td>START_TIME</td>
<td>TIMESTAMP</td>
<td>Start time of the task</td>
</tr>
<tr>
<td>END_TIME</td>
<td>TIMESTAMP</td>
<td>End time of the task</td>
</tr>
<tr>
<td>DURATION</td>
<td>BIGINT</td>
<td>Execution time of the task (microseconds)</td>
</tr>
<tr>
<td>STATUS</td>
<td>VARCHAR(16)</td>
<td>Status of the task:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● STARTING</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● RUNNING</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● FAILED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● COMPLETED</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● CANCELLING</td>
</tr>
<tr>
<td></td>
<td></td>
<td>● CANCELLED</td>
</tr>
<tr>
<td>PROCESSED_RECORDS</td>
<td>BIGINT</td>
<td>Total number of records processed</td>
</tr>
<tr>
<td>OPERATION_PROGRESS_PERCENT</td>
<td>DOUBLE</td>
<td>Operation progress (percent)</td>
</tr>
<tr>
<td>HAS_SIDE_EFFECTS</td>
<td>VARCHAR(5)</td>
<td>'TRUE' if the task produces side effect data, else 'FALSE'</td>
</tr>
</tbody>
</table>

### 8.2.24 Smart Data Integration: TASK_PARAMETERS

Details about the task parameters view

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.
Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Schema in which the task was created</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of task</td>
</tr>
<tr>
<td>PARAMETER_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of parameter</td>
</tr>
<tr>
<td>POSITION</td>
<td>INTEGER</td>
<td>Position of parameter</td>
</tr>
<tr>
<td>TABLE_TYPE_SCHEMA</td>
<td>NVARCHAR(256)</td>
<td>Schema in which the TableType was created</td>
</tr>
<tr>
<td>TABLE_TYPE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of TableType</td>
</tr>
<tr>
<td>PARAMETER_TYPE</td>
<td>VARCHAR(7)</td>
<td>Parameter type: IN or OUT</td>
</tr>
</tbody>
</table>

8.2.25 Smart Data Integration: TASK_TABLE_DEFINITIONS

Contains all of the tables used by the various side-effect producing operation.

⚠️ Caution
This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>TABLE_ID</td>
<td>INTEGER</td>
<td>Unique identifier for the table</td>
</tr>
<tr>
<td>TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the table defined in the task plan for an operation</td>
</tr>
<tr>
<td>SIDE_EFFECT_SCHEMA</td>
<td>NVARCHAR(128)</td>
<td>Schema where the generated side-effect table is located</td>
</tr>
<tr>
<td>SIDE_EFFECT_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the generated side-effect table</td>
</tr>
<tr>
<td>IS_PRIMARY_TABLE</td>
<td>TINYINT</td>
<td>Specifies whether this table is the primary table in a relationship</td>
</tr>
</tbody>
</table>
8.2.26 Smart Data Integration: TASK_TABLE_RELATIONSHIPS

Defines the relationships, if any, between tables within an operation.

⚠️ Caution
This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the table defined in the task plan for an operation</td>
</tr>
<tr>
<td>RELATED_TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the table to which the table specified in TABLE_NAME is related</td>
</tr>
<tr>
<td>FROM_ATTRIBUTE</td>
<td>NVARCHAR(128)</td>
<td>Name of the column in the TABLE_NAME table that relates to the TO_ATTRIBUTE</td>
</tr>
<tr>
<td>TO_ATTRIBUTE</td>
<td>NVARCHAR(128)</td>
<td>Name of the column in the RELATED_TABLE_NAME table that relates to the FROM_ATTRIBUTE</td>
</tr>
</tbody>
</table>

8.2.27 Smart Data Integration: TASKS

Details about tasks.

⚠️ Caution
This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.
### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TASK_OID</td>
<td>BIGINT</td>
<td>Unique identifier for a task</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of task</td>
</tr>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Schema the task was created in</td>
</tr>
<tr>
<td>OWNER_NAME</td>
<td>NVARCHAR(256)</td>
<td>Owner of the task</td>
</tr>
<tr>
<td>CREATE_TIME</td>
<td>TIMESTAMP</td>
<td>Creation time</td>
</tr>
<tr>
<td>MEMORY_SIZE</td>
<td>BIGINT</td>
<td>Memory size of loaded task</td>
</tr>
<tr>
<td>TASK_TYPE</td>
<td>NVARCHAR(64)</td>
<td>Type of task (‘PLAN’ or ‘PROCEDURE’), based on how the task was created</td>
</tr>
<tr>
<td>PLAN_VERSION</td>
<td>NVARCHAR(32)</td>
<td>Version of the task plan</td>
</tr>
<tr>
<td>PLAN</td>
<td>NCLOB</td>
<td>Task plan used to define the task, or task plan generated to call the procedure</td>
</tr>
<tr>
<td>COMMENTS</td>
<td>NVARCHAR(256)</td>
<td>Description of the task, from the task plan</td>
</tr>
<tr>
<td>HAS_TABLE_TYPE_INPUT</td>
<td>VARCHAR(5)</td>
<td>‘TRUE’ if the task is modeled with a table type as input, meaning data would need to be passed at execution time</td>
</tr>
<tr>
<td>HAS SDQ</td>
<td>VARCHAR(5)</td>
<td>‘TRUE’ if the task contains SDQ (smart data quality) functionality</td>
</tr>
<tr>
<td>IS_REALTIME_TASK</td>
<td>VARCHAR(5)</td>
<td>‘TRUE’ if the task is a real-time task, else ‘FALSE’</td>
</tr>
<tr>
<td>IS_VALID</td>
<td>VARCHAR(5)</td>
<td>‘TRUE’ if the task is in a valid state; ‘FALSE’ if it has been invalidated by a dependency</td>
</tr>
<tr>
<td>IS_READ_ONLY</td>
<td>VARCHAR(5)</td>
<td>‘TRUE’ if the task is read only (has only table type outputs), ‘FALSE’ if it writes to non-table-type outputs</td>
</tr>
<tr>
<td>PROCEDURE_SCHEMA</td>
<td>NVARCHAR(256)</td>
<td>If the task was created with a procedure instead of a plan, this attribute will contain the schema name of the stored procedure</td>
</tr>
<tr>
<td>PROCEDURE_NAME</td>
<td>NVARCHAR(256)</td>
<td>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</td>
</tr>
<tr>
<td>INPUT_PARAMETER_COUNT</td>
<td>SMALLINT</td>
<td>Number of input (tableType) parameters</td>
</tr>
<tr>
<td>OUTPUT_PARAMETER</td>
<td>SMALLINT</td>
<td>Number of output (tableType) parameters</td>
</tr>
<tr>
<td>SQL_SECURITY</td>
<td>VARCHAR(7)</td>
<td>Security model for the task, either ‘DEFINER’ or ‘INVOKER’</td>
</tr>
</tbody>
</table>
8.2.28 Smart Data Integration: VIRTUAL_COLUMN_PROPERTIES

Lists the properties of the columns in a virtual table sent by the adapter via CREATE VIRTUAL TABLE SQL statement.

⚠️ Caution
This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Schema name of virtual table</td>
</tr>
<tr>
<td>TABLE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Virtual table name</td>
</tr>
<tr>
<td>COLUMN_NAME</td>
<td>NVARCHAR(256)</td>
<td>Virtual table column name</td>
</tr>
<tr>
<td>PROPERTY</td>
<td>NVARCHAR(256)</td>
<td>Property name</td>
</tr>
<tr>
<td>VALUE</td>
<td>NVARCHAR(512)</td>
<td>Property value</td>
</tr>
</tbody>
</table>

8.2.29 Smart Data Integration: VIRTUAL_TABLE_PROPERTIES

Lists the properties of a virtual table sent by the adapter via the CREATE VIRTUAL TABLE SQL statement.

⚠️ Caution
This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Schema name of virtual table</td>
</tr>
<tr>
<td>TABLE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Virtual table name</td>
</tr>
<tr>
<td>PROPERTY</td>
<td>NVARCHAR(256)</td>
<td>Property name</td>
</tr>
</tbody>
</table>
### 8.2.30 Smart Data Quality: BEST_RECORD_GROUP_MASTER_STATISTICS

Contains a summary of Best Record group master statistics.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VALUE</td>
<td>NCLOB</td>
<td>Property value. For example: • Large XSD of size 1M</td>
</tr>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>NUM_RECORDS</td>
<td>BIGINT</td>
<td>Total number of records processed</td>
</tr>
<tr>
<td>NUM_GROUP_MASTERS</td>
<td>BIGINT</td>
<td>Number of group master records processed</td>
</tr>
<tr>
<td>NUM_DUPLICATES</td>
<td>BIGINT</td>
<td>Number of duplicate records processed</td>
</tr>
<tr>
<td>NUM_SURVIVORS</td>
<td>BIGINT</td>
<td>Number of surviving records processed</td>
</tr>
<tr>
<td>NUM_NON_MATCH_RECORDS</td>
<td>BIGINT</td>
<td>Number of non-matching records processed</td>
</tr>
</tbody>
</table>
8.2.31 Smart Data Quality: BEST_RECORD_RESULTS

Contains governance information for every column in every record that is updated in the best record process.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>DST_TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the destination table for the operation</td>
</tr>
<tr>
<td>DST_ROW_ID</td>
<td>BIGINT</td>
<td>Unique identifier for the destination row</td>
</tr>
<tr>
<td>DST_COLUMN_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the destination column in the destination table</td>
</tr>
<tr>
<td>DST_ROW_TYPE</td>
<td>NVARCHAR(1)</td>
<td>Identifies how the record was updated or if it was newly created</td>
</tr>
<tr>
<td>SRC_TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the source table for the operation</td>
</tr>
<tr>
<td>SRC_ROW_ID</td>
<td>BIGINT</td>
<td>Unique identifier for the source row</td>
</tr>
<tr>
<td>SRC_COLUMN_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the source column in the source table</td>
</tr>
<tr>
<td>STRATEGY_GROUP_ID</td>
<td>INTEGER</td>
<td>Identification number that identifies the best record strategy group</td>
</tr>
<tr>
<td>STRATEGY_ID</td>
<td>INTEGER</td>
<td>Identification number that identifies each strategy listed in the strategy group</td>
</tr>
<tr>
<td>BEST_RECORD_RULE</td>
<td>NVARCHAR(256)</td>
<td>Name of the rule that updates one or more columns as it is defined in the best record configuration</td>
</tr>
<tr>
<td>ACTION_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the action that updates a column as it is defined in the best record configuration</td>
</tr>
</tbody>
</table>
### 8.2.32 Smart Data Quality: BEST_RECORD_STRATEGIES

Contains information on which strategies are used in each strategy group and in which order.

⚠️ **Caution**

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

#### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>STRATEGY_GROUP_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the strategy group as defined in the best record configuration</td>
</tr>
<tr>
<td>STRATEGY_ID</td>
<td>INTEGER</td>
<td>Identification number that identifies each strategy listed in the strategy group</td>
</tr>
<tr>
<td>STRATEGY_ORDER</td>
<td>INTEGER</td>
<td>Order of the strategy as defined in the list of strategies</td>
</tr>
<tr>
<td>STRATEGY_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the strategy as defined in the best record configuration</td>
</tr>
</tbody>
</table>
8.2.33 Smart Data Quality: CLEANSE_ADDRESS_RECORD_INFO

Describes how well an address was assigned as well as the type of address.

⚠️ Caution

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### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the table defined in the task plan</td>
</tr>
<tr>
<td>ROW_ID</td>
<td>BIGINT</td>
<td>Unique identifier of the row processed for this execution of the task plan</td>
</tr>
<tr>
<td>ENTITY_INSTANCE</td>
<td>INTEGER</td>
<td>Identifier to differentiate between multiple entities processed in a row</td>
</tr>
<tr>
<td>ENTITY_INSTANCE_OCCURRENCE</td>
<td>INTEGER</td>
<td>Unique identifier to identify the occurrence of an entity</td>
</tr>
<tr>
<td>DATA_SOURCE</td>
<td>NVARCHAR(256)</td>
<td>Source where the data was produced</td>
</tr>
<tr>
<td>ISO_COUNTRY_2CHAR</td>
<td>NVARCHAR(4)</td>
<td>Two-character country code</td>
</tr>
<tr>
<td>ASSIGNMENT_TYPE</td>
<td>NVARCHAR(4)</td>
<td>Code that represents the type of an address</td>
</tr>
<tr>
<td>ASSIGNMENT_INFORMATION</td>
<td>NVARCHAR(4)</td>
<td>Code that specifies the validity of an address</td>
</tr>
<tr>
<td>ASSIGNMENT_LEVEL</td>
<td>NVARCHAR(4)</td>
<td>Code that represents the level to which the address matched data in the address reference data</td>
</tr>
</tbody>
</table>
8.2.34 Smart Data Quality: CLEANSE_CHANGE_INFO

Describes the changes made during the cleansing process.

⚠️ Caution

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Structure

<table>
<thead>
<tr>
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<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
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<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the table defined in the task plan for the operation</td>
</tr>
<tr>
<td>ROW_ID</td>
<td>BIGINT</td>
<td>Unique identifier of the row processed for this execution of the task plan</td>
</tr>
<tr>
<td>ENTITY_ID</td>
<td>NVARCHAR(12)</td>
<td>Identifier describing the type of record that was processed</td>
</tr>
<tr>
<td>ENTITY_INSTANCE</td>
<td>INTEGER</td>
<td>Identifier to differentiate between multiple entities processed in a row</td>
</tr>
<tr>
<td>ENTITY_INSTANCE_OCCURRENCE</td>
<td>INTEGER</td>
<td>Unique identifier to identify the occurrence of an entity</td>
</tr>
<tr>
<td>COMPONENT_ID</td>
<td>NVARCHAR(12)</td>
<td>Identification number that refers to data components</td>
</tr>
<tr>
<td>COMPONENT_ELEMENT_ID</td>
<td>NVARCHAR(12)</td>
<td>Identification number that refers to more granular elements within a component</td>
</tr>
<tr>
<td>DATA_SOURCE</td>
<td>NVARCHAR(256)</td>
<td>Source where the data was produced</td>
</tr>
<tr>
<td>CHANGE_SIGNIFICANCE_ID</td>
<td>NVARCHAR(12)</td>
<td>Identification number that refers to the significance of the change</td>
</tr>
</tbody>
</table>
8.2.35 Smart Data Quality: CLEANSE_COMPONENT_INFO

Identifies the location of parsed data elements in the input and output.

⚠️ Caution
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Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>ENTITY_ID</td>
<td>NVARCHAR(12)</td>
<td>Identifier describing a data attribute such as a person name, organization name, address and so on.</td>
</tr>
<tr>
<td>ENTITY_INSTANCE</td>
<td>INTEGER</td>
<td>Identifier to differentiate between multiple entities processed in a row</td>
</tr>
<tr>
<td>ENTITY_INSTANCE_OCCURRENCE</td>
<td>INTEGER</td>
<td>Unique identifier to identify the occurrence of an entity</td>
</tr>
<tr>
<td>DATA_SOURCE</td>
<td>NVARCHAR(256)</td>
<td>Source where the data originated</td>
</tr>
<tr>
<td>COMPONENT_ID</td>
<td>NVARCHAR(12)</td>
<td>Identification number that refers to data components</td>
</tr>
<tr>
<td>COMPONENT_ELEMENT_ID</td>
<td>NVARCHAR(12)</td>
<td>Identification number that refers to more granular elements within a component</td>
</tr>
<tr>
<td>TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the input table where the component element was found</td>
</tr>
<tr>
<td>ROW_ID</td>
<td>BIGINT</td>
<td>Unique identifier of the row processed for this execution of the task plan</td>
</tr>
<tr>
<td>COLUMN_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the column in the input table where the component element was found</td>
</tr>
</tbody>
</table>
### 8.2.36 Smart Data Quality: CLEANSE_INFO_CODES

Contains one row per info code generated by the cleansing process.

#### Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

#### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLUMN_START_POSITION</td>
<td>INTEGER</td>
<td>Starting character of the component element in the input column</td>
</tr>
<tr>
<td>COLUMN_DATA_LENGTH</td>
<td>INTEGER</td>
<td>Number of characters of the component element in the input column</td>
</tr>
<tr>
<td>OUTPUT_TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the output table where the component element was written</td>
</tr>
<tr>
<td>OUTPUT_COLUMN_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the column in the output table where the component element was written</td>
</tr>
<tr>
<td>OUTPUT_COLUMN_START_POSITION</td>
<td>INTEGER</td>
<td>Starting character of the component element in the output column</td>
</tr>
<tr>
<td>OUTPUT_COLUMN_DATA_LENGTH</td>
<td>INTEGER</td>
<td>Number of characters of the component element in the output column</td>
</tr>
</tbody>
</table>
### 8.2.37 Smart Data Quality: CLEANSE_STATISTICS

Contains a summary of Cleanse statistics.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

#### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROW_ID</td>
<td>BIGINT</td>
<td>Unique identifier of the row processed for this execution of the task plan</td>
</tr>
<tr>
<td>ENTITY_ID</td>
<td>NVARCHAR(12)</td>
<td>Identifier describing the type of record that was processed</td>
</tr>
<tr>
<td>ENTITY_INSTANCE</td>
<td>INTEGER</td>
<td>Identifier to differentiate between multiple entities processed in a row</td>
</tr>
<tr>
<td>ENTITY_INSTANCE_OCCURRENCE</td>
<td>INTEGER</td>
<td>Unique identifier to identify the occurrence of an entity</td>
</tr>
<tr>
<td>DATA_SOURCE</td>
<td>NVARCHAR(256)</td>
<td>Source where the data was produced</td>
</tr>
<tr>
<td>INFO_CODE</td>
<td>NVARCHAR(10)</td>
<td>Information code that gives information about the processing of the record</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>ENTITY_ID</td>
<td>NVARCHAR(12)</td>
<td>Identifier describing the type of record that was processed</td>
</tr>
<tr>
<td>ENTITY_INSTANCE</td>
<td>INTEGER</td>
<td>Identifier to differentiate between multiple entities processed in a row</td>
</tr>
</tbody>
</table>
### 8.2.38 Smart Data Quality: GEOCODE_INFO_CODES

Contains one row per info code generated by the geocode transformation process.

**Caution**

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#### Structure

<table>
<thead>
<tr>
<th>Column</th>
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the table defined in the task plan for the operation</td>
</tr>
<tr>
<td>ROW_ID</td>
<td>BIGINT</td>
<td>Unique identifier of the row processed for this execution of the task plan</td>
</tr>
<tr>
<td>DATA_SOURCE</td>
<td>NVARCHAR(256)</td>
<td>Source where the data was produced</td>
</tr>
<tr>
<td>INFO_CODE</td>
<td>NVARCHAR(10)</td>
<td>Information code generated by the geocode transformation operation</td>
</tr>
</tbody>
</table>
8.2.39 Smart Data Quality: GEOCODE_STATISTICS

Contains a summary of Geocode statistics.

⚠️ Caution

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### Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>NUM_RECORDS</td>
<td>BIGINT</td>
<td>Total number of records processed</td>
</tr>
<tr>
<td>NUM_ASSIGNED</td>
<td>BIGINT</td>
<td>Number of assigned records processed</td>
</tr>
<tr>
<td>NUM_UNASSIGNED</td>
<td>BIGINT</td>
<td>Number of unassigned records processed</td>
</tr>
</tbody>
</table>

8.2.40 Smart Data Quality: MATCH_GROUP_INFO

Contains one row for each match group.

⚠️ Caution

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<table>
<thead>
<tr>
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>GROUP_ID</td>
<td>INTEGER</td>
<td>Group identification number</td>
</tr>
<tr>
<td>GROUP_COUNT</td>
<td>INTEGER</td>
<td>Number of records in the match group</td>
</tr>
<tr>
<td>SOURCE_COUNT</td>
<td>INTEGER</td>
<td>Number of sources represented in the match group</td>
</tr>
<tr>
<td>REVIEW_GROUP</td>
<td>NVARCHAR(1)</td>
<td>Indicates whether the group is flagged for review</td>
</tr>
<tr>
<td>CONFLICT_GROUP</td>
<td>NVARCHAR(1)</td>
<td>Indicates whether the group is flagged for conflict</td>
</tr>
</tbody>
</table>

8.2.41 Smart Data Quality: MATCH_RECORDINFO

Contains one row for each matching record per level.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.
<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the table defined in the task plan for the operation</td>
</tr>
<tr>
<td>ROW_ID</td>
<td>BIGINT</td>
<td>Unique identifier of the row processed for this execution of the task plan</td>
</tr>
<tr>
<td>GROUP_ID</td>
<td>INTEGER</td>
<td>Group identification number</td>
</tr>
</tbody>
</table>

### 8.2.42 Smart Data Quality: MATCH_SOURCE_STATISTICS

Contains counts of matches within and between data sources.

**Caution**

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#### Structure

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<tr>
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<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>SOURCE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Data source name</td>
</tr>
<tr>
<td>RELATED_SOURCE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Related data source name</td>
</tr>
<tr>
<td>NUM_MATCH_DECISIONS</td>
<td>INTEGER</td>
<td>Number of comparisons resulting in a match decision between records in each SOURCE_ID/RELATED_SOURCE_ID pair</td>
</tr>
</tbody>
</table>
8.2.43 Smart Data Quality: MATCH_STATISTICS

Contains statistics regarding the run of the transformation operation.

⚠️ Caution

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**Structure**

<table>
<thead>
<tr>
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<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>NUM_RECORDS</td>
<td>BIGINT</td>
<td>Total number of records processed by the transformation operation</td>
</tr>
<tr>
<td>NUM_MATCH_RECORDS</td>
<td>BIGINT</td>
<td>Number of records that reside in match groups</td>
</tr>
<tr>
<td>NUM_NON_MATCH_RECORDS</td>
<td>BIGINT</td>
<td>Number of non-matching records that do not reside in match groups</td>
</tr>
<tr>
<td>NUM_MATCH_GROUPS</td>
<td>BIGINT</td>
<td>Number of match groups identified</td>
</tr>
<tr>
<td>NUM_REVIEW_GROUPS</td>
<td>BIGINT</td>
<td>Number of match groups flagged for review</td>
</tr>
<tr>
<td>NUM_NON_REVIEW_GROUPS</td>
<td>BIGINT</td>
<td>Number of match groups not flagged for review</td>
</tr>
<tr>
<td>NUM_CONFLICT_GROUPS</td>
<td>BIGINT</td>
<td>Number of match groups flagged with conflicts</td>
</tr>
<tr>
<td>NUM_COMPARISONS_PERFORMED</td>
<td>BIGINT</td>
<td>Number of comparisons performed by the transformation operation</td>
</tr>
<tr>
<td>NUM_MATCH_DECISIONS</td>
<td>BIGINT</td>
<td>Number of comparisons resulting in a match decision</td>
</tr>
</tbody>
</table>
8.2.44 Smart Data Quality: MATCH_TRACING

Contains one row for each match decision made during the matching process.

⚠️ Caution

This information applies only for the SAP HANA option cited in the title of this topic. You must have purchased the license for it in order to use the information contained in this topic.

Structure

<table>
<thead>
<tr>
<th>Column</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCHEMA_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the schema where the task is located</td>
</tr>
<tr>
<td>TASK_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the task</td>
</tr>
<tr>
<td>TASK_EXECUTION_ID</td>
<td>BIGINT</td>
<td>Unique identifier for a particular run of a task plan created when START TASK is called</td>
</tr>
<tr>
<td>OPERATION_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the operation in the task plan</td>
</tr>
<tr>
<td>TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the table defined in the task plan for the operation</td>
</tr>
<tr>
<td>ROW_ID</td>
<td>BIGINT</td>
<td>Unique identifier of the row processed for this execution of the task plan</td>
</tr>
<tr>
<td>RELATED_TABLE_NAME</td>
<td>NVARCHAR(128)</td>
<td>Name of the table defined in the task plan for an operation</td>
</tr>
<tr>
<td>RELATED_ROW_ID</td>
<td>BIGINT</td>
<td>Unique identifier of the row processed for this execution of the task plan</td>
</tr>
<tr>
<td>POLICY_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the match policy that processed the related rows</td>
</tr>
<tr>
<td>RULE_NAME</td>
<td>NVARCHAR(256)</td>
<td>Name of the match rule that processed the related rows</td>
</tr>
<tr>
<td>SCORE</td>
<td>INTEGER</td>
<td>Similarity score of the related rows</td>
</tr>
</tbody>
</table>
9 Open a Support Connection

In some support situations, it may be necessary to allow an SAP support engineer to log into your system to analyze the situation.

Procedure

1. To enable a support user to log on to your system, complete the following tasks:
   a. Install the SAProuter as described on SAP Support Portal.
   b. Set up a support connection as described in SAP Note 1634848 (SAP HANA database service connections).
   c. Configure a Telnet connection as described in SAP Note 37001 (Telnet link to customer systems).
   d. Configure an SAP HANA database connection as described in SAP Note 1592925 (SAP HANA studio service connection).
   e. Configure a TREX/BIA/HANA service connection as described in SAP Note 1058533 (TREX/BIA/HANA service connection to customer systems).
2. Create a database user and grant the MONITORING role.
   The MONITORING role allows a database user to open the SAP HANA Administration Console perspective with read-only access to the system, system views, statistics views, trace files, and so on. However, this role does not provide any privileges for accessing application data. With the MONITORING role, it is also not possible to change the configuration of or start and stop a system. You can grant the MONITORING role to a support engineer if SAP support needs to connect to the system. Depending on the issue to be analyzed, further privileges may be needed to allow sufficient analysis (for example, to access application data or data models).

Related Information

SAP Note 1634848
SAP Note 37001
SAP Note 1592925
SAP Note 1058533
SAProuter
Important Disclaimers and Legal Information

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