



## **PUBLIC**

SAP BusinessObjects Business Intelligence platform

Document Version: 4.3 Support Package 4 – 2023-12-07

# **Data Access Guide**

# Content

<b>1</b>	<b>What's new.</b>	<b>12</b>
<b>2</b>	<b>Introduction to the Data Access Guide.</b>	<b>13</b>
2.1	About This Guide.	13
2.2	Audience.	13
2.3	Key Tasks.	13
2.4	Conventions in This Guide.	14
<b>3</b>	<b>Introduction to Data Access.</b>	<b>15</b>
3.1	About Connection Server.	15
3.2	Components of a Connection.	15
	System Architecture.	16
	Data Access Drivers.	16
3.3	Data Access Configuration Files.	17
	About the cs.cfg Global Configuration File.	17
	About the Driver Configuration Files.	18
	About the OlapClient.cfg Configuration File.	19
3.4	Deployment Mode.	19
3.5	Connectivity Services.	20
3.6	OLAP Connections.	21
3.7	Enabling Data Federator SSL mode for Connection Server.	21
<b>4</b>	<b>Learning Data Access Specifics.</b>	<b>23</b>
4.1	64-bit Operating System Support.	23
	64-bit UNIX Support.	23
	Installation of ODBC Drivers.	23
4.2	Single Sign-On Support.	24
4.3	Stored Procedures.	26
	Supported Database Capabilities.	26
	Oracle Stored Procedures.	27
	To Create a Cursor Inside a Package.	27
	To Create an Oracle Stored Procedure.	27
	SAP HANA Stored Procedures.	28
	Teradata Macros.	28
4.4	Connection Pools.	29
	About Connections of the Pool.	30
	Connection Pool Mode.	30
	Checking Middleware Connection Pooling.	31

4.5	Load Balancing. . . . .	31
	Finding the Best Server. . . . .	31
	Load Balancing Logic. . . . .	32
	Backward Compatibility. . . . .	32
4.6	Activity in CA Wily Introscope Workstation. . . . .	33
<b>5</b>	<b>Creating a Connection. . . . .</b>	<b>34</b>
5.1	Connection Requirements. . . . .	34
5.2	Connection Credentials. . . . .	34
5.3	Checking Connection Configuration with the <code>cscheck</code> Tool. . . . .	35
	Displaying Help on the <code>cscheck</code> Tool. . . . .	36
	To Run the <code>cscheck</code> Tool. . . . .	36
	Check Tool—Function Overview. . . . .	37
	Check Tool— <code>list</code> . . . . .	38
	Check Tool— <code>driverssearch</code> . . . . .	39
	Check Tool— <code>find</code> . . . . .	39
	Check Tool— <code>middleware</code> . . . . .	41
	Check Tool— <code>accessdriver</code> . . . . .	42
	Check Tool— <code>connectivity</code> . . . . .	43
	Check Tool— <code>ping</code> . . . . .	44
	Check Tool—CMS Information. . . . .	46
5.4	Creating JDBC Connections. . . . .	47
	To Create a JDBC Connection with Extensions. . . . .	48
	To Create a Generic JDBC Connection. . . . .	49
	JAR File Location Reference. . . . .	49
	To Find the Version of a JDBC Driver. . . . .	53
5.5	Creating JavaBean Connections. . . . .	53
	JavaBean sample. . . . .	54
5.6	Creating ODBC Connections. . . . .	55
	To Create a Generic ODBC3 Connection. . . . .	56
5.7	To Add a New Driver After a Patch Installation. . . . .	58
5.8	To Set the Locale in a Multiple Data Sources Workflow. . . . .	58
<b>6</b>	<b>Data Access Driver Reference. . . . .</b>	<b>60</b>
6.1	Data Access Drivers. . . . .	60
6.2	CSV OpenDriver. . . . .	60
	CSV OpenDriver Capabilities. . . . .	61
	CSV OpenDriver - Table Mapping. . . . .	61
	CSV File Location. . . . .	63
	CSV Schema Detection. . . . .	63
6.3	OData Driver. . . . .	65
	OData Driver Capabilities. . . . .	66

	OData Service Location. . . . .	67
	OData Service Example. . . . .	67
	OData Driver - Mapping Namespace, Owner and Qualifier. . . . .	68
	OData Driver - Mapping Tables. . . . .	69
	OData Driver - Mapping Columns. . . . .	70
	OData Driver - Mapping Keys. . . . .	70
	OData Driver - Mapping Documentation Elements. . . . .	72
	OData Driver - Mapping Entities of Derived Types. . . . .	73
	Monitoring the OData Driver Performance. . . . .	74
	OData Driver - Nontrivial Behaviors and Restrictions. . . . .	76
	OData Driver - Configuring Column Maximum Size. . . . .	78
	Authenticating OData Sources. . . . .	78
	Tracing the OData Driver Activity. . . . .	79
6.4	SAP ERP Driver. . . . .	79
	SAP ERP Driver Capabilities. . . . .	80
	SAP ERP Driver - Access to InfoSets and SAP Queries. . . . .	80
	SAP ERP Driver - Access to ABAP Functions. . . . .	82
	SAP ERP Driver Restrictions. . . . .	85
6.5	XML Driver. . . . .	85
	XML Driver Capabilities. . . . .	86
	XML File Location. . . . .	86
	XML Document and Schema Example. . . . .	87
	XML Driver - Mapping Multiple Files. . . . .	89
	XML Driver - Mapping Tables. . . . .	89
	XML Driver - Mapping Columns. . . . .	90
	XML Driver - Mapping Primary and Foreign Keys. . . . .	92
	XML Driver - Mapping Mixed Elements. . . . .	94
	XML Driver - Mapping Recursive Elements. . . . .	94
	XML Driver - Mapping any and anyAttribute. . . . .	95
	XML Driver - Mapping anyType and simpleType. . . . .	96
	XML Driver - Configuring Column Maximum Size. . . . .	98
6.6	Web Service Driver. . . . .	98
	Web Service Driver Capabilities. . . . .	99
	Web Service Location. . . . .	99
	Web Service Definition Example. . . . .	100
	Mapping Rules for Web Services. . . . .	102
	Web Service Driver - Configuring Column Maximum Size. . . . .	105
6.7	Local Disk Used as a Cache for Sorting Operations. . . . .	106
6.8	For OData and Web Services with One-way Authentication. . . . .	106
<b>7</b>	<b>Connection Reference. . . . .</b>	<b>108</b>
7.1	Amazon Athena. . . . .	108

7.2	Amazon Aurora. . . . .	109
7.3	Amazon Relational Database Service (RDS). . . . .	109
7.4	AWS (Amazon Web Service) Connections. . . . .	109
	To Create Simba JDBC Connection to Amazon RedShift. . . . .	110
	To Create Simba ODBC Connection to Amazon RedShift. . . . .	110
7.5	Cloudera Data Platform. . . . .	111
7.6	Databricks. . . . .	111
7.7	Denodo. . . . .	111
7.8	Google BigQuery Connections. . . . .	112
	Google BigQuery jars and drivers. . . . .	113
	Getting the BigQuery key file. . . . .	115
	Creating the connection to the Google BigQuery Service. . . . .	115
	Creating a JDBC Connection for Google BigQuery. . . . .	116
	Creating an ODBC Connection for Google BigQuery. . . . .	116
7.9	Google Cloud SQL. . . . .	117
7.10	HIVE, Impala and Spark Connections. . . . .	117
	Single Sign-On(SSO) to Windows AD with Kerberos Support. . . . .	117
	To Create JDBC Connection to Apache Hadoop HIVE. . . . .	119
	To Create ODBC Connection to Apache Hadoop HIVE. . . . .	124
	To Make HIVE Connections Work After Platform Update. . . . .	125
	To Create JDBC Connection to Amazon EMR HIVE. . . . .	126
	To Create ODBC Connection to Amazon EMR HIVE. . . . .	127
	To Create JDBC Connection to Cloudera Impala. . . . .	127
	To Create ODBC Connection to Cloudera Impala. . . . .	128
	To Create JDBC Connection to Apache Spark. . . . .	129
	To Create ODBC Connection to Apache Spark. . . . .	130
	To Create JDBC Connection to Hortonworks Data Platform. . . . .	130
	To Create ODBC Connection to Hortonworks Data Platform. . . . .	131
7.11	IBM DB2 Connections - Reference Keys Mapped to Null. . . . .	131
7.12	IBM Informix Connections. . . . .	131
	To Set the JVM Timezone for IBM Informix Connections. . . . .	131
	To Set the Transaction Mode for IBM Informix Connections. . . . .	132
7.13	IBM Netezza Performance Server 11. . . . .	132
7.14	MariaDB. . . . .	133
7.15	Microsoft Analysis Services Connections. . . . .	134
7.16	Microsoft Azure SQL Database. . . . .	134
7.17	Microsoft SQL Server Connections. . . . .	135
	Synonym Support for OLE DB Connections to Microsoft SQL Server. . . . .	135
	To Set the JVM Options for Connections to Microsoft SQL Server on UNIX. . . . .	136
	To Configure SQL Server ODBC on Linux with DataDirect. . . . .	136
7.18	MongoDB 4.2 . . . . .	137

7.19	MySQL Connections - Database Privileges Needed for Some Workflows in the Information Design Tool. . . . .	138
7.20	Oracle Connections. . . . .	138
	Connections to Clusters of Oracle Servers. . . . .	138
	To Set the Oracle CURSOR_SHARING Parameter Value. . . . .	139
	Using Oracle JDBC Connections in the Information Design Tool in Norwegian Bokmål Interface Language. . . . .	139
7.21	Oracle Essbase Connections. . . . .	140
7.22	Oracle RAC Connections. . . . .	141
7.23	Oracle Cloud Connections. . . . .	142
7.24	Presto DB. . . . .	142
7.25	Salesforce.com Connections . . . . .	144
	To Configure the Environment. . . . .	144
	To Make salesforce.com Connections Work in the Information Design Tool. . . . .	144
	To Make salesforce.com Connections Work in the Universe Design Tool. . . . .	145
	To Create Simba JDBC Connection. . . . .	145
	To Create Simba ODBC Connection. . . . .	146
7.26	SAP BW Connections. . . . .	146
	Requirements for Connecting Data Federator to SAP BW. . . . .	146
	Requirements for Making SAP BW Connections Work in the Information Design Tool. . . . .	147
	Requirements for Accessing Multisource-Enabled Universes on SAP BW. . . . .	147
	BW Connections for .unv universes. . . . .	148
7.27	SAP Datasphere. . . . .	148
7.28	SAP ERP Connections - Driver Failed to Load. . . . .	149
7.29	SAP HANA Connections. . . . .	149
	Creating an SAP HANA Connection. . . . .	151
	Editing an SAP HANA Connection. . . . .	152
	Before Configuring Single Sign-On for SAP HANA Connections. . . . .	152
	To Configure Single Sign-On to SAP HANA for the Information Design Tool. . . . .	153
	To Configure Single Sign-On to SAP HANA for Web Intelligence. . . . .	154
	To Configure Single Sign-On to SAP HANA for Web Intelligence Rich Client. . . . .	155
	To Configure the Java Virtual Machine for Instrumentation with SAP HANA Connections. . . . .	155
7.30	SAP HANA Cloud 1.0. . . . .	156
7.31	SAP HANA Vora Connections. . . . .	157
	To Create JDBC Connection to SAP HANA Vora Platform. . . . .	157
	To Create ODBC Connection to SAP HANA Vora Platform. . . . .	157
7.32	SAP MaxDB Connections. . . . .	157
7.33	SAS Connections. . . . .	158
	Installing Drivers for SAS Connections. . . . .	158
7.34	Snowflake Connections. . . . .	158
7.35	SQLite. . . . .	159

7.36	Sybase SQL Anywhere Connections. . . . .	160
	To Create JDBC Connection to Sybase SQL Anywhere 16. . . . .	160
	To Create ODBC Connection to Sybase SQL Anywhere 16. . . . .	161
7.37	Teradata Connections - Mapping Teradata Database to Current Owner. . . . .	163
7.38	Trino Connections. . . . .	163
<b>8</b>	<b>Configuring Data Access Global Parameters. . . . .</b>	<b>166</b>
8.1	About Global Parameters. . . . .	166
8.2	About the cs.cfg Configuration File. . . . .	166
8.3	To View and Edit the cs.cfg File. . . . .	167
8.4	Configuring the Global Settings Parameters. . . . .	167
	Ignore Driver Load Failure. . . . .	168
	Load Drivers On Startup. . . . .	168
	Max Pool Time. . . . .	169
	Validate Configuration Files. . . . .	169
	Validate XML Streams. . . . .	170
	JVM Settings. . . . .	170
8.5	Setting the Deployment Mode. . . . .	171
8.6	Configuring the Deployment Mode. . . . .	172
8.7	Configuring the Drivers to Load. . . . .	172
	Setting One Connectivity per Machine. . . . .	173
8.8	Configuring the CORBA Access Protocols. . . . .	173
8.9	Activating Logs and Traces of Connection Server and Drivers. . . . .	173
	About the _trace.ini Configuration File. . . . .	174
	Activating Logs and Traces in the cs.cfg File. . . . .	177
	To activate Logs and Traces in Library Mode. . . . .	177
	To activate Logs and Traces in Server Mode. . . . .	178
	Reading Logs and Traces. . . . .	178
8.10	Activating Logs and Traces for the OLAP Client. . . . .	180
	Example of Log. . . . .	180
<b>9</b>	<b>Configuring Data Access Driver Parameters. . . . .</b>	<b>182</b>
9.1	Configuring Driver Parameters. . . . .	182
	Data Access Configuration Files. . . . .	182
	Installed SBO Files. . . . .	183
	To View and Edit SBO Files. . . . .	186
	To Customize SBO Files. . . . .	187
	To Check Connections Dynamically. . . . .	187
	JDBC Driver Properties. . . . .	188
9.2	About DataDirect ODBC Drivers. . . . .	189
	To Enable the Use of DataDirect Branded Drivers. . . . .	189
<b>10</b>	<b>SBO Parameter Reference. . . . .</b>	<b>191</b>

10.1	SBO File Structure. ....	191
10.2	SBO Parameter Description. ....	191
10.3	Common SBO Parameters. ....	192
	Array Bind Available. ....	193
	Array Fetch Available. ....	193
	Array Fetch Size. ....	193
	BigDecimal Max Display Size. ....	194
	Binary Max Length. ....	195
	Bucket Split Size. ....	195
	Catalog Separator. ....	196
	CharSet Table. ....	197
	Description File. ....	197
	Dictionary Transaction Mode. ....	197
	Driver Capabilities. ....	198
	Driver Name. ....	198
	Escape Character. ....	199
	Extensions. ....	199
	Family. ....	199
	Force Execute. ....	200
	Identifier Case. ....	200
	Identifier Quote String. ....	200
	Include Synonyms. ....	201
	Integer Max Length. ....	201
	Max Rows Available. ....	202
	Native Int64 Available. ....	202
	Optimize Execute. ....	202
	Owners Available. ....	203
	Qualifiers Available. ....	203
	Query TimeOut Available. ....	203
	Quote Identifiers. ....	204
	Skip SAML SSO. ....	204
	SQL External File. ....	205
	SQL Parameter File. ....	205
	SSO Available. ....	205
	Strategies File. ....	206
	String Max Length. ....	206
	Temp Data Dir. ....	207
	Transactional Available. ....	207
	Type. ....	208
	Unicode. ....	208
	URL Format. ....	209




	XML Max Size.....	209
10.4	JCO SBO Parameters.....	210
	ERP Max Rows.....	210
10.5	JDBC SBO Parameters.....	210
	Default Col Size if Not Specified.....	211
	Escape Character Available.....	211
	ForeignKeys Available.....	211
	JDBC Class.....	211
	PrimaryKey Available.....	212
	PVL Available.....	212
	JDBC ResultSet Type.....	212
	JDBC ResultSet Concurrency.....	213
10.6	OData SBO Parameters.....	214
	Enforce Max Protocol Version.....	214
10.7	ODBC SBO Parameters.....	214
	CharSet.....	215
	Connection Status Available.....	215
	Cost Estimate Available.....	215
	Empty String.....	216
	ODBC Cursors.....	216
	SQLDescribeParam Available.....	216
	SQLMoreResults Available.....	217
	Use DataDirect OEM Driver.....	217
	V5toV6DriverName.....	217
10.8	OLE DB SBO Parameters.....	218
	Enumerator CLSID.....	218
	Provider CLSID.....	218
10.9	Sybase SBO Parameters.....	219
	Driver Behavior.....	219
	Password Encryption.....	219
	Quoted Identifier.....	219
	Recover Errors.....	220
	Text Size.....	220
10.10	Teradata SBO Parameters.....	221
	Replace Current Owner With Database.....	221
<b>11</b>	<b>Configuring Database Capability Parameters.....</b>	<b>222</b>
11.1	About Database Capability Parameters.....	222
11.2	About PRM Files.....	222
	PRM Parameter File Structure.....	223
11.3	To View and Edit PRM Files.....	224

11.4	To Verify and Add Analytic Function Support to PRM Files. . . . .	224
11.5	To View and Edit a Function Help Text File. . . . .	225
11.6	To Edit the Help Text for a PRM Function. . . . .	225
<b>12</b>	<b>PRM Parameter Reference. . . . .</b>	<b>227</b>
12.1	PRM file Configuration Reference. . . . .	227
	ANALYTIC_CLAUSE. . . . .	227
	ANALYTIC_FUNCTIONS. . . . .	228
	CALCULATION_FUNCTION. . . . .	228
	CONSTANT_SAMPLING_SUPPORTED. . . . .	228
	DISTINCT. . . . .	229
	EXT_JOIN. . . . .	229
	FULL_EXT_JOIN. . . . .	230
	GROUP_BY. . . . .	230
	GROUP_BY_SUPPORTS_COLUMN_INDEX. . . . .	230
	GROUP_BY_SUPPORTS_COMPLEX. . . . .	230
	GROUP_BY_SUPPORTS_CONSTANT. . . . .	231
	HAVING. . . . .	231
	INTERSECT. . . . .	232
	INTERSECT_ALL. . . . .	232
	INTERSECT_IN_SUBQUERY. . . . .	232
	JOIN. . . . .	233
	LEFT_EXT_JOIN. . . . .	233
	LEFT_OUTER. . . . .	233
	LIKE_SUPPORTS_ESCAPE_CLAUSE. . . . .	234
	MINUS. . . . .	234
	MINUS_ALL. . . . .	235
	MINUS_IN_SUBQUERY. . . . .	235
	ORDER_BY. . . . .	235
	ORDER_BY_REQUIRES_SELECT. . . . .	236
	ORDER_BY_SUPPORTS_COLUMN_INDEX. . . . .	236
	PERCENT_RANK_SUPPORTED. . . . .	236
	RANK_SUPPORTED. . . . .	237
	RIGHT_EXT_JOIN. . . . .	237
	RIGHT_OUTER. . . . .	237
	SEED_SAMPLING_SUPPORTED. . . . .	238
	SELECT_SUPPORTS_NULL. . . . .	238
	SUBQUERY_IN_FROM. . . . .	239
	SUBQUERY_IN_IN. . . . .	239
	SUBQUERY_IN_WHERE. . . . .	239
	TECHNICAL_COLUMN_NAME_PATTERN. . . . .	239

	UNION. . . . .	240
	UNION_ALL. . . . .	240
	UNION_IN_SUBQUERY. . . . .	240
<b>13</b>	<b>Data Type Conversion Reference. . . . .</b>	<b>242</b>
13.1	Data Type Conversion. . . . .	242
	CSV File Data Types. . . . .	243
	JDBC Data Types. . . . .	244
	ODBC Data Types. . . . .	246
	OData Data Types. . . . .	248
	OLE DB Data Types. . . . .	249
	Oracle OCI Data Types. . . . .	250
	SAP ERP Data Types. . . . .	251
	SAP HANA Data Types. . . . .	252
	Sybase CTL Data Types. . . . .	253
	XML Data Types. . . . .	254
13.2	Large Variable Length Data Restriction. . . . .	255
13.3	Data Type Mapping for Multisource-Enabled Universes. . . . .	256

# 1 What's new

The following table provides an overview of the most important document changes for the version 4.3 SP4 release.

Version	Date	Database Support
SAP BusinessObjects Business Intelligence platform 4.3 SP4	December 2024	<div>New database support:<ul style="list-style-type: none"><li>• Google Cloud SQL</li><li>• Databricks</li></ul><div> <b>Note</b> Multi-source universes are not supported for these databases.</div></div>

## 2 Introduction to the Data Access Guide

### 2.1 About This Guide

The Data Access Guide helps you learn about the Connection Server functionality and how to configure Connection Server to enable connections of SAP BusinessObjects Business Intelligence Platform 4.3 to production databases. The Platform 4.3 Connection Server drivers support only 64-bit applications.

The Data Access Guide provides the following information:

- Learning Connection Server fundamentals
- Learning about data access drivers for CSV, OData, SAP ERP, and XML data sources
- Creating a JDBC, ODBC, or JavaBean connection
- Configuring data access parameters

#### Note

It also provides information for configuring some relational connections that rely on the data federation service, and OLAP connections.

### 2.2 Audience

The Data Access Guide is intended for the following audience:

- SAP BusinessObjects application users in charge of creating connections to data sources
- System administrators who are responsible for configuring, managing, and maintaining a BI platform installation

### 2.3 Key Tasks

The Data Access Guide provides you with key information for managing configuration parameters and establishing connections. For each of these following tasks, refer to the appropriate section below:

- How to set the server working mode?
- How to choose the drivers you want to load?
- How to configure data access drivers?
- How to check connection configuration?
- How to create JDBC connections?

- How to create SAP HANA connections?

#### Note

For administrative tasks such as starting and stopping Connection Server, managing properties and metrics, refer to the *SAP BusinessObjects Business Intelligence Platform Administrator Guide*.

## Related Information

[Configuring the Deployment Mode \[page 172\]](#)

[Configuring the Drivers to Load \[page 172\]](#)

[To View and Edit SBO Files \[page 186\]](#)

[To Run the cscheck Tool \[page 36\]](#)

[Creating JDBC Connections \[page 47\]](#)

[SAP HANA Connections \[page 149\]](#)

## 2.4 Conventions in This Guide

In this guide, the variable `<connectionserver-install-dir>` is the installation root path for the data access files used by SAP BusinessObjects client tools. On Microsoft Windows, the default `<connectionserver-install-dir>` stands for `C:\Program Files\SAP Business Objects\SAP BusinessObjects Enterprise XI 4.0\dataAccess`.

The variable `<bip-install-dir>` is the installation root path of the BI platform or Client Tools. On Microsoft Windows (64-bit), it stands for the `C:\Program Files (x86)\SAP Business Objects\SAP BusinessObjects Enterprise XI 4.0` directory.

#### Caution

In the data access configuration files, use the escape sign `\` with the backslash `\` in file paths if you deploy the BI platform on Microsoft Windows.

## 3 Introduction to Data Access

### 3.1 About Connection Server

Connection Server is the data access software that manages the connection between an SAP BusinessObjects application and a data source.

Connection Server allows applications such as Universe Design Tool, Information Design Tool and SAP BusinessObjects Web Intelligence to connect to and run queries against a data source.

Connection Server does not have a user interface. You create and administer connections from the user interface of these applications, or by editing Connection Server configuration files.

- **Creating connections**  
You create connections using the connection wizard of the BI Platform Client Tools.

#### Note

The connection wizard of the Universe Design Tool is the New Connection wizard. In the Information Design Tool, it can be either the New Relational Connection wizard or the New OLAP Connection wizard. See the application user guides to learn how to use the connection wizard.

- **Optimizing data access**  
You can optimize the way that data is passed through Connection Server by modifying the data access configuration files. These files are in XML format, and are installed with Connection Server. You can set parameter values to apply to a specific data access driver, or to all installed data access drivers.

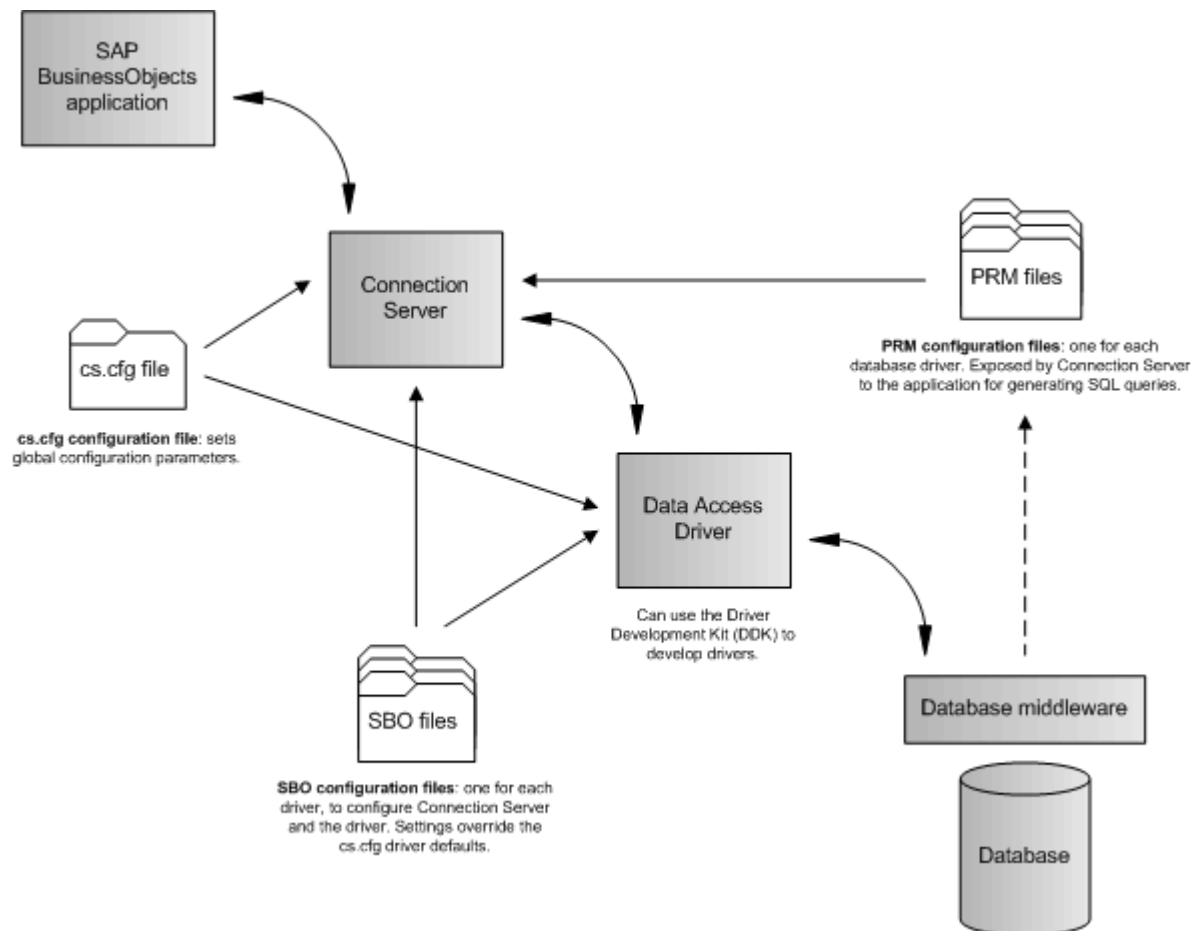
### 3.2 Components of a Connection

A data access connection consists of the following components:

- Connection Server is the software that manages the connection between the application and the data source. For example, Connection Server handles requests for data from the application.
- A data access driver is the database-specific software component that manages the connection between Connection Server and the database middleware.
- Configuration files define parameters to configure the connection between the following systems:
  - The application and Connection Server
  - The application and the data access driver
  - Connection Server and the data access driver

## 3.2.1 System Architecture

The diagram below details where Connection Server and data access drivers fit into an SAP BusinessObjects configuration.



## 3.2.2 Data Access Drivers

Data access drivers provide the connection between Connection Server and a data source. A database requires a data access driver to allow access by the SAP BusinessObjects application.

SAP BusinessObjects applications include data access drivers that you can use to configure connections to your databases. The data access drivers that are included can depend on your license.

Before you can create a connection to a database for which you do not have a driver, you need to obtain the required drivers. The following options are available for obtaining a driver:

- Contact your SAP representative to determine if there is a driver available, and if you are licensed to use it.
- Use the Driver Development Kit (DDK) to develop a driver to use. Contact your SAP representative for details.



When you create a new connection, you select the appropriate data access driver for the target data source. For example, if you access an Oracle 11 database, you must install the appropriate middleware (Oracle 11 Client), then the SAP BusinessObjects Oracle data access driver.

#### Caution

Excel bean (`bean_excel.jar`) and CSV (`dbd_open_sample.jar`) data access drivers are driver samples. You should not use them as is, but as starting points for developing more complex drivers by using the DDK.

For an up-to-date list of supported data access drivers, check the SAP Service Marketplace at <https://support.sap.com/pam>, or contact your SAP representative.

For more information about the DDK, refer to the *Data Access Driver Java SDK Developer Guide* at <http://bic.sdn.sap.com>.

## 3.3 Data Access Configuration Files

Data access configuration files come with installation of the BI platform. They can be divided into the following levels:

- Global level  
The `cs.cfg` configuration file applies to all connections.
- Driver level  
The SBO configuration files apply to specific drivers.
- OLAP connections  
The `olapClient.cfg` configuration file applies to OLAP connections for .unx universes.

In addition to the configuration files that control a connection, each data access driver has an associated PRM configuration file. These files control the way in which an application generates SQL depending on the database software capabilities. They are used by applications such as the information design tool.

### Related Information

[OLAP Connections \[page 21\]](#)

[About the cs.cfg Configuration File \[page 166\]](#)

[Data Access Configuration Files \[page 182\]](#)

### 3.3.1 About the cs.cfg Global Configuration File

The `cs.cfg` global configuration file used by all data access drivers is installed in the following location:

- `<connectionserver-install-dir>\connectionServer`

The `cs.cfg` file contains parameters that apply to all installed data access drivers.

## Related Information

[About Global Parameters \[page 166\]](#)

### 3.3.2 About the Driver Configuration Files


The configuration files used by data access drivers are installed in the following path:

- On a Microsoft Windows system:  
`<connectionserver-install-dir>\connectionServer\<RDBMS>`
- On a UNIX system:  
`<connectionserver-install-dir>/connectionServer/<RDBMS>`

where `<RDBMS>` is either the name of the network layer or the database middleware that uses the configuration file.

The files listed below have parameters that apply to installed data access drivers.

Driver Specific File	Can Edit?	Description	Example
<code>&lt;driver&gt;.sbo</code>	Yes	Each data access driver has a SBO file. Defines the specific connectivity configuration for each driver and target database.	<code>oracle.sbo</code>
<code>&lt;driver&gt;.prm</code>	Yes	Each data access driver has a PRM file. Defines parameters that affect the way that an application generates SQL.	<code>oracle.prm</code>
<code>&lt;driver&gt;&lt;language&gt;.cod</code>	No	Each data access driver has a COD file. Stores information related to connection definitions. Defines the fields that appear when you create a new connection.	<code>oracleen.cod</code>

 **Note**  
Do not modify these files.

Driver Specific File	Can Edit?	Description	Example
<code>&lt;driver&gt;.rss</code>	No	Each data access driver has a RSS file. Stores predefined SQL sentences, which are used by Connection Server.	<code>oracle.rss</code>
<code>&lt;driver&gt;.stg</code>	No	The data access driver can have a strategy file. See SBO file parameter reference for more information.	<code>oracle.stg</code>

## Related Information

[SBO Parameter Description \[page 191\]](#)

[PRM file Configuration Reference \[page 227\]](#)

[About Database Capability Parameters \[page 222\]](#)

### 3.3.3 About the OlapClient.cfg Configuration File

On Microsoft Windows, the `OlapClient.cfg` file is stored in the following location:

- `<bip-install-dir>\win32_x86`

In the `OlapClient.cfg` file, you can configure parameters of the `OlapClient` section only.

## Related Information

[Activating Logs and Traces for the OLAP Client \[page 180\]](#)

## 3.4 Deployment Mode

Connection Server can run in the following deployment modes:

- Library mode (in-proc)  
Connection Server is included in the client process. Most SAP BusinessObjects applications use Connection Server in library mode.
- Server mode  
Connection Server is a CORBA server and is accessed remotely. Connection Server serves the CORBA and HTTP clients to address the 2-tier and web tier deployment modes respectively.

See the *SAP BusinessObjects Business Intelligence Platform Administrator Guide* for more information on the deployment scenarios.

## Related Information

[Setting the Deployment Mode \[page 171\]](#)

[Configuring the Deployment Mode \[page 172\]](#)

[Configuring the Drivers to Load \[page 172\]](#)

## 3.5 Connectivity Services

Three Connection Server server instances come with the default BI Platform installation. They are grouped under [Connectivity Services](#) in the Central Management Console (CMC).

Connection Server servers host Native Connectivity (64-bit) Services.

The Adaptive Processing Server hosts the Adaptive Connectivity Service, which allows user applications to access Java-based data sources remotely.

When starting up, the Connectivity Services advertise the list of the data sources they support on the BI Platform cluster, so that SAP BusinessObjects applications are able to look up and use the appropriate server instance. Applications look for data sources through Connection Server first in library mode, then in the server mode.

### Connection vs. Service

When Connection Server is used in library mode, the list of available data sources is defined by the data access drivers and middleware installed on the local machine. When Connection Server is used in server mode, the list of data sources also includes those supported by each server instance that runs on the back-end system of the BI Platform.

Each server instance supports a subset of the data sources supported by the Data Access layer. The subset depends on the following parameters:

- The CS server implementation technology (C++ or Java)
- The host operating system (UNIX flavors or Microsoft Windows)
- The drivers you can select when installing the BI Platform
- The active data sources you can select for each server instance in the CMC

The following table describes which Connectivity Service each kind of connection can use.

Connection	Connectivity Service	Description
All 64-bit native data sources	Native Connectivity Service	Support of ODBC, OLE DB, OCI, and so on.
Java-based data sources	Adaptive Connectivity Service	Support of all Java-based middleware. This service is a Java implementation based on the Platform Java Service (PJS) framework.

## Example

- A 64-bit native data source is Oracle database through Oracle OCI.
- A Java-based data source is Microsoft SQL Server 2008 R2 through JDBC.

## 3.6 OLAP Connections

The Data Access layer allows the BI Platform to connect to OLAP data sources.

The .unx universes based on OLAP data sources use connections managed by the OLAP Client component of the BI Platform.

For the list of the supported OLAP data sources, see the SAP Business Objects BI Platform 4.3 Supported Platforms (*Product Availability Matrix*) at <https://support.sap.com/pam>. For creating OLAP connections, see the *Information Design Tool User Guide*.

## Related Information

[BW Connections for .unv universes \[page 148\]](#)

## 3.7 Enabling Data Federator SSL mode for Connection Server

How to enable Data Federator connectivity for SSL mode for Connection Server.

In order for SSL mode to work for the Data Federator connectivity, edit the Connection Server classpath registry key (Connection Server Jars). The jars can be found here:

### Sample Code

```
:\\Program Files (x86)\\SAP BusinessObjects\\SAP BusinessObjects
Enterprise XI 4.0\\java\\lib\\freessl201.jar;C:\\Program Files (x86)\\
```

```

\SAP BusinessObjects\\SAP BusinessObjects Enterprise XI 4.0\java\
\lib\certjFIPS.jar;C:\\Program Files (x86)\\SAP BusinessObjects\\SAP
BusinessObjects Enterprise XI 4.0\java\lib\ssljFIPS.jar

```

Add the following arguments to the <JavaVM> declaration:

#### Sample Code

```

<Option>-Dbusinessobjects.orb.oci.protocol=ssl</Option>
    <Option>-DcertDir=C:\SSL</Option>
    <Option>-DtrustedCert=cacert.der</Option>
    <Option>-DsslCert=servercert.der</Option>
    <Option>-DsslKey=server.key</Option>
    <Option>-Dpassphrase=passphrase.txt</Option>

```

Example before adding the arguments:

#### Sample Code

```

<JavaVM>
    <!-- The default JVM configuration can be overridden here -->
    <!-- Use an absolute path for the JVM -->
    <!--
    <LibraryName JNIVersion="JNI_VERSION_1_4">ABSOLUTE_PATH/jvm.dll</
LibraryName>
    -->
    <Options>
        <Option Processor="64">-Xmx2048m</Option>
                                <Option Processor="32">-
Xmx512m</Option>
        <Option>-Xrs</Option>
    </Options>
</JavaVM>

```

<JavaVM> with the arguments added:

#### Sample Code

```

<JavaVM>
    <!-- The default JVM configuration can be overridden here -->
    <!-- Use an absolute path for the JVM -->
    <!--
    <LibraryName JNIVersion="JNI_VERSION_1_4">ABSOLUTE_PATH/jvm.dll</
LibraryName>
    -->
    <Options>
        <Option Processor="64">-Xmx2048m</Option>
                                <Option Processor="32">-
Xmx512m</Option>
        <Option>-Xrs</Option>
        <Option>-Dbusinessobjects.orb.oci.protocol=ssl</Option>
        <Option>-DcertDir=C:\SSL</Option>
        <Option>-DtrustedCert=cacert.der</Option>
        <Option>-DsslCert=servercert.der</Option>
        <Option>-DsslKey=server.key</Option>
        <Option>-Dpassphrase=passphrase.txt</Option>
    </Options>
</JavaVM>

```

## 4 Learning Data Access Specifics

### 4.1 64-bit Operating System Support

The SAP BusinessObjects BI platform runs on 64-bit versions of Microsoft Windows and UNIX flavors.

The Data Access layer then provides data access drivers for the 64-bit environment.

The following sections give details on what this implies for database middleware support in 64-bit environments.

For the complete list of data sources supported on 64-bit operating systems, see the *Product Availability Matrix*.

#### 4.1.1 64-bit UNIX Support

Connection Server comes with the BI Platform and then supports installation on 64-bit UNIX environments as in-proc or as a remote server.

##### Caution

You must make sure you install 64-bit middleware to run database connections through Connection Server.

Some vendors do not provide 64-bit middleware for the following databases and network layers on UNIX. They are only available on Microsoft Windows:

- DB2 UDB for iSeries V5 with Client Access AS400
- DB2 UDB for iSeries V6 with Client Access AS400
- DB2 for i v6.1 with Client Access AS400
- DB2 for i v7.1 with Client Access AS400
- Generic data source through OLE DB
- Microsoft Access 2010 and 2013 through ODBC
- Microsoft Excel 2010 and 2013 through ODBC
- Microsoft SQL Server 2008, 2008 R2 and 2012 through OLE DB

#### 4.1.2 Installation of ODBC Drivers

For the information design tool, the ODBC data sources that need to be used by the server components are defined using the ODBC Data Source Administrator that can be found at the following location on the physical machine where the server components are installed: `C:\Windows\System32\odbcad32.exe`

### Note

If the information design tool or universe design tool is using ODBC DSN for universe data sources, DSN with the same names should be created on the physical machine where server components are installed for the SAP BusinessObjects reporting applications that use the published universes.

For information, refer to *SAP BusinessObjects Business Intelligence Platform Installation Guide*.

## Using DSN connections

If the information design tool or universe design tool is using ODBC DSN for universe data sources, DSN with the same names should be created on the physical machine where server components are installed for the SAP BusinessObjects reporting applications that use the published universes.

## Using DSN-less connections

If the information design tool or universe design tool is using ODBC DSN-less connection, declare the driver and connection string in the connection wizard, and the connection details are stored and managed centrally.

The following databases support DSN-less connection:

- Microsoft SQL Server
- SAP HANA
- Microsoft Excel
- Microsoft Access
- Teradata
- Oracle MySQL
- PostgreSQL
- Oracle Database
- IBM Informix
- Snowflake

## 4.2 Single Sign-On Support

The BI platform provides single sign-on (SSO) authentication when installed on the following platforms and with the following connectivities:

Data Source	Description
Microsoft Analysis Services on Microsoft Windows	Single sign-on to BI platform is provided by Windows AD with Kerberos.



Data Source	Description
Microsoft SQL Server through ODBC or OLE DB on Microsoft Windows	Single sign-on to BI platform is provided by Windows AD with Kerberos.
Oracle through OCI on Microsoft Windows	Single sign-on to BI platform is provided by LDAP.
SAP BW through OLAP BAPI on all platforms	You enable SSO by installing and configuring SAP Authentication. Users log into the BI platform from an SAP BusinessObjects application by using their SAP BW credentials.
SAP ERP systems through SAP Java Connectivity (JCo) 3.x on all platforms	You enable SSO by installing and configuring SAP Authentication. Users log into the BI platform from an SAP BusinessObjects application by using their SAP ERP credentials.
SAP HANA database 1.0 SPS 08 through ODBC, JDBC on all platforms and OLAP on Microsoft Windows, Linux and AIX	The SSO provided is SSO to database and uses either Windows AD with Kerberos (in ODBC, JDBC and OLAP) or SAML protocol (in JDBC and OLAP). Users log into the BI platform from an SAP BusinessObjects application by using their Windows AD credentials.
Sybase IQ database through ODBC on Microsoft Windows	Single sign-on to BI platform is provided by Windows AD with Kerberos.
Teradata 14 and Teradata 15 through ODBC on Microsoft Windows	Single sign-on to BI platform is provided by Windows AD with Kerberos.
Apache Hadoop HIVE 0.13 and above (Hive2) and Apache Spark 1.0 through Simba ODBC on Microsoft Windows	Single sign-on to BI platform is provided by Windows AD with Kerberos.
Cloudera Impala 1.0 and Cloudera Impala 1.0 through Simba ODBC on Microsoft Windows	Single sign-on to BI platform is provided by Windows AD with Kerberos.
Amazon EMR Hive 0.13 (Hive2) through Simba ODBC on Microsoft Windows	Single sign-on to BI platform is provided by Windows AD with Kerberos.

For more information about SSO, refer to the *SAP BusinessObjects Business Intelligence platform Administrator Guide*.

## Related Information

[SAP ERP Driver \[page 79\]](#)

[SAP HANA Connections \[page 149\]](#)

## 4.3 Stored Procedures

Connection Server is able to manage data from data sources that result either from SQL query or stored procedure execution.

Stored procedures are SQL scripts that are stored as executable code in an RDBMS. They can receive arguments and return data. By nature, they also write data to the database.

### ⚠ Caution

Stored Procedures are a powerful feature, but they must be designed and used carefully because any stored procedures will be called concurrently where they are used, giving unpredictable results.

For example, if two reports that use the same stored procedure are refreshed at the same time, there is a risk of data corruption.

Stored procedures for the following databases and network layers are supported in the BI platform:

- DB2 UDB and iSeries through CLI driver
- Sybase Adaptive Server through CTLIB
- Javabeam
- DB2 UDB, Informix, Microsoft SQL Server, MySQL 5, Oracle, SAP HANA and Sybase, all through JDBC
- Oracle through OCI
- DB2 iSeries, Informix, Microsoft SQL Server, SAP HANA, Sybase ASIQ, Sybase SQL Anywhere, and Teradata (only macros) all through ODBC
- Microsoft SQL Server through OLE DB

### 4.3.1 Supported Database Capabilities

Connection Server only supports stored procedures that return data as result sets, that is, tables. This means that the stored procedure cannot return integers, strings, or cursors and must always contain `SELECT` statements. Plus, supported stored procedures must not contain `OUT` or `IN/OUT` parameters, but only `IN` parameters. In addition, `COMPUTE`, `PRINT`, `OUTPUT` or `STATUS` statements contained in stored procedures are not executed.

### ⚠ Caution

These restrictions are not valid for Oracle stored procedures. Refer to next section for learning about supported Oracle stored procedures.

Connection Server supports Oracle stored procedures inside a package. The package name is returned as the catalog name. This behavior is valid for Oracle OCI and JDBC network layers.

For more information about using stored procedures, refer to the *Universe Design Tool User Guide*.

## 4.3.2 Oracle Stored Procedures

The supported Oracle stored procedures are the following:

- Any PL/SQL procedure that returns result sets through a REF Cursor
- PL/SQL stored procedures that have one IN/OUT REF cursor variable parameter and no OUT parameter

### Note

The other IN/OUT cursor parameters of the procedure are ignored.

The unsupported Oracle stored procedures are the following:

- Any PL/SQL procedure that does not return result sets through a REF CURSOR parameter
- Any PL/SQL procedures having at least one OUT parameter
- Any PL/SQL function
- Any PL/SQL procedure having one IN/OUT parameter of a type different than a REF CURSOR, for example, VARRAY
- Any PL/SQL Table function

To access Oracle stored procedures, you must do a number of tasks at the server end to allow the BI platform to connect to a stored procedure. This is explained in the next sections.

## 4.3.3 To Create a Cursor Inside a Package

In Oracle databases, a package is a database object that contains related PL/SQL types, objects, and subprograms. You must first create a cursor inside a package before creating an Oracle stored procedure using the defined cursor.

In the Oracle database administration system, use the following statement:

```
CREATE or REPLACE PACKAGE catalog_data AS
  TYPE CatCurTyp IS REF CURSOR RETURN
    all_objects%ROWTYPE;
END catalog_data;
```

The BI platform does not support packaged stored procedures, only standalone.

## 4.3.4 To Create an Oracle Stored Procedure

In the following procedure, you use `catcurtyp` cursor that you previously created in the package, and `catalog_data.catcurtyp`.

Do one of the following:

- a. Write the following statement:

```
CREATE or REPLACE PROCEDURE get_allobjects(cat_cv IN OUT
  catalog_data.catcurtyp) AS
BEGIN
```

```
OPEN cat_cv FOR SELECT * FROM all_objects;
END;
```

- b. Write the following statement with several parameters:

```
CREATE or REPLACE PROCEDURE get_ownerobjects(owner_name IN
varchar2, cat_cv IN OUT catalog_data.catcurtyp) AS
BEGIN
  OPEN cat_cv FOR SELECT * FROM all_objects WHERE
  owner=owner_name;
END;
```

See your Oracle documentation for more information on how to create packages and stored procedures.

## 4.3.5 SAP HANA Stored Procedures

Connection Server supports SAP HANA stored procedures through JDBC and ODBC.

You create SAP HANA stored procedures with the following syntax:

```
CREATE PROCEDURE <procedure_name>
{LANGUAGE <lang>} {SQL SECURITY <mode>}
{READS SQL DATA {WITH RESULT VIEW <view_name>}} AS
BEGIN
  select ... from <table_name>;
END
```

LANGUAGE, SQL SECURITY and READS SQL DATA are not mandatory. The default language is SQLScript. See the *SAP HANA Database SQLScript Guide* for more information.

### Example

Simple stored procedure:

```
CREATE PROCEDURE Proc
LANGUAGE SQLSCRIPT READS SQL DATA AS
BEGIN
  select * from CUSTOMER;
END
```

Stored procedure with a parameter and a result view:

```
CREATE PROCEDURE ProcWithResultView(IN id int)
LANGUAGE SQLSCRIPT READS SQL DATA WITH RESULT VIEW ProcView AS
BEGIN
  select * from CUSTOMER where CUST_ID = :id;
END
```

## 4.3.6 Teradata Macros

Connection Server only supports Teradata macros when the connection established uses ODBC.

### ⚠ Caution

It does not support Teradata stored procedures in ODBC, because stored procedures do not return any result sets. It also does not support macros and stored procedures in JDBC.

You create Teradata macros with the following syntax:

```
create macro <macro_name> as (select * from <table_name>;);
```

See the Teradata documentation for more information.

## Example

Simple macro:

```
create macro GUEST95 as (select * from guest where TYear='FY95');
```

Macro with a parameter:

```
create macro MGUESTIN (inyear VARCHAR(12)) as (select * from GUEST where TYear=:inyear);
```

Macro with multiple result sets:

```
create macro MGUEST as
(
  select * from guest where TYear='FY95';
  select count(*) from guest;
);
```

## 4.4 Connection Pools

A driver opens a connection to the database in order to access data. The following are two methods that you can use to connect to a database:

- Each time that Connection Server requires information, the data access driver opens a connection to the database, retrieves the data, then closes the connection.
- Connection Server keep available connections open and maintain their details in a connection pool. Each time that Connection Server requires information from the data source, the data access driver checks the connection pool to see if it contains an unused, suitable connection. If an existing connection is available, the connection is used. If all connections are being used, Connection Server creates a new connection and adds it to the pool. This method uses system resources more efficiently.

### → Remember

Connection Server does not add a connection that uses single sign-on to the pool.

## 4.4.1 About Connections of the Pool

Connections that are available in the connection pool can be exclusive or shareable.

- Exclusive connections can be allocated to one user only at a time. When an exclusive connection is allocated, it is no longer available in the pool. Then it cannot be allocated to any other requesters. When the connection is no longer required, the custom driver releases the connection so that it can be reallocated.
- Shareable connections can be allocated to multiple users at a time. When a connection is allocated, the connection remains in the pool so that it is available for other requesters.

You can choose to create an exclusive or shareable connection with the [Connection Pool Mode](#) parameter of the connection wizard.

## Related Information

[Max Pool Time \[page 169\]](#)

## 4.4.2 Connection Pool Mode

Connection Pool Mode Value	Connection Pool Mode Description
<a href="#">Disconnect after each transaction</a>	Disconnects from the database after a query is completed. The next time a query is run, the connection is re-created.
<a href="#">Keep the connection active for</a>	This is the connection pooling option. If a query is completed before the time specified in <a href="#">Pool Timeout</a> (10 minutes is the default), then the connection can be re-used. All the users share the connection.
<a href="#">Keep the connection active during the whole session (local mode only)</a>	The connection is closed when the user exits the application. This option does not use the connection pooling.

## Choosing the Connection Pool Mode

The connection pool mode may depend on the availability of your machine resources.

- If the memory is low, then choose the [Disconnect after each transaction](#) option.
- If the memory is high and the performance is critical, then choose the [Keep the connection active during the whole session \(local mode only\)](#) option.
- To control the behavior more precisely, choose the [Keep the connection active for](#) option.

### 4.4.3 Checking Middleware Connection Pooling

Data source middleware often provide their own connection pool mechanism. You must make sure the middleware connection pool setting is compatible with the one set in the design tool to obtain the connection performance that you expect.

## 4.5 Load Balancing

In server mode, you can run several Connection Server instances on the BI platform. Connection Server implements a load-balancing mechanism in this deployment mode. It chooses the best server in terms of resources that can support new client requests.

Load balancing helps to address scalability issues by increasing the number of server instances on the BI platform.

#### ⚠ Caution

This load-balancing mechanism is different from the load balancing implemented by the Central Management Server.

Load balancing is performed at the following levels:

- Client proxies in a 2-tier deployment, on the client tier
- Server bridges in a web tier deployment, on the web tier

Connection Server also provides an application-level lookup mechanism, which helps it to choose the right server instance for a job. Connection Server binds the client to the appropriate server, depending on the type of data source requested by the client and on what network layer and database pair the server supports.

#### → Remember

Load balancing is performed after the lookup. It is available on all platforms.

### 4.5.1 Finding the Best Server

Connection Server scalability issues may come from the following:

- The number of opened database connections  
Issues dealing with the number of database connections are already handled by the connection pool mechanism.
- The CPU used by Connection Server  
Connection Server may use a noticeable amount of CPU when converting data or when writing and sending back big response buffers to the client. However, Connection Server is not an intensive CPU consumer.
- The number of jobs running  
The number of jobs that run on a server increases its workload.

- The amount of memory allocated by either Connection Server or the middleware it embeds  
The amount of memory used depends on the SQL queries executed. For example, a single SQL statement against a large table may have a bigger impact on scalability than a series of small SQL queries.

Connection Server implements load balancing with the help of the most relevant indicator of server workload, which is in this case the amount of allocated memory. The less memory a Connection Server server uses, the healthier it is.

#### Note

Connection Server may also use the number of jobs as health indicator in future releases.

The following formula calculates the HEALTH of the server:

```
HEALTH = (available memory / max memory) * constant
```

where:

- `max memory` is the maximum amount of allocatable memory
- `available memory` is the difference between `max memory` and the current amount of allocated memory
- `constant` is the maximum HEALTH (set to 10000 for Connection Server).

## 4.5.2 Load Balancing Logic

1. Each candidate server reports its HEALTH to the load balancer.  
A candidate server is a Connection Server server that supports the requested network layer and database pair. Assuming that all the server instances support the same set of data sources, they are all potential candidates for serving a client request.
2. The load balancer determines which server to send the client request to by identifying and ranking the healthiest servers. It then identifies the best server among those. If the set of servers only contains one server, then this is the target server.

The HEALTH is updated during the lifecycle of the server. HEALTH is recalculated when one of the following operations is performed:

- A job is created or destroyed
- A job is prepared or executed
- A data fetch operation is performed

## 4.5.3 Backward Compatibility

The load-balancing mechanism is supported on all platforms that are supported by this release. In the case of incremental deployments or limited upgrades on previous releases, backward compatibility is supported. Any server which fails to report its HEALTH to the load balancer is considered as healthy, that is, at its maximum health.



#### Note

Load balancing is also available for some platforms in some Service Packs of previous releases. Contact your SAP representative for more information.

## 4.6 Activity in CA Wily Introscope Workstation

Workflow activity involving Connection Server is traced in CA Wily Introscope workstation. Connection Server functions can be analyzed through the different views proposed by the tool, which are the following:

- Dashboard and summary view for overall information
- Trace view, where errors are highlighted and described by messages
- Tree view, where successive function calls of a specific workflow are displayed and time spent on a function is highlighted to track the time-consuming activities easily

For more information, see the *SAP BusinessObjects Business Intelligence platform Administrator Guide*.

### Related Information

[To Configure the Java Virtual Machine for Instrumentation with SAP HANA Connections \[page 155\]](#)

# 5 Creating a Connection

## 5.1 Connection Requirements

This section covers the requirements for creating a connection.

- Ensure that your platform conforms to the platforms supported for SAP connections.
- Ensure that the database middleware is installed correctly, and that you can access your database through either your computer or a server.
- Ensure that you have all the information necessary to access your database, for example the database login name and password.
- Install the SAP BusinessObjects solution that you will use, including the appropriate data access driver.
- Check that all of the services have started successfully.
- Refer to the Readme notice that comes with your SAP BusinessObjects solution to check for any configuration changes that your environment and software might require.
- Refer to the current Data Access release notice to check for any configuration changes that could affect your environment.

### Note

You can use the `cscheck` tool to check your infrastructure and determine if it is suitable for use with SAP BusinessObjects applications.

## Related Information

[Checking Connection Configuration with the cscheck Tool \[page 35\]](#)

## 5.2 Connection Credentials

When you connect to a database, you create a connection that uses a pair of user/password connection credentials.

The connection server now supports multiple sets of connection credentials (enhanced credential mapping). The user enters the relevant credentials for a given connection in order to create or edit a connection, or to consume a connection. Enhanced credential mapping is documented in the *Business Intelligence Platform Administrator Guide*.

### Note

Credential mapping will not work with multisource enabled universes.

When creating or editing a relational/OLAP connection, select the *Credential Mapping* option for the *Authentication Mode*. If the connection property is missing, the default secondary credentials are used.

#### Note

This feature is not supported by the Universe Design Tool.

When consuming a Relational/OLAP connection that uses credential mapping, once the appropriate credentials have been authenticated, the user can refresh documents that were created using these credentials.

#### Note

This feature is not supported by Data Federator.

## 5.3 Checking Connection Configuration with the `cscheck` Tool

#### Note

The `cscheck` tool is not supported on AIS.

The Connection Server software includes a command line utility that you can use to check your data source connection infrastructure. You can use the `cscheck` tool to check your client middleware and the installed data access drivers at any time.

#### Note

The results of all checks apply to your local machine, from which you run the tool.

The `cscheck` tool is installed in the `<boe-install-dir>\<platform_dir>` where `<boe-install-dir>` is the BOE installation directory and `<platform_dir>` is `win64_x64`, `linux_x64`, and so on.

You run the `cscheck` tool from a command console (DOS or shell). The output is displayed on the screen. You can specify that the output is generated as XML format, or you can suppress output, to use the tool in a script.

The `cscheck` tool can perform the following functions on your local machine:

- Return details of all the connectivities, that is network layers and databases, that the installation can support
- Return details of the data access drivers installed on your local machine
- Return details of the connectivities installed on your local machine
- Check for a valid middleware installation for a supplied network layer and database client
- Check for a valid data access driver installation for a supplied network layer and database client
- Check if a connection can be established to a given database

## Related Information

[Check Tool—Function Overview \[page 37\]](#)

### 5.3.1 Displaying Help on the cscheck Tool

The `cscheck` tool provides functionality to do the following:

- Display general help on the `cscheck` utility
- Display help on each available `cscheck` function

The help can be displayed in any language selected when you installed your SAP BusinessObjects solution.

To display general help on `cscheck`, use the following syntax:

```
cscheck --help|h --language|l {language}
```

Command help syntax

To display help on a function, use the following syntax, where `<functionName>` is the name of the function for which you want help, and `<language>` is the language in which to display the help:

```
cscheck --help|h {functionName} --language|l {language}
```

Function help syntax

#### Example

To display help in English on the `cscheck` tool, use the following command:

```
cscheck --help
```

To display help in French on the `connectivity` function, use the following command:

```
cscheck --language fr --help connectivity
```

### 5.3.2 To Run the cscheck Tool

You can run the `cscheck` tool at any time after you have installed your SAP BusinessObjects solution.

1. Open a command console.
2. Change directory to the path where the tool is installed.
3. Enter `cscheck` with the correct parameters to find the information that you want.
4. Review the returned information.

## Related Information

[Check Tool—Function Overview \[page 37\]](#)

## 5.3.3 Check Tool—Function Overview

From a command console, you use the `cscheck` command with the appropriate function and its arguments to return the results that you want.

`cscheck` commands have the following structure. Some of the parameters are optional.

```
cscheck --language | l { output language } --xml | x --mute | m function name function options  
cscheck syntax
```

The first part of the command controls the output format:

- `<output language>` or `l` followed by the language specified in ISO639-1 standard. This is optional. The default language is English.
- `--xml` or `x` specifies that the output is in XML format. This is optional. The default output is text displayed on the screen.
- `--mute` specifies that the output is not generated. You would use this switch if you were using the tool in a script that checked the returned status. This is optional. The default is that output is generated.

The remaining part of the command consists of the function and its option arguments.

`<function name>` can take the following values. Each function has a short version that you can use in place of the full function name:

- `list` or `lt`
- `driverssearch` or `ds`
- `find` or `fd`
- `middleware` or `mw`
- `accessdriver` or `ad`
- `connectivity` or `ct`
- `ping` or `pg`

## Related Information

[Check Tool— accessdriver \[page 42\]](#)

[Check Tool— connectivity \[page 43\]](#)

[Check Tool— driverssearch \[page 39\]](#)

[Check Tool— find \[page 39\]](#)

[Check Tool— list \[page 38\]](#)

[Check Tool— middleware \[page 41\]](#)

[Check Tool— ping \[page 44\]](#)

## 5.3.4 Check Tool— list

### Syntax

This function returns a list of the supported network layers and database engines. For example you could use it to determine the correct values to use with other check tool functions.

### Note

This function returns the full list of supported data access drivers and middleware, including those that are not necessarily installed on your machine.

```
cscheck |list| |lt|
```

**list syntax**

## Example

The following command lists all network layers and database engines supported by the SAP BusinessObjects solution installed on the current machine.

```
cscheck list
```

The following is an excerpt of the result list:

```
Oracle Client
  Oracle 11
  Oracle 12
Sybase Open Client
  Sybase Adaptive Server 15.7
Informix ODBC Driver
  Informix Dynamic Server 11
Teradata ODBC Driver
  Teradata 12
  Teradata 13
  Teradata 14
ODBC Drivers
  Generic ODBC Datasource
  Generic ODBC3 Datasource
...
```

## Related Information

[Check Tool—Function Overview \[page 37\]](#)

[Displaying Help on the cscheck Tool \[page 36\]](#)

## 5.3.5 Check Tool— driverssearch

### Syntax

This function returns a list of the installed data access drivers.

```
cscheck |driverssearch| |ds|
```

driverssearch syntax

## Example

The following command lists all the Connection Server drivers installed on the machine.

```
cscheck driverssearch
```

The following is an excerpt of the result list:

```
This access driver is installed: Generic ODBC access driver
Client layer: ODBC Drivers
Database engine(s):
  Generic ODBC Datasource
  Generic ODBC3 Datasource
This access driver is installed: MS Access access driver
Client layer: ODBC Drivers
Database engine(s):
  MS Access 2010
  MS Access 2013
  MS Access 2016
This access driver is installed: Microsoft SQL Server access driver
Client layer: ODBC Drivers
Database engine(s):
  MS SQL Server 2012
  MS SQL Server 2014
...
```

## Related Information

[Check Tool—Function Overview \[page 37\]](#)

[Displaying Help on the cscheck Tool \[page 36\]](#)

## 5.3.6 Check Tool— find

### Syntax

This function lists the available connectivity types, that is middleware and database clients, that are available from the local machine. This includes:

- connectivity types available on the local machine
- connectivity types available using the CORBA communication layer
- connectivity types available using the HTTP communication layer
- Java connectivity types available on the local machine

```
cscheck |find| |fd| -m { Connection Server access mode }
```

#### find syntax

#### Function input parameters

Connection Server access mode (-m)

The mode in which the client application accesses Connection Server:

- `local`: lists connectivity types available on the local machine.
- `corba`: lists connectivity types available using CORBA.
- `http`: lists connectivity types available using HTTP.
- `java`: lists Java connectivity types available on the local machine.
- `extended`: lists local, java, and CORBA connectivity types.

## Example: Finding local connectivities

The following command returns a list of the data access drivers on the local machine that can be loaded by Connection Server.

```
cscheck find -m local
```

The following is an excerpt of the result list:

```
Local Library mode
Simba ODBC Drivers
Amazon Redshift
Hive in HDP 2.5
Hive in CDH 6.1
Hive in MEP 6.1
Hive in HDP 3.1
Hive in Amazon EMR 5.6
Hive in Amazon EMR 5.20
Impala in MEP 6.1
Impala in CDH 6.1
Salesforce.com
SAP Hana VORA
...
```



## Example: Finding CORBA server connectivities

The following command returns a list of the data access drivers available from a CORBA server.

```
cscheck find -m corba
```

## Related Information

[Check Tool—Function Overview \[page 37\]](#)

[Displaying Help on the cscheck Tool \[page 36\]](#)

[Check Tool—CMS Information \[page 46\]](#)

## 5.3.7 Check Tool— middleware

### Syntax

For a supplied network layer and database client, this function checks for a valid installation of the client middleware. To check both the middleware and data access driver for a supplied network layer and database client, you can use the `connectivity` function.

```
cscheck |middleware| |mw| -c {network layer} -d {database client}
                               middleware syntax
```

Function input parameters

network layer (-c)	The network layer that the database middleware uses, as returned by the <code>find</code> function.
database client (-d)	The database to check, as returned by the <code>find</code> function.

## Example

The following command checks for a valid installation of the Oracle Client 10g middleware on the local machine. It creates an XML file of the output: `c:\result.xml`

```
cscheck --xml middleware -c "Oracle Client" -d "Oracle 9" > c:\result.xml
```

If the middleware is not correctly installed, the result will be the following:

```
Starting to check the middleware component installation...
Begin AND operator...
  ORACLE_HOME... The environment setting does not exist.
End AND operator: failure.
The middleware is not correctly installed.
```

## Related Information

[Check Tool—Function Overview \[page 37\]](#)

[Displaying Help on the cscheck Tool \[page 36\]](#)

[Check Tool— connectivity \[page 43\]](#)

[Check Tool— accessdriver \[page 42\]](#)

## 5.3.8 Check Tool— accessdriver

### Syntax

For a supplied network layer and database client, this function checks for a valid data access driver installation. To check both the middleware and data access driver for a supplied network layer and database client, you can use the `connectivity` function.

```
cscheck |accessdriver| |ad| -c {network layer} -d {database client}
                                accessdriver syntax
```

Function input parameters

network layer ( -c )	The network layer that the database middleware uses, as returned by the <code>find</code> function.
database client ( -d )	The database to check, as returned by the <code>find</code> function.

## Example

The following command checks for a valid installation of an Oracle 12 data access driver, and displays the output in French:

```
cscheck -l fr accessdriver -c "Oracle Client" -d "Oracle 12"
```

If the French language is not installed, the result will be the following:

```
The language specified is not installed. Please use an installed language.
English ([en]).
```

## Example

The following command checks for a valid installation of an Oracle 12 data access driver:

```
cscheck ad -c "Oracle Client" -d "Oracle 12"
```

The result is the following:

```
Starting to check the access driver component installation...
Begin AND operator...
Config Directory... success.
%SharedRoot%\ConnectionServer\Network Layers\Oracle OCI... success.
Directory... success.
/<connectionserver-install-dir>/connectionServer//oracle... success.
Library... success.
/<connectionserver-install-dir>/connectionServer//libdbd_oci12.so... success.
Data File Name... success.
/<connectionserver-install-dir>/connectionServer//oracle/oracle.sbo... success.
End AND operator: success.
The access driver is installed.
```

## Related Information

[Check Tool—Function Overview \[page 37\]](#)

[Displaying Help on the cscheck Tool \[page 36\]](#)

[Check Tool— list \[page 38\]](#)

## 5.3.9 Check Tool— connectivity

### Syntax

For the supplied network layer and database client, this function checks that both the installed middleware and the data access driver are valid.

You can check each individually using the `middleware` and the `accessdriver` functions. You can use the `ping` function to check if you can connect to a specific database.

```
cscheck |connectivity| |ct| -c {network layer} -d {database client }
```

#### connectivity syntax

Function input parameters

network layer (-c)	The network layer that the database middleware uses, as returned by the <code>find</code> function.
database client (-d)	The database to check, as returned by the <code>find</code> function.

## Example

The following command checks the installed Oracle client middleware, and the Oracle 11 data access driver. The command writes the output to a text file: `c:\result.txt`.

```
cscheck -l en connectivity -c "Oracle Client" -d "Oracle 11">c:\result.txt
```

If the middleware is not correctly installed, the result will be the following:

```
Starting to check the middleware component installation...
Begin AND operator...
  ORACLE_HOME... The environment setting does not exist.
End AND operator: failure.
The middleware is not correctly installed.
Starting to check the access driver component installation...
Begin AND operator...
  Config Directory... success.
  %SharedRoot%\ConnectionServer\Network Layers\Oracle OCI... success.
  Directory... success.
  /<connectionserver-install-dir>/connectionServer//oracle... success.
  Library... success.
  /<connectionserver-install-dir>/connectionServer//libdbd_oc11.so... success.
  Data File Name... success.
  /<connectionserver-install-dir>/connectionServer//oracle/oracle.sbo... success.
End AND operator: success.
The access driver is installed.
```

## Related Information

[Check Tool—Function Overview \[page 37\]](#)

[Displaying Help on the cscheck Tool \[page 36\]](#)

[Check Tool— find \[page 39\]](#)

[Check Tool— accessdriver \[page 42\]](#)

[Check Tool— middleware \[page 41\]](#)

[Check Tool— ping \[page 44\]](#)

### 5.3.10 Check Tool— ping

#### Syntax

This function attempts to access a given database using the supplied details.

```
cscheck ping|pg| -m { Connection Server access mode } -c { network layer } -d { database client }
-u { user name } -p { password } -s { data source } -t { database } -r { host name } -j { PID }
```

**ping syntax**

#### Function input parameters

Connection Server access mode <code>&lt;(-m)&gt;</code>	The mode in which the client application accesses Connection Server: <ul style="list-style-type: none"><li>• <code>local</code>: Connection Server is running on the local machine.</li><li>• <code>corba</code>: Connection Server is running on a CORBA server.</li><li>• <code>http</code>: Connection Server is running on a HTTP server.</li><li>• <code>java</code>: Connection Server uses a Java data access driver on the local machine.</li></ul>
network layer <code>(-c)</code>	The database middleware for the connection to check, as returned by the <code>find</code> function.
database client <code>(-d)</code>	The database type, as returned by the <code>find</code> function.
user name <code>(-u)</code>	A valid user name for the database.
password <code>(-p)</code>	The password for the user name.
data source <code>(-s)</code>	The server on which the database is running.
database <code>(-t)</code>	The database server.
host name <code>(-r)</code>	For CORBA mode, the computer hosting Connection Server.
PID <code>(-i)</code>	For CORBA mode, the process number of the Connection Server to ping through.

## Example: Pinging an Oracle database

The following command checks access for:

- Connection Server access mode: `local`, that is, the database runs on the local machine.
- Network layer: `Oracle Client`
- Database: `Oracle 12`
- Data source: `Harlaxton`
- User name: `efashion`
- Password: `x2345`

```
cscheck ping -m local -c "Oracle Client" -d "Oracle 12" -u "efashion" -p "x2345" -s "Harlaxton"
```

## Example: Pinging a Sybase database using CORBA

The following command checks access for:

- Connection Server access mode: CORBA, that is, Connection Server runs on a CORBA server.
- Network layer: Sybase
- User name: syadmin
- Password: password
- Data source: Sybase Adaptive Server 15
- Database: SY1
- Database host: sybasehost
- Process ID: 456

```
cscheck ping -m corba -c "Sybase Open Client" -d syb15 -u "syadmin" -p "password"
-s "Sybase Adaptive Server 15.7" -t "SY1" -r "sybasehost" -i 456
```

## Related Information

[Check Tool—Function Overview \[page 37\]](#)

[Check Tool— find \[page 39\]](#)

[Check Tool—CMS Information \[page 46\]](#)

### 5.3.11 Check Tool—CMS Information

#### Syntax

The following parameters allow you to specify the CMS information that you can use with the `find` or `ping` function of the `cscheck` tool.

```
cscheck --ce_cluster {CMS server} --ce_user {User name} --ce_pass {Password} --
ce_auth {Authentication} find -m corba
```

#### CMS syntax

#### Function Input Parameters

CMS server (--ce_cluster)	The host and port to access the CMS.
User name (--ce_user)	The user name to access the CMS.
Password (--ce_pass)	The password to access the CMS.
Authentication (--ce_auth)	The method used to authenticate the user's login credentials when accessing the CMS.

## Example

The following command returns a list of connections that are stored on the CMS and available using CORBA.

```
cscheck --ce_cluster localhost --ce_user Administrator --ce_pass Password1 --  
ce_auth SecEnterprise find -m corba
```

### → Remember

The parameters must be placed before the `find` or `ping` function in the command line. They all are mandatory.

## Related Information

[Check Tool— find \[page 39\]](#)

[Check Tool— ping \[page 44\]](#)

## 5.4 Creating JDBC Connections

A set of data access drivers are installed when you install the BI platform. You can use these data access drivers to create connections to databases. They are located in the `<connectionserver-install-dir>\connectionServer\drivers\java` directory.

SAP BusinessObjects software also includes configuration files for using JDBC drivers to access your databases. To use these drivers, you do the following:

1. Obtain the java driver software from your database supplier.
2. Specify JAR file paths by one of the following ways:
  - Store JAR files into directories you create from the `Extensions` parameter values of the SBO file.

You can use simultaneously these two ways of specifying JAR file paths. However, JAR files specified in the SBO file take precedence over JAR files stored in your own directories.

### 📘 Note

SAP Lumira allows users to select JAR files directly from the connection creation box of the application. For more information, see *SAP Lumira User Guide*.

For an up-to-date list of supported JDBC drivers, check the SAP Service Marketplace at <https://support.sap.com/pam>, or contact your SAP representative.

### 📘 Note

The Data Access layer provides the Generic JDBC connectivity to create a connection to a data source that the BI platform does not support explicitly.

## Related Information

[To Create a JDBC Connection with Extensions \[page 48\]](#)

[To Create a Generic JDBC Connection \[page 49\]](#)

[JDBC Driver Properties \[page 188\]](#)

### 5.4.1 To Create a JDBC Connection with Extensions

- Obtain the necessary JDBC driver software for the database, and copy the files to your system. These files are available from the database vendor. The driver software consists typically of one or more JAR files.
  - Ensure that you have the database access details to hand, for example the login and password details.
1. Go to the next section of the guide to find the `Extensions` parameter values.
  2. Use one or more of the `Extensions` parameter values to create your own driver directories.  
For example, `Extensions` parameter values for Microsoft SQL Server 2008 middleware are `sqlsrv2008`, `sqlsrv` and `jdbc` in the `sqlsrv.sbo` file. You can create any of the following directories:
    - `<connectionserver-install-dir>\connectionServer\jdbc\drivers\sqlsrv2008`
    - `<connectionserver-install-dir>\connectionServer\jdbc\drivers\sqlsrv`
    - `<connectionserver-install-dir>\connectionServer\jdbc\drivers\jdbc`
  3. Copy the JAR files into the directories of your choice.
  4. Run the connection wizard.  
The JDBC driver that you have configured appears in the list of available connections.
  5. Select the JDBC driver and use the wizard to configure the connection.

To load JDBC drivers, Connection Server searches for JAR files in each directory from the most specific to the least specific until it finds them. The connection is then available for use.

### Example

For example, if you store JAR files in `<connectionserver-install-dir>\connectionServer\jdbc\drivers\sqlsrv` only, then Connection Server first searches for drivers in `sqlsrv2008` directory, finds it empty, then it searches in `sqlsrv` directory, finds the JAR files and loads the driver.

#### Note

Because `sqlsrv` is `Extensions` value of all Microsoft SQL Server target databases, JAR files specified in this directory are loaded for all Microsoft SQL Server databases.



## Related Information

[Data Access Configuration Files \[page 182\]](#)

### 5.4.2 To Create a Generic JDBC Connection

- Obtain the necessary JDBC driver software for the database. The `.jar` file needs to be installed on the machine running the SAP BusinessObjects application.
  - Ensure that you have the database access details ready, for example the login and password details.
1. Navigate to the directory that contains the `jdbc.sbo` and `jdbc.prm` files.  
For example, on Microsoft Windows, the configuration files are located in the `<connectionserver-install-dir>\connectionServer\jdbc` directory.
  2. Copy the required `.jar` file to the `<connectionserver-install-dir>\connectionServer\jdbc\drivers\jdbc` directory.  
You have to create the directory if it does not exist.
  3. Run the connection wizard and follow the steps in the wizard.  
The JDBC driver appears in the list of available connections under Generic.

When you complete this task, the connection to the data source is available for use through JDBC.

#### ⓘ Note

The `jdbc.prm` file only contains information about generic functions of a JDBC database. You can add or update any information specific to a custom database in the file. The modifications to `jdbc.prm` file apply to all generic JDBC connections that are created or to be created.

## Related Information

[Data Access Configuration Files \[page 182\]](#)

[About PRM Files \[page 222\]](#)

### 5.4.3 JAR File Location Reference

Syntax:

The following table describes the names of the folders where you must place middleware JAR files to enable JDBC connections. The first column lists the database vendor names as shown in the connection wizard. The second column lists the names of the databases that support JDBC connections, as described in the `DataBase` section of the corresponding SBO file. The third column lists the names of the folders you can create, as described by the `Extensions` parameter values of the SBO file.

The `Extensions` parameter is a child element of the `DataBase` element that corresponds to the targeted database middleware in SBO files. If it is not under `DataBase`, it means the parameter value is valid for all middleware configured in the SBO file. Then refer to the `Defaults` section of the file. On Microsoft Windows, JDBC configuration files are located in the `<connectionserver-install-dir>\connectionServer\jdbc` directory.

### Note

The Data Federator JDBC drivers are installed as part of the BI platform in the `<connectionserver-install-dir>\connectionServer\jdbc\drivers\datafederator` directory. The SAP HANA 1.0 SPS 08 JDBC drivers are installed in the `<connectionserver-install-dir>\connectionServer\jdbc\drivers\newdb` directory. Consequently, you do not require to perform any additional configuration to create a connection to either Data Federator XI Query Server or SAP HANA database.

Vendor	Database	Extensions Parameter Values
Amazon	Amazon RedShift	amazonsimba4, amazon, jdbc
	Hive in Amazon EMR 5.20	saphive, simbahive2, hive2, amazon, hive, jdbc
	Hive in Amazon EMR 5.6	saphive, simbahive2, hive2, amazon, hive, jdbc
Apache	Hive in HDP 2.5	saphive, simbahive2, apache, hive, jdbc
	Hive in CDH 6.1	saphive, simbahive2, apache, hive, jdbc
	Hive in MEP 6.1	saphive, simbahive2, apache, hive, jdbc
	Hive in HDP 3.1	saphive, simbahive3, apache, hive, jdbc
	Spark in HDP 3.1	sapspark, spark2, jdbc
	Spark in MEP 6.1	sapspark, spark2, jdbc
Cloudera	Impala in MEP 6.1	sapimpala, cloudera, impala, hive, jdbc
	Impala in CDH 6.1	sapimpala, cloudera, impala, hive, jdbc
Denodo	Denodo 7	denodo, jdbc
GreenPlum	GreenPlum 4	postgresql9, postgresql, jdbc
	GreenPlum 5	greenplum5, greenplum, postgresql, jdbc
	GreenPlum 6	greenplum6, greenplum, postgresql, jdbc
Hewlett Packard	HP Vertica 9	vertica, jdbc
	HP Vertica 8	vertica, jdbc
Hortonworks	Hortonworks	hive, jdbc

Vendor	Database	Extensions Parameter Values
IBM	DB2 Warehouse 3	db2warehouse, db2, jdbc
	DB2 for z/OS v11	db2mvs11, db2mvs, db2, jdbc
	DB2 for z/OS v12	db2mvs12, db2mvs, db2, jdbc
	DB2 10 for LUW	db2v10, db2udb, db2, jdbc
	DB2 10.5 for LUDB2, 10.5 for LUW	db2v10_5, db2udb, db2, jdbc
	DB2 11 for LUW	db2v11, db2udb, db2, jdbc
	Informix Dynamic Server 11	ids11, informix, jdbc
	Informix Dynamic Server 12	ids12, informix, jdbc
	IBM Puredata (Netezza) Server 7	netezza7, netezza, jdbc
Microsoft	Microsoft SQL Server 2012	sqlsrv2012, sqlsrv, jdbc
	Microsoft SQL Server 2014	sqlsrv2014, sqlsrv, jdbc
	Microsoft SQL Server 2016	sqlsrv2016, sqlsrv, jdbc
	Microsoft SQL Server 2017	sqlsrv2017, sqlsrv, jdbc
	Azure SQL Data Warehouse	azure, sqlsrv, jdbc
	Microsoft Parallel Data Warehouse	sqlsrv2016, sqlsrv, jdbc
Oracle	MySQL 5	mysql5, mysql, jdbc
	MySQL 8	mysql8, mysql, jdbc
	Oracle 11	oracle11, oracle, jdbc
	Oracle Exadata 11	oracleexadata, oracle11, oracle, jdbc
	Oracle Exadata 12	oracleexadata12, oracle12, oracle, jdbc
	Oracle Exadata 18c	oracleexadata18c, oracleexadata12, oracle12, oracle, jdbc
	Oracle Exadata 19c	oracleexadata19c, oracleexadata18c, oracleexadata12, oracle12, oracle, jdbc
	Oracle 12	oracle12, oracle, jdbc
	Oracle 12	oracle12cR2, oracle12, oracle, jdbc
	Oracle 12c Release 2	oracle12cR2, oracle12, oracle, jdbc

Vendor	Database	Extensions Parameter Values
	Oracle 18c	oracle18c, oracle12cR2, oracle12, oracle, jdbc
	Oracle 19c	oracle19c, oracle18c, oracle12cR2, oracle12, oracle, jdbc
PostgreSQL	PostgreSQL 9	postgresql9, postgresql, jdbc
	PostgreSQL 10	postgresql10, postgresql, jdbc
	PostgreSQL 11	postgresql11, postgresql, jdbc
Progress	Progress OpenEdge 10	progress10, progress, jdbc
	Progress OpenEdge 11	progress11, progress, jdbc
Salesforce.com	Salesforce.com	salesforce, jdbc
SAP	SAP HANA VORA	sapspark, spark12simba4, spark, jdbc
	SAP Vora 1.4	sapspark, spark2, spark, jdbc
	SAP Vora 2.0	sapspark, spark2, spark, jdbc
	MaxDB 7.9	maxdb7.9, maxdb, jdbc
Snowflake	Snowflake	snowflake, jdbc
Sybase	Sybase Adaptive Server Enterprise 15.7	sybase15, sybase, jdbc
	Sybase Adaptive Server Enterprise 16	sybase16, sybase, jdbc
	Sybase IQ 16	iq16, asiq, jdbc
	Sybase SQL Anywhere 16	ssa16, ssa, jdbc
	Sybase SQL Anywhere 17	ssa17, ssa, jdbc
Teradata	Teradata 15	teradata15, teradata, jdbc
	Teradata 16	teradata16, teradata, jdbc

## Related Information

[SAP HANA Connections \[page 149\]](#)

## 5.4.4 To Find the Version of a JDBC Driver

This section describes how to find the version of the driver in your JDBC connection.

You can find the version of the JDBC driver used in the `META-INF/MANIFEST.MF` file contained in the driver JAR file.

Do one of the following:

Option	Description
To extract the file by using WinRAR	<ol style="list-style-type: none"><li>1. Launch the WinRAR application.</li><li>2. Drag the JAR file and drop it into the application window.</li><li>3. Expand the <i>META-INF</i> folder.</li><li>4. Drag the <i>MANIFEST.MF</i> file from WinRAR and drop it into a local folder.</li><li>5. Open the file and locate the <i>Bundle-Version</i> value.</li></ol>
To extract the file from a command prompt	<ol style="list-style-type: none"><li>1. Open a command prompt.</li><li>2. Go to the folder where you should extract the file: <pre>cd &lt;driver_path&gt;</pre></li><li>3. Run the following command: <pre>&lt;JAR_path&gt;\jar.exe -xf &lt;driver_path&gt;\&lt;driver_name&gt;.jar META-INF/MANIFEST.MF</pre></li><li>4. Open the file and locate the <i>Bundle-Version</i> value.</li></ol>

For example, run the following commands to retrieve the version of the SAP HANA JDBC driver:

```
cd C:\Program Files (x86)\SAP BusinessObjects\SAP BusinessObjects Enterprise XI 4.0\dataAccess\connectionServer\jdbc\drivers\newdb "C:\Program Files (x86)\SAP BusinessObjects\SAP BusinessObjects Enterprise XI 4.0\win64_x64\jdk\bin\jar.exe" -xf ngdbc.jar META-INF/MANIFEST.MF
```

### Note

Put the path of the JAR file into double quotes if it contains spaces.

## 5.5 Creating JavaBean Connections

To access data sources that are not supported by SAP BI Platform, developers and partners can write their own data access driver through JavaBean.

For more details about writing a JavaBean, refer to the *SAP BusinessObjects BI Developer's Guide for Web Intelligence and the BI Semantic Layer*.

Once you have written the JavaBean, a JavaBean driver is provided as one or several JAR file(s). To use this driver, in all server and client machines that need to access this data source:

- Create a dedicated folder in the `<INSTALL_DIR>\SAP BusinessObjects\SAP BusinessObjects Enterprise XI 4.0\dataAccess\connectionServer\javabean` folder.

- Copy the JAR file(s) in this folder.

Then, to create a connection based on this JavaBean driver:

- Start the information design tool
- Create a relational connection
- Select ► *Java Beans* ► *Generic JavaBean datasource* ► *JavaBean* ►
- In the *Parameters for Generic JavaBean datasource Connection*, provide the following information:
  - *Authentication*: You may select the authentication mode among *Use specified username and password*, *Use BusinessObjects credential mapping* or *No authentication*.
  - *Data Source Reference*: The name of the Data Source Reference to use if you have selected *Use BusinessObjects credential mapping*.
  - *User Name* and *Password*: user's credentials if you have selected *Use specified username and password*.
  - *Initialization String*: A string used to pass parameters to allows connection to the data source. This can be an URL, a key, a token... The value itself depends on the JavaBean implementation.
  - *JavaBean Class*: The name of the class the JavaBean exposes.
  - *JavaBean Folder*: The name of the dedicated subfolder you have created to store the JavaBean.

Within a JavaBean driver, data-retrieval procedures are configured as stored procedures.

To query the data source, you need to create a table based on a stored procedure. The stored procedures' names are the names of the methods implemented in the JavaBean. If the stored procedure has arguments, they are prompted so you may answer them.

#### ⓘ Note

As with any table based on stored procedure, operations like filter, join or aggregate... are not possible.

For more details about table based on stored procedure, refer to the *Information Design Tool User Guide*.

## Related Information

[JavaBean sample \[page 54\]](#)

### 5.5.1 JavaBean sample

A sample JavaBean is delivered with your SAP BI installation and can be used to query Google Cloud database.

When you install the BI platform, this JavaBean is installed in the folder:

```
<INSTALL DIR>\SAP BusinessObjects\SAP BusinessObjects Enterprise XI
4.0\dataAccess\connectionServer\javabean\BigQuery.
```

To use this JavaBean driver, in the information design tool, create a JavaBean connection and provide the following parameters:

- *Authentication mode*: *No authentication* since the JavaBean uses key authentication.
- *Initialization String*: You need to generate a unique key from your Google account and pass this key for authentication.
- *JavaBean Class*: `com.sap.bigquery.sample.SimpleBigQuery`
- *JavaBean Folder*: `BigQuery`

## 5.6 Creating ODBC Connections

A set of data access drivers are installed when you install the BI platform. You can use these data access drivers to create connections to databases. They are located in the `<connectionserver-install-dir>\connectionServer\drivers\lib32` or `<connectionserver-install-dir>\connectionServer\drivers\lib64` directory.

SAP BusinessObjects software also includes configuration files for using ODBC drivers to access your databases. To use these drivers, you do the following:

1. Obtain the ODBC driver software from your database supplier.
2. Modify the supplied configuration files.

Most of ODBC drivers are available in Unicode and non-Unicode.

For an up-to-date list of supported ODBC drivers, check the SAP Service Marketplace at <https://support.sap.com/home.html>, or contact your SAP representative.

### Note

The Data Access layer provides the Generic ODBC connectivity to create a connection to a data source that the BI platform does not support explicitly.

## About Generic ODBC Connections on UNIX

The Microsoft Windows operating system comes with a standard ODBC driver manager. In contrast, UNIX does not provide any standard way to manage drivers. SAP BusinessObjects software allows you to use either DataDirect or unixODBC driver managers for generic ODBC connections on UNIX.

Before creating a generic ODBC connection on UNIX for a specific database, you must identify the following:

- The version of the ODBC driver
- If the driver is able to work with DataDirect driver manager or unixODBC

You then modify the supplied configuration files and configure the relevant data source to enable the connection.

## Related Information

[To Create a Generic ODBC3 Connection \[page 56\]](#)

### 5.6.1 To Create a Generic ODBC3 Connection

The following procedure shows how to configure a generic ODBC connection to a database with the following assumptions:

- The driver is ODBC3
  - The driver supports the unixODBC driver manager
1. Navigate to the directory that contains the `odbc.sbo` and `odbc.prm` files.

The configuration files are located in the `<connectionserver-install-dir>/connectionServer/odbc` directory.

2. Use an XML editor to open the `odbc.sbo` file for editing.
3. Locate the following section:

```
<DataBase Active="Yes" Name="Generic ODBC3 datasource">
  <Libraries>
    <Library Platform="MSWindows">dbd_wodbc3</Library>
    <Library Platform="MSWindows">dbd_odbc3</Library>
    <Library Platform="Unix">dbd_wddodbc3</Library>
    <Library Platform="Unix">dbd_ddodbc3</Library>
    <!-- To use unixODBC version 2.2.12 for 'Generic ODBC3
datasource' comment out previous 2 lines and uncomment one of the four next
ones -->
    <!-- "CharSet" Table parameter must also be
commented out when unixODBC is used -->
    <!-- Library Platform="Unix"&gt;dbd_wuxodbc3&lt;/
Library -->
    <!-- Library Platform="Unix"&gt;dbd_uxodbc3&lt;/
Library -->
    <!-- Library
Platform="Unix64"&gt;dbd_wux32odbc3&lt;/Library -->
    <!-- Library Platform="Unix64"&gt;dbd_ux32odbc3&lt;/
Library -->
    <!-- To use unixODBC version 2.3 for 'Generic ODBC3
datasource' comment out previous 2 lines and uncomment one of the four next
ones -->
    <!-- "CharSet" Table parameter must also be
commented out when unixODBC is used -->
    <!-- Library Platform="Unix"&gt;dbd_wuxodbc23&lt;/
Library -->
    <!-- Library Platform="Unix"&gt;dbd_uxodbc23&lt;/
Library -->
    <!-- Library
Platform="Unix64"&gt;dbd_wux32odbc23&lt;/Library -->
    <!-- Library
Platform="Unix64"&gt;dbd_ux32odbc23&lt;/Library -->
  </Libraries>
  <Parameter Name="CharSet Table" Platform="Unix">datadirect</
Parameter>
</DataBase>
```



### Note

For configuring generic ODBC2.2 and ODBC2.3.0, information on which rows to comment is provided in the above `<DataBase>` tag.

4. Comment the first two rows for DataDirect and uncomment one of the next four rows. Make sure you put the row you uncomment on top of the section, so that it can be read first. Comment out the `<Parameter name="CharSet Table" Platform="Unix">` element.

### Note

- `dbd_wddodbc3` specifies the DataDirect-based ODBC3 Unicode driver
- `dbd_ddodbc3` specifies the DataDirect-based ODBC3 non-Unicode driver
- `dbd_wuxodbc3` specifies the unixODBC-based ODBC3 Unicode driver
- `dbd_uxodbc3` specifies the unixODBC-based ODBC3 non-Unicode driver
- `dbd_wux32odbc3` specifies the unixODBC-based ODBC3 Unicode driver with 32-bit API rather than 64-bit (available only on 64-bit platforms)
- `dbd_ux32odbc3` specifies the unixODBC-based ODBC3 non-Unicode driver with 32-bit API rather than 64-bit (available only on 64-bit platforms)
- `dbd_wuxodbc23` specifies the unixODBC2.3.0-based ODBC3 Unicode driver
- `dbd_uxodbc23` specifies the unixODBC2.3.0-based ODBC3 Unicode driver
- `dbd_wux32odbc23` specifies the unixODBC2.3.0-based ODBC3 Unicode driver with 32-bit API rather than 64-bit (available only on 64-bit platforms)
- `dbd_ux32odbc23` specifies the unixODBC2.3.0-based ODBC3 non-Unicode driver with 32-bit API rather than 64-bit (available only on 64-bit platforms)

5. Save and close the `odbc.sbo` file.
6. Use an XML editor to open the `odbc.prm` file for editing.
7. Add or update any information specific to the database.

### Note

The `odbc.prm` file may not contain information about specific functions of the database.

8. Save and close the `odbc.prm` file.
9. Install the relevant ODBC drivers on your UNIX machine.
10. Configure the data source by editing the `odbc.ini` file.
11. Save and close the `odbc.ini` file.
12. Run the connection wizard.

The ODBC driver that you have configured appears in the list of available connections under Generic.

13. Select the ODBC driver and use the wizard to configure the connection.

When you complete this task, the connection to the data source is available for use through ODBC3 with unixODBC driver manager.

## Related Information

[Data Access Configuration Files \[page 182\]](#)

## 5.7 To Add a New Driver After a Patch Installation

You need to modify the BI platform installation manually if you want to add a new driver.

You have made a patch installation of this release to the BI platform servers or client tools.

A patch on the BI platform servers or client tools does not install any new feature to the existing installation. It only updates files that are already installed. To benefit from a new driver, you need to install it manually from the latest full installation.

1. In the *Control Panel*, locate the latest full installation program of the BI platform.

### → Remember

You cannot perform the next step on a program update of the platform.

2. Right-click and select *Uninstall/Change*.
3. In the *Application Maintenance* screen of the *SAP BusinessObjects BI platform setup* dialog box, select *Modify* and click *Next*.
4. In the *Select Features* screen, select the desired driver option under *Database Access and Security*.
5. Click *Next* and complete the installation.

You have installed the driver on the platform. You can now create connections to the desired database.

## 5.8 To Set the Locale in a Multiple Data Sources Workflow

In the designing and reporting tools, queries to BigDecimal columns of a multisource-enabled universe that is using a native connection may return an error (`java.lang.NumberFormatException`). To avoid this problem, add the `Locale` parameter with the appropriate language and country values to the SBO file of the database driver on the BIP platform server.

The procedure uses the French locales as examples.

1. Stop the Adaptive Connectivity Service.
2. Open the SBO file for editing.

It is located in the `<bip-install-dir>\dataAccess\connectionServer\<connection_type>` directory, where `<connection_type>` is for example `db2`, `odbc`, `oracle`, or `sybase`.

3. Add one of the following lines under the appropriate Database section:

- `<Parameter Name="Locale">fr</Parameter>`
- `<Parameter Name="Locale">fr_FR</Parameter>`

4. Save the file.
5. Restart the service and application.

When you complete this task, native connections in a multisource workflow run properly.

# 6 Data Access Driver Reference

## 6.1 Data Access Drivers

This chapter provides detailed information on some data access drivers, which enable connections to data sources using OData or XML documents, and specific databases like ABAP-based SAP ERP systems. It mainly describes mapping rules between nontrivial data models and the relational model used in the Data Access layer.

This chapter only relates to connections to be created in the information design tool.

### Related Information

[CSV OpenDriver \[page 60\]](#)

[OData Driver \[page 65\]](#)

[SAP ERP Driver \[page 79\]](#)

[XML Driver \[page 85\]](#)

[Web Service Driver \[page 98\]](#)

## 6.2 CSV OpenDriver

The Data Access layer allows the BI platform to connect to Comma-Separated Value (CSV) files through BusinessObjects OpenConnectivity network layer. It provides a data access driver called CSV OpenDriver to access the CSV files.

The connection wizard provides a workflow to enter the necessary information to connect to CSV files. CSV data sources show up under `Text Files DBMS` and `BusinessObjects OpenConnectivity NetworkLayer`.

### Backward compatibility

BusinessObjects OpenConnectivity is not compatible between XI 3.x and 4.1. If you want to migrate such report, first change it to ODBC connectivity as ODBC is only supported.

The following exception occurs if you refresh the reports in 4.1 without changing the connectivity to ODBC:

```
Database error: (CS) "Specified network layer is invalid : BO OC". (IES 10901)
(WIS 10901)
```

Since JDBC connectivity in 3-tier mode is not supported in XI 3.x releases, BusinessObjects OpenConnectivity is not recognized as a network layer when the user tries to refresh a document in the 4.1 release.

## 6.2.1 CSV OpenDriver Capabilities

Since text files do not provide any database operations, the data access driver implements the following querying capabilities:

- Basic operations for SELECT statements (WHERE, ORDER BY, GROUP BY, and AS)
- Basic operators within the WHERE clause (=, <>, <, <=, >, >=, BETWEEN, NOT BETWEEN, LIKE, NOT LIKE, IS NULL, IS NOT NULL, AND, OR)
- Use of wildcards ("?", \*) within the WHERE clause
- DISTINCT clause within the SELECT statement
- UNION and UNION ALL

The data access driver also supports the MIN, MAX, AVG, SUM, and COUNT grouping functions in SELECT statements.

## Driver Restrictions

The CSV OpenDriver does not implement any functionality for altering the state of the CSV file, such as INSERT, UPDATE and ALTER. The data access driver also does not support indexes or JOIN operations on CSV files.

## Related Information

[Local Disk Used as a Cache for Sorting Operations \[page 106\]](#)

## 6.2.2 CSV OpenDriver - Table Mapping

The data access driver exposes CSV files as tables to the information design tool.

You can connect to multiple files if the *Filepath or Pattern* parameter of the connection wizard is set to a pattern, for example `report_*.csv`, which is matched by files such as `report_2010-09-22.csv` and `report_2010-09-21.csv`.

### → Remember

You cannot connect to multiples files located on an HTTP server. The HTTP protocol does not support the use of wildcards in patterns.

The driver applies one of the following processes:

- If the [Merge Files into One](#) parameter is selected in the connection wizard, all CSV files are mapped to one single table. It is assumed they all have the same schema. This is the default behavior of the data access driver.
- If the parameter is not selected, each CSV file is mapped to a different table.

## Mapping All Files to One Table

The table name is the name of the pattern, for example `report_*.csv`. The table has an additional column named `sourcefile`, which contains the name of the source file for each table row.

If you use an SQLDDL file to provide the schema, the table name must also be the pattern.

If the files have different column names, the column names of the resulting table are the ones of the first file analyzed by the driver, knowing that the files are analyzed in alphabetical order.

## Mapping One File to One Table

The name of each table corresponds to the file name of its data source.

If you use an SQLDDL file to provide the schema, the name of the table in the `CREATE` statement must be the file name.

Independently of the parameter value, the file path is mapped to the qualifier of the table.

## Example: Column Names

If the `report_1.csv` file has the `col1`, ..., and `col10` columns, while the `report_2.csv` file has the `column1`, ..., and `column10` columns, then the columns of the resulting table are `col1`, ..., and `col10`.

## Example: Qualifier

If `C:\reports\report_1.csv` is the data source, then the qualifier is `C:\reports\` and the table name is `report_1.csv`.

## Related Information

[CSV File Location \[page 63\]](#)

[CSV Schema Detection \[page 63\]](#)

## 6.2.3 CSV File Location

CSV files used as data sources can be either local or remote. For files on remote systems, the HTTP, FTP, and SMB (also known as CIFS) protocols are supported. The present release also supports the HTTPS and FTPS encrypted protocols based on one certificate. CSV files can be located on the Central Management Server (CMS) of the BI platform.

### Note

SMB is the standard file sharing protocol on Microsoft Windows. Since the jCIFS library provides access to the protocol, you must install the jCIFS JAR file in the Connection Server directory, that is `<connectionserver-install-dir>\connectionServer\sharedLibraries\jcifs`. The version to install is 1.3.15. It is available at <http://jcifs.samba.org/> .

You can set whether the data source is local or remote through the *Location Type* parameter of the connection wizard. If the data source is remote, you must set the protocol used through the *Protocol* parameter of the wizard. The *Protocol* value must match the protocol specified in the *Filepath or Pattern* and *Schema File* parameter values.

### Example: CSV File Paths

- `C:\csv\report.csv` or `csv/report.csv` for a local file
- `http://server:8080/path/report.csv` for a file accessible through HTTP
- `ftp://server/path/` for files accessible through FTP
- `smb://server:port/myshare/mydirectory` for files accessible through SMB

## 6.2.4 CSV Schema Detection

The Data Access layer provides the following methods for the schema detection of a CSV file:

- No detection
- Automatic detection
- Use of a Data Definition Language (DDL) file
- Use of an SQLDDL file

You choose the method to apply to the files using the *Schema Detection* parameter in the connection wizard. You can provide the schema by using schema files (DDL or SQLDDL). This can be helpful for large and complex files.

Files are analyzed in alphabetical order.

### Note

The first lines of a CSV file may contain comments and can be skipped using the *Number of Comment Lines in the Beginning* parameter in the wizard.

## No Detection

The data access driver skips comment lines, analyzes the first line, and determines the number of columns, but not the column types. All values are considered as strings, and column size is set to 255 characters, which corresponds to the standard length of the `VARCHAR` data type. A value that exceeds 255 is truncated. The columns can contain null values.

## Automatic Detection

### → Remember

You cannot apply this method to CSV files with fixed-length columns.

The data access driver analyzes well-formed files and obtains the following information:

- **column names**  
In most cases, the first line contains column names. Otherwise, the CSV OpenDriver generates column names in the format `column_0`, `column_1`, ..., `column_<n>`.
- **Column types**  
The driver finds column types by using predefined patterns and user settings for numerical, date and time datatypes. If a column contains values of different types, the driver then considers column values as strings.
- **Column sizes**  
The column size depends on its type. For numerical values, the column size is the length of the highest value in the range of the type. For the other values, this is the length of the longest string value found during the detection.

### ⚠ Caution

Only *Probe Rows* set to *all* allows the driver to find the longest string.

- **Column nullability**  
Nullability is true if there is a null value in the column, false if all values are filled.

Unless you select all rows, you choose the number of lines the driver has to analyze by setting the *Number of Probe Rows* parameter in the connection wizard.

See the *Information Design Tool User Guide* for recommendations.

## Use of DDL Files

The data access driver first analyzes the DDL file to convert SQL data types into driver data types.

The DDL file follows this pattern:

```
ColumnName [ :ColumnType [ (Length) ] ] ;
```

For example:



```
col1:VARCHAR(20);
col2:DATE;
col3:INTEGER;
col4:INTEGER;
```

The DDL file can only define one table schema. The driver assigns the same schema to every CSV file used as data source.

## Use of SQLDDL Files

The data access driver first analyzes the SQLDDL file to convert SQL data types into driver data types.

The SQLDDL file follows this pattern:

```
CREATE TABLE <Filename> (
  (<ColumnName> <ColumnType> [NOT] NULL,)*
  (<ColumnName> <ColumnType> [NOT] NULL)
);
```

For example:

```
CREATE TABLE Clients (
  id INTEGER NOT NULL,
  name CHAR(20) NULL,
  date DATE NULL,
  PRIMARY KEY (id) )
```

The SQLDDL file can define several table schemas. The driver can assign a schema to several tables.

The data access driver analyzes CREATE statements and ignores the other ones, if any.

If the DDL or SQLDDL file does not define a column type, the driver then considers column values as strings of 255 characters. A value that exceeds 255 is truncated. If the DDL or SQLDDL file provides a type but not its length, the driver then uses standard lengths, such as 10 for integers. Precision and scale are mandatory for the DECIMAL data type.

## 6.3 OData Driver

The Data Access layer allows the BI platform to connect to data sources that use the Open Data (OData) protocol. It provides a data access driver called OData driver to access online data sources on the Internet or intranets. The OData driver supports the OData 2.0 protocol, whose schema is described with the Conceptual Schema Definition Language (CSDL) 2.0, see <https://msdn.microsoft.com/en-us/library/hh878523.aspx> .

The OData driver allows the BI platform to connect to the OData services that SAP Gateway 2.0 exposes. SAP Gateway 2.0 allows application users to access data from SAP Business Suite systems such as ERP and CRM through HTTP.

The connection wizard provides a workflow to enter the necessary information to connect to OData data sources. OData data sources show up under **Generic OData 2.0 DBMS** and **OData Connector NetworkLayer**.

For windows, you can find the driver configuration files in the `<installation-dir>\SAP BusinessObjects Enterprise XI 4.0\dataAccess\connectionServer\odata` directory.

For unix, you can find the driver configuration files in the `<installation-dir>\sap_bobj\enterprise_xi40\dataAccess\connectionServer\odata` directory.

The `odata.prm` file lists the data access driver capabilities in terms of database operations and functions.

## 6.3.1 OData Driver Capabilities

The data access driver supports the following querying capabilities:

- Basic database operations (SELECT, WHERE, ORDER BY, structured joins)
- Basic filtering operators within the WHERE clause (=, !=, <, <=, >, >=, AND, OR, LIKE, NOT LIKE, BETWEEN, NOT BETWEEN, IS NULL, IS NOT NULL)
- Nested queries within the FROM clause

The data access driver supports the AS, DISTINCT and GROUP BY operations, although they cannot be expressed in the OData 2.0 protocol. The driver performs these operations internally.

### ⚠ Restriction

The present version of the OData driver does not support the following capabilities:

- UNION and UNION ALL operations
- HAVING clause
- DISTINCT in aggregate functions
- Subqueries in the WHERE clause
- Table filters

## Database Functions

The data access driver supports the AVG, MIN, MAX, and SUM database functions, although they cannot be expressed in the OData 2.0 protocol. The driver performs these operations internally. The OData 2.0 protocol only supports the COUNT function, which corresponds to the \$count operator.

## Related Information

[OData Driver - Mapping Keys \[page 70\]](#)

[OData Driver - Nontrivial Behaviors and Restrictions \[page 76\]](#)

[Local Disk Used as a Cache for Sorting Operations \[page 106\]](#)

## 6.3.2 OData Service Location

You can connect to OData services through HTTP. The present release also supports the HTTPS encrypted protocols based on one certificate.

### Example

The following links refer to examples of OData services through HTTP and HTTPS and to an example of an SAP Gateway service.

### Related Information

<http://services.odata.org/Northwind/Northwind.svc/> ➡

<https://api.datamarket.azure.com/Data.ashx/data.gov/Crimes/> ➡

<http://gw.esworkplace.sap.com/sap/opu/odata/sap/SALESORDERS/> ➡

## 6.3.3 OData Service Example

An OData data source exposes its data according to a schema based on the Entity Data Model (EDM). The schema is described with the help of CSDL. CSDL is an XML format that describes the structure and semantics of Entity Data Model schemas.

The following examples illustrate the structure of a schema based on CSDL. This schema defines metadata of an OData data source that provides the Northwind service. The service URI is <http://services.odata.org/Northwind/Northwind.svc/> ➡. To learn more about the concepts that rule an entity data model, see the [CSDL specification](#) ➡.

#### → Remember

The present version of OData driver does not support FunctionImports, AnnotationElements, ReferentialConstraints, and dynamic properties.

### Example: Northwind Service Schema

You access the schema from [http://services.odata.org/Northwind/Northwind.svc/\\$metadata](http://services.odata.org/Northwind/Northwind.svc/$metadata) ➡.

```
<Schema Namespace = "NorthwindModel">
  ...
  <EntityType Name = "Customer">
    <Key>
      <PropertyRef Name = "CustomerID"/>
```

```

</Key>
  <Property Name="CustomerID" Type="Edm.String" Nullable="false" MaxLength="5"
Unicode="true" FixedLength="true"/>
  <Property Name="CompanyName" Type="Edm.String" Nullable="false" MaxLength="40"
Unicode="true" FixedLength="false"/>
  <Property Name="ContactName" Type="Edm.String" Nullable="true" MaxLength="30"
Unicode="true" FixedLength="false"/>
  <Property Name="ContactTitle" Type="Edm.String" Nullable="true" MaxLength="30"
Unicode="true" FixedLength="false"/>
  ...
  <NavigationProperty Name="Orders"
Relationship="NorthwindModel.FK_Orders_Customers" FromRole="Customers"
ToRole="Orders"/>
  <NavigationProperty Name="CustomerDemographics"
Relationship="NorthwindModel.CustomerCustomerDemo" FromRole="Customers"
ToRole="CustomerDemographics"/>
</EntityType>

<Association Name="FK_Orders_Customers">
  <End Role="Customers" Type="NorthwindModel.Customer" Multiplicity="0..1"/>
  <End Role="Orders" Type="NorthwindModel.Order" Multiplicity="*" />
  <ReferentialConstraint>
    ...
  </ReferentialConstraint>
</Association>
...
</Schema>
<Schema Namespace="ODataWeb.Northwind.Model">
  <EntityContainer Name="NorthwindEntities" p7:LazyLoadingEnabled="true"
m:IsDefaultEntityContainer="true">
    ...
    <EntitySet Name="Customers" EntityType="NorthwindModel.Customer"/>
    <EntitySet Name="Employees" EntityType="NorthwindModel.Employee"/>
    <EntitySet Name="Order_Details" EntityType="NorthwindModel.Order_Detail"/>
    <EntitySet Name="Orders" EntityType="NorthwindModel.Order"/>
    <EntitySet Name="Products" EntityType="NorthwindModel.Product"/>
    ...
    <AssociationSet Name="FK_Orders_Customers"
Association="NorthwindModel.FK_Orders_Customers">
      <End Role="Customers" EntitySet="Customers"/>
      <End Role="Orders" EntitySet="Orders"/>
    </AssociationSet>
    <AssociationSet Name="FK_Employees_Employees"
Association="NorthwindModel.FK_Employees_Employees">
      <End Role="Employees" EntitySet="Employees"/>
      <End Role="Employees1" EntitySet="Employees"/>
    </AssociationSet>
    ...
  </EntityContainer>
</Schema>

```

## 6.3.4 OData Driver - Mapping Namespace, Owner and Qualifier

The `Namespace` attribute of the schema is mapped to the model namespace.

The `EntityContainer` is mapped to the database qualifier. The default qualifier is the `EntityContainer` with the attribute `m:IsDefaultEntityContainer` set to `true`.

`EntityContainer` elements are children of `Schema` elements. Since different Schemas can contain the same `EntityContainer`, the database qualifier value is `<Schema_NameSpace>.<EntityContainer_Name>`.

The present version of the driver exposes only one owner, which is called `entities`.

## Example

The namespace of the Northwind service is `odataWeb.Northwind.Model`.

The database qualifier of the Northwind service is `odataWeb.Northwind.Model.NorthwindEntities`.

The database owner of the Northwind service is `entities`.

## 6.3.5 OData Driver - Mapping Tables

The data access driver exposes OData feeds as tables to the information design tool.

An `EntitySet` is mapped to a table. The `Name` attribute of the `EntitySet` is mapped to the table name.

In the OData schema, an `AssociationSet` links two `EntitySets`. An `AssociationSet` is mapped to a table, if the multiplicity of both `EntitySets` is `*`. The `Name` attribute of the `AssociationSet` is mapped to the table name. If at least one of the multiplicities of the `EntityTypes` is `1` or `0..1`, the `AssociationSet` is mapped to a foreign key.

### Example: Mapping EntitySets

The following `EntitySets` of the Northwind service are mapped to tables:

- `Customers`
- `Orders`
- `Products`

### Example: Mapping AssociationSets

The following `AssociationSets` of the Northwind service are also mapped to tables:

- `CustomerCustomerDemo`
- `EmployeeTerritories`

The `CustomerCustomerDemo` `AssociationSet` is mapped to the `CustomerCustomerDemo` table, because the `CustomerCustomerDemo` Association links both `CustomerDemographic` and `Customer` `EntityTypes` with `*` multiplicities.

```
<Association Name="CustomerCustomerDemo">
  <End Role="CustomerDemographics" Type="NorthwindModel.CustomerDemographic"
  Multiplicity="*" />
  <End Role="Customers" Type="NorthwindModel.Customer" Multiplicity="*" />
</Association>
```

## Related Information

[OData Driver - Mapping Keys \[page 70\]](#)

### 6.3.6 OData Driver - Mapping Columns

An EntitySet is defined by an EntityType. An EntityType consists of a series of Properties. A Property of primitive type is mapped to a column of the table that represents the EntitySet. The Name attribute of the Property is mapped to the column name.

A Property of complex type is mapped to a set of table columns. One column corresponds to one subproperty. The column name is the concatenation of the names of the properties of complex type and primitive type, separated by a slash (/). This mapping also applies to nested properties of complex type.

#### Example

The `Orders` table has the `OrderID` column, because the `Order` EntityType has the `OrderID` Property.

The `Customers` table has the `Address`, `CustomerClothes/Suit` and `CustomerClothes/Shoes` columns, because:

- The `Address` Property of the `Customer` EntityType has a primitive type.
- The `CustomerClothes` Property of the `Customer` EntityType has a complex type, which is made of the `Suit` and `Shoes` Properties of primitive type.

### 6.3.7 OData Driver - Mapping Keys

#### Mapping Primary Keys

The Key of an EntityType is mapped to the primary key of the table that maps the corresponding EntitySet. This can be one or more columns.

#### Example

The `Customers` table has a primary key on the `CustomerID` column, because the `Customer` EntityType has a Key that refers to the `CustomerID` Property.

## Mapping Foreign Keys

The OData protocol uses NavigationProperties to expose the join paths of a relational model. NavigationProperties use Roles defined in AssociationSets to link EntitySets according to their multiplicity.

The OData driver represents bidirectional joins as foreign keys. A bidirectional join can be created between tables if EntityTypes of the EntitySets that represent these tables contain NavigationProperties that use the same AssociationSet to link EntitySets. This means that both ends of an AssociationSet must have NavigationProperties in both EntityTypes. Associations that do not meet this condition are not exposed as foreign keys.

If the multiplicity of both EntitySets is \*, the AssociationSet is mapped to a table. If at least one of the multiplicities of the EntityTypes is 1 or 0..1, the AssociationSet is mapped to a foreign key in the table that represents the EntitySet of \* multiplicity. The pattern of a foreign key name is -idref-<NavigationProperty>-<Primary Key>.

### → Remember

Foreign keys are hidden columns in data foundation tables by default, because they do not contain business data. However, you can display them by editing the table and column properties. See the *Information Design Tool User Guide*.

### ⚠ Caution

SAP recommends application users not to query -idref columns, because it may cause a driver performance decrease.

## Example: Foreign Keys of an EntitySet

The Orders table has -idref-Customer-CustomerID, -idref-Employee-EmployeeID, and -idref-Shipper-ShipperID foreign keys because:

- The Order EntityType has the following NavigationProperties.

```
<EntityType Name="Order">
...
  <NavigationProperty Name="Customer"
    Relationship="NorthwindModel.FK_Orders_Customers" FromRole="Orders"
    ToRole="Customers" />
  <NavigationProperty Name="Employee"
    Relationship="NorthwindModel.FK_Orders_Employees" FromRole="Orders"
    ToRole="Employees" />
  <NavigationProperty Name="Shipper"
    Relationship="NorthwindModel.FK_Orders_Shippers" FromRole="Orders"
    ToRole="Shippers" />
</EntityType>
```

- These NavigationProperties refer to the FK\_Orders\_Associations, which link the Order EntityType to Customer, Employee and Shipper EntityTypes. There is one 0..1 multiplicity in each Association. This generates three foreign keys in the table that represents the Orders EntitySet.

```
<Association Name="FK_Orders_Employees">
  <End Role="Employees" Type="NorthwindModel.Employee" Multiplicity="0..1"/>
```

```
<End Role="Orders" Type="NorthwindModel.Order" Multiplicity="*" />
</Association>
```

- The CustomerID in -idref-Customer-CustomerID comes from the primary key of the Customers table.
- The EmployeeID in -idref-Employee-EmployeeID comes from the primary key of the Employees table.
- The ShipperID in -idref-Shipper-ShipperID comes from the primary key of the Shippers table.

## Example: Foreign Keys of an AssociationSet

The CustomerCustomerDemo table has the -idref-CustomerDemographics-CustomerTypeID and -idref-Customers-CustomerID foreign keys because:

- The Customer EntityType has a CustomerDemographics NavigationProperty.

```
<EntityType Name="Customer">
...
  <NavigationProperty Name="CustomerDemographics"
    Relationship="NorthwindModel.CustomerCustomerDemo" FromRole="Customers"
    ToRole="CustomerDemographics" />
</EntityType>
```

- The CustomerDemographic EntityType has a Customers NavigationProperty.

```
<EntityType Name="CustomerDemographic">
...
  <NavigationProperty Name="Customers"
    Relationship="NorthwindModel.CustomerCustomerDemo"
    FromRole="CustomerDemographics" ToRole="Customers" />
</EntityType>
```

- The NavigationProperties refers to the CustomerCustomerDemo Association, which links Customer and CustomerDemographic EntityTypes. This generates two foreign keys in the table that represents the CustomerCustomerDemo AssociationSet.

```
<Association Name="CustomerCustomerDemo">
  <End Role="CustomerDemographics" Type="NorthwindModel.CustomerDemographic"
    Multiplicity="*" />
  <End Role="Customers" Type="NorthwindModel.Customer" Multiplicity="*" />
</Association>
```

- The CustomerID in -idref-Customers-CustomerID comes from the primary key of the Customers table.
- The CustomerTypeID in -idref-CustomerDemographics-CustomerTypeID comes from the primary key of the CustomerDemographics table.

## 6.3.8 OData Driver - Mapping Documentation Elements

Depending on availability, either Summary or LongDescription subelements of Documentation are mapped to descriptions of relational model entities.



A Documentation subelement of EntitySet and AssociationSet is displayed as the table description in the information design tool. A Documentation subelement of Property or NavigationProperty is displayed as the column description. If there is no Summary or LongDescription, then the Description field remains empty.

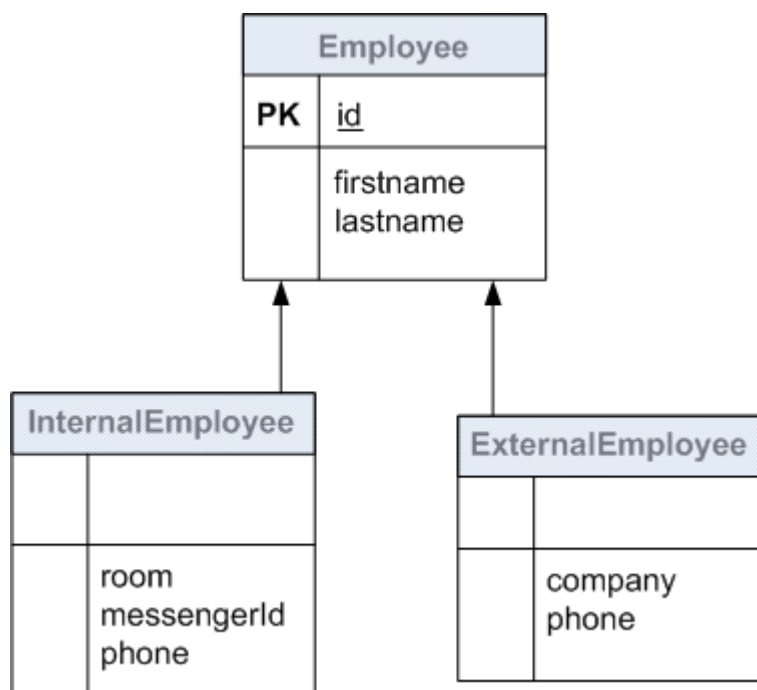
Descriptions are not localized.

## 6.3.9 OData Driver - Mapping Entities of Derived Types

The following example illustrates an EntitySet of type Employee.

```
<EntitySet Name="Employees" EntityType="Employee" />
```

The following diagram shows the inheritance concept between one base type Employee, and two derived types, ExternalEmployee and InternalEmployee. The derived types inherit from all properties of the base type. They also define additional properties, which are called direct properties.



For a specific EntitySet, the result schema is the result of a merge to one general type. The following diagram shows the Employee table as represented in the relational model.

Employee	
<b>PK</b>	<u>id</u>
	firstname lastname InternalEmployee_room InternalEmployee_messengerId InternalEmployee_phone ExternalEmployee_company ExternalEmployee_phone

The `Employee` table of the relational model will contain information from both entities, that is, columns of the parent type and of the derived types. To prevent naming conflicts, columns declared in derived types are prefixed with the name of the `EntityType`. They can also contain the null value.

## 6.3.10 Monitoring the OData Driver Performance

You may consider the following behaviors of the OData driver to improve the performance of the connection at query execution.

### Executing Operations on Client or Provider Side

When creating a connection, you can choose to execute some operations of the SQL query at the driver or provider level. The following table shows the parameters of the connection wizard that control this behavior.

If a parameter is selected, the OData service provider handles the corresponding operation if it can support it. This is the default behavior. If unselected, the OData driver handles the operation.

#### Caution

SAP recommends that you do not use the data access driver to execute these operations, because it can reduce the connection performance. Since the full data set needs to be transferred to the client, response time increases. Use it only if the OData service provider does not support or partially supports the operation.

Parameter	Operation	Impact on Performance
<i>Column Selection</i>	SELECT	If the parameter is unselected, the OData driver handles the SQL projection, which increases the data traffic significantly.

Parameter	Operation	Impact on Performance
<i>Supported Filter Conditions</i>	WHERE	<p>You can execute some filtering operations at the driver level if the OData standards do not support them. However, filters on the provider usually reduce query execution time.</p> <p>The Data Access layer applies the following logic to improve performance: any filtering condition compatible with OData standards is pushed to the OData provider. The OData driver executes any other incompatible filter that the WHERE clause may contain. See the example below.</p>
<i>Sorting</i>	ORDER BY	The OData provider executes the ORDER BY operation if no DISTINCT or GROUP BY expression is used in the query. If a query contains either a DISTINCT or a GROUP BY expression, then the driver has to perform the sorting operation, which increases the execution time.

#### Note

- The ORDER BY operation depends on the `Bucket Split Size` SBO parameter when it is performed by the driver.
- The BETWEEN operator is mapped to OData comparison functions, then executed by the OData provider.
- The LIKE and NOT LIKE operators are usually executed on the client. However, they are translated into the `startsWith` and `endsWith` OData functions, if only one % pattern is placed at the end or at the beginning of the filter value respectively.

## Example: Supporting Filter Expressions

The following query contains two filter conditions in the WHERE clause:

```
SELECT * FROM T1 WHERE col1='San Francisco' AND col2 LIKE 'S%n'
```

The OData provider can handle the first part of the clause, but not the second one. The OData driver then executes `col2 LIKE 'S%n'`, while the provider executes `col1='San Francisco'`.

## Example: Mapping the startsWith and endsWith Functions

The following SQL query returns the Sales employees who live on boulevards.

```
SELECT * FROM EMPLOYEES WHERE EMPLOYEES."Title" LIKE 'Sales %' AND  
EMPLOYEES."Address" LIKE '% Blvd.'
```

It corresponds to the URI below:

```
http://services.odata.org/Northwind/Northwind.svc/Employees?  
$filter=startswith(Title,'Sales')&endswith(Address,'Blvd.')
```

## Executing Aggregate Functions

The `COUNT` database function is the only aggregate function that the OData 2.0 protocol supports. Other aggregate functions and grouping triggered by the `GROUP BY` clause are executed on the client. However, if the driver performs calculations that modify the result before the count is computed, the `COUNT` function must also be executed on the client. This can decrease the connection performance.

## Setting the Connection Timeout Parameter

You can choose the value of the [Connection Timeout](#) parameter in the connection wizard to fine-tune the driver performance. It specifies the time in seconds a connection remains active in case of no response from the data source.

You have to choose the best parameter value for the best performance. For example, if you connect to a data source with a high response time, you may choose a high value for [Connection Timeout](#) to wait for the server response and not to raise an error too early. If your data source is usually fast, you may choose a low value, not to wait too long for an error if the server does not respond.

## Using the Cache Metamodel

The [Cache MetaModel](#) parameter is selected by default in the connection wizard. It allows you to retrieve the metadata model only once for the duration of the connection in the connection pool, instead of doing it at each query execution. This results in a performance increase of the connection.

### Note

You must enable the connection pooling if the metadata model is cached.

## Related Information

[OData Driver Capabilities \[page 66\]](#)

## 6.3.11 OData Driver - Nontrivial Behaviors and Restrictions

### Sorting Algorithms

Sorting algorithms may differ from one service provider to another. This can lead to different results when `ORDER BY` is used in the query.

Since the OData driver may execute sorting operations using its own algorithm, the use of combined operations such as ORDER BY, GROUP BY and DISTINCT may also lead to different sort orders.

## Mapping the Max Rows Parameter

The \$top OData function is mapped to the Max Rows parameter of the Query Panel, only if the query operations do not modify the number of rows. Query results can be erroneous if a filter is applied, which removes some rows from the expected \$top result.

## Example

The following OData query returns the first 15 rows from the Orders table:

```
http://services.odata.org/Northwind/Northwind.svc/Orders?$top=15
```

The following query returns the first 15 rows where the shipment city is "Reims". This returns only 5 rows:

```
http://services.odata.org/Northwind/Northwind.svc/Orders?
$top=15&$filter=ShipCity eq 'Reims'
```

## Restrictions to the COUNT Function

A row count on a table in the information design tool is semantically counting rows that contain non-null values for the defined columns. Some Azure services return only the total number of rows in one table. This may cause a discrepancy between expected and actual query results.

## Restrictions to the SAP Gateway Services

If the Gateway service provider does not support filters on all columns, you must not select [Supported Filter Conditions](#) when creating the connection. If it does not support sorting on all columns, you must not select [Sorting](#) when creating the connection.

The schema may indicate these filtering and sorting restrictions with the help of the sap:filterable and sap:sortable metadata. In the present version, the OData driver does not map these attributes.

Some providers may not offer a full table scan capability on all tables. This can lead to runtime errors, for example if one of the tables involved in a JOIN cannot be scanned.

SAP recommends that you create connections to the SAP ERP system directly to avoid issues with ad hoc queries.

## 6.3.12 OData Driver - Configuring Column Maximum Size

For some properties, the `MaxLength` parameter may have the value `Max`. For example:

```
<Property Name="Synopsis" Type="Edm.String" Nullable="true" MaxLength="Max"
Unicode="true" FixedLength="false"/>
```

Since the OData driver cannot recognize this nonnumeric value, it has to be configured. The `cs.cfg` configuration file provides the following parameters:

- `Binary Max Length` to set the maximum size of table columns whose type is binary
- `String Max Length` to set the maximum size of table columns whose type is string

### Related Information

[Binary Max Length \[page 195\]](#)

[String Max Length \[page 206\]](#)

## 6.3.13 Authenticating OData Sources

Access to some OData data sources requires authentication. An application can authenticate to an OData data source using the following methods:

- HTTP basic authentication, which uses a username and a password. Credentials are not encrypted.
- A GET access token, that is, a {key, value} pair appended to the service URI. The token key and value can vary according to the service. Set the token through custom parameters by using [Custom Authentication Parameters](#) in the connection wizard. Use the following pattern: `<<key>>=<<value>>`.

#### ⓘ Note

The Data Access layer does not provide traces for custom authentication parameters, because they contain security information. They are replaced with `<CUSTOM_AUTH_PARAMS>` in the OData driver traces. However, consider using other tracing levels such as the [Enable Job Tracing](#) option in the CMC to display the parameters.

### Example: Access Token

```
http://wine.cloudapp.net/Regions?apikey=<api key value>.
```

## Authenticating Microsoft Azure Data Sources

You connect to a Microsoft Azure data set using the HTTP basic authentication. In the connection wizard, enter the account key as password. You can leave the username blank.

### 6.3.14 Tracing the OData Driver Activity

The Data Access layer traces the OData driver with the PATH and DEBUG severity levels. The PATH traces contain the entries and exits of each method used in query planning and execution. It allows you to find out whether the OData driver or the OData provider has executed a query operation and where the cause of a problem can be.

The information contained in the URI (the data source credentials, the proxy server credentials and the custom authentication parameters) is blanked out in driver traces.

## 6.4 SAP ERP Driver

The Data Access layer allows the BI platform to connect to SAP ERP systems through the SAP Java Connector (JCo) 3.x network layer. It provides a data access driver that allows access to the following ERP objects:

- InfoSets
- SAP Queries
- ABAP functions

For more information about supported SAP ERP systems, see the *Product Availability Matrix*.

SAP ERP connectivities support single sign-on (SSO) on all platforms. For more information about authentication, see the *SAP BusinessObjects Business Intelligence platform Administrator Guide*.

SAP ERP connectivities also support Preferred Viewing Locale (PVL) for all authentication modes. You deactivate the use of PVL by checking [Save Language](#) when creating the connection.

You can find the driver configuration files in the `<connectionserver-install-dir>\connectionServer\jco` directory. The `jco.prm` file lists the data access driver capabilities in terms of database operations.

The connection wizard provides a workflow to enter the necessary information to connect to SAP ERP systems.

## Related Information

[Single Sign-On Support \[page 24\]](#)

## 6.4.1 SAP ERP Driver Capabilities

The data access driver supports the following querying capabilities:

- Basic operations (SELECT, WHERE, ORDER BY, GROUP BY, and AS)
- Basic operators (=, !=, <, <=, >, >=, BETWEEN, NOT BETWEEN, IN, NOT IN, AND, OR) whose operands can be either column names or constant values
- DISTINCT clause within the SELECT statement
- Constant values within the SELECT statement
- LIKE and NOT LIKE accepts escape characters
- Nested queries within the FROM clause

The Data Access layer performs the sorting operations internally.

### ⓘ Note

The data access driver does not allow ordering columns by index in SQL statements. Only ORDER BY with column names is a valid clause. The `ORDER_BY_SUPPORTS_COLUMN_INDEX` parameter is set to NO in the `jco.prm` file.

## Related Information

[Local Disk Used as a Cache for Sorting Operations \[page 106\]](#)

[ORDER\\_BY\\_SUPPORTS\\_COLUMN\\_INDEX \[page 236\]](#)

## 6.4.2 SAP ERP Driver - Access to InfoSets and SAP Queries

### About InfoSets and SAP Queries

In the SAP ERP system, InfoSets and SAP Queries are organized within either a local work area or a global work area. Objects within the local work area can only be accessed by the SAP ERP client used, whereas objects of the global work area can be accessed by all clients. An SAP Query is created in a user group and belongs to it.

For more information about work areas and user groups, refer to your SAP ERP documentation.

### Object Mapping

The data access driver exposes InfoSets and SAP Queries as tables to the Information Design Tool. InfoSets and SAP Queries are made of a series of fields, which are mapped to table columns. Fields are used in SELECT statements.

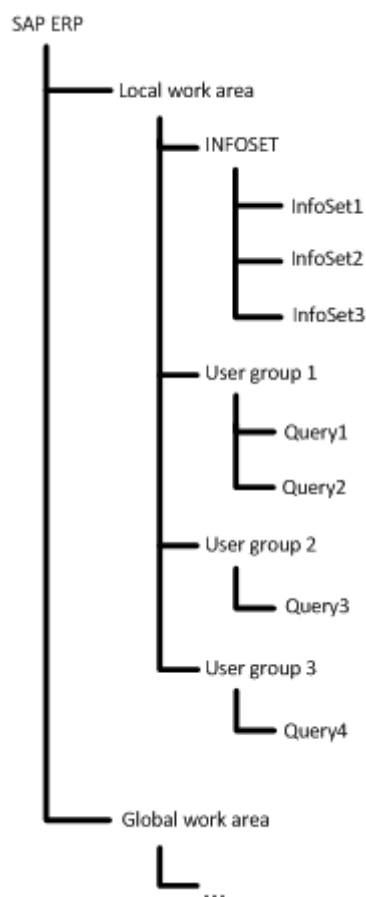
At driver level, work areas are mapped to qualifiers. The default qualifier corresponds to the Local work area.



User groups are mapped to owners. User groups of a work area are then placed beneath a qualifier that represents this work area.

InfoSets of a work area are placed beneath a qualifier that represents this work area and beneath a fictive owner called `INFOSET`. SAP Queries of a work area are placed beneath the qualifier that represents this work area. SAP Queries of a user group are placed beneath the owner that represents this user group.

The organization of InfoSets and SAP Queries in a work area is depicted in the figure below:



Fields are mapped to table columns. An InfoSet or an SAP Query contains fields that are both projection and selection fields. It also contains selection fields that are not used for projection. When you create a connection with the connection wizard, you choose whether these selection fields are represented as table columns. The [Map Selection Fields into Table Columns](#) parameter addresses this functionality. If selected, then the field is mapped as an optional input column. If unselected, the selection field is ignored, and no filtering is possible on this field.

#### Note

There is no specific mapping for obligatory selection fields. The application user must query these fields with filters.

## Input Columns

Input columns of a table are columns on which an equal condition (= operator) must be given when the application user queries the table. Only equal conditions are allowed on input columns. `IN` conditions are forbidden.

In the information design tool, the user can view input columns as mandatory or optional. A mandatory input column is a column for which it is mandatory to set a value. An optional input column is a column for which it is not mandatory to set a value.

If the user does not set any value to an optional input column in a query, then Connection Server returns one of the following:

- No value if the optional input column has no default value
- The default value if the optional input column has a default value

## Driver Capabilities

When the application user queries an InfoSet, some database operations are passed to the SAP ERP system (SELECT, WHERE, sorting only with ORDER BY columns, and AS), while others are handled internally by the driver (other filtering with WHERE, GROUP BY, DISTINCT and sorting only with ORDER BY aggregate functions).

When the application user queries an SAP Query, some operations are also passed to the ERP system. These are SELECT, WHERE, ORDER BY (only if the SAP query already contains the same sorting) and AS.

For more information on the operations directly managed by the system, see your SAP ERP system documentation.

### 6.4.3 SAP ERP Driver - Access to ABAP Functions

#### → Remember

The SAP ERP driver allows you to create connections to released and unreleased ABAP functions.

## ABAP Function Concepts

ABAP functions are made of a series of parameters that can either be input parameters used in function calls, or output parameters, which are contained in call responses. In SAP terminology, input parameters are called import, whereas output parameters are called export. Some parameters can be both input and output. They are called changing parameters. Besides import, export and changing parameters, there are also table parameters, which can be considered as a type of changing parameters.

An ABAP function parameter can have the following type:

- Field of primitive ABAP type
- Structure, which is a sequence of several fields
- Table, which can either be made of fields, structures, or even tables

## Object Mapping

The data access driver exposes ABAP functions as tables to the information design tool. At driver level, ABAP function groups are mapped to owners and ABAP functions are mapped to a qualifier called `ABAPFunction`. This means each ABAP function is placed beneath a specific owner, which corresponds to a function group in the SAP ERP system.

Import, changing, and table parameters used as input are mapped to input columns. Export, changing, and table parameters used as output are mapped into tables. Input columns can either be mandatory or optional. The Data Access layer considers these parameters as primary key attributes, which are not nullable.

The driver maps ABAP function parameters as follows:

- A mandatory parameter is mapped to a mandatory input column. The user has to set a value to this column.
- An optional parameter that has a default value is mapped to an optional input column. The user does not have to set a value to this column. The value returned to Connection Server by the data source in that case is the default value.
- An optional parameter with no default value is also mapped to an optional input column. Connection Server returns the following values of string data type, depending on the SQL type of the input column:

SQL Type	Value
SQL_Integer	0
SQL_Char, SQL_VarChar, SQL_Binary	An empty string
SQL_Double, SQL_Float, SQL_Numeric	0 . 0
SQL_Date	00010101
SQL_Time	000000
Any other type	An empty string

### Note

The driver appends a `<column_name>-ID` column to the table which the ABAP function is mapped into and another `<column_name>-IDREF` to the table if it contains a reference to another table.

## Column Renaming

Column names are renamed at driver level. The following table shows the prefixes added to the columns.

Input or Output	Parameter	Prefix
Input	Import	- IMPORT_
Input	Changing	- IMPORT_CH_
Input	Table	- IMPORT_CH_
Output	Changing	- EXPORT_CH_
Output	Table	- EXPORT_CH_

#### 📌 Note

When an output table parameter (A) is made of another table (B), both tables are renamed -EXPORT\_CH\_A and -EXPORT\_CH\_A.B respectively.

## Driver Capabilities

All database operations (SELECT, WHERE, ORDER BY, GROUP BY, AS, etc.) are handled internally by the driver, while equal conditions on input columns are passed to the SAP ERP system.

#### → Remember

The driver only accepts tables with one single row as input parameters. They are equivalent to input structures.

- When you create a connection in the connection wizard, you set whether a changing parameter of table type or a table parameter is considered as both input and output. The [Map Table Parameters into Input Columns](#) parameter addresses this functionality. If checked, the parameter is both input and output. In this case, it can only be a structure as input. If not checked, the parameter is only considered as an output parameter.
- The driver considers fields of an optional input structure as optional input columns. Input columns are considered optional as a whole, that is, if a column has a value, the others must also have a value. The application user must ensure all columns have a value.
- Some ABAP function parameters may have values whose size is reported to be equal to zero by the SAP ERP system. The driver uses the `String Max Length` parameter of the `cs.cfg` file to set a string maximum length to the table columns that are mapped to these parameters.

## Related Information

[String Max Length \[page 206\]](#)

## 6.4.4 SAP ERP Driver Restrictions

- You cannot query ERP objects based on ABAP programs that involve a SAPGUI processing, because they cannot be accessed using Remote Function Calls.
- The JCo API does not support array fetch. This means the result data is returned all at once. To restrict the number of resulting rows and to avoid an out-of-memory issue, the application user has to filter data appropriately. Regardless of this restriction, Connection Server still applies array fetch.

### Note

The application user can also set a value to `Max Rows` in the Query Panel. However, the SAP ERP system does not take `Max Rows` into account if the universe defined is multisource or if the query requires computations after data is fetched (SELECT DISTINCT, ORDER BY, and GROUP BY).

- The `ERP_Max_Rows` parameter of the `jco.sbo` configuration file allows the application user to query without filter an InfoSet or an SAP Query table that only contains numerical data type columns. The user can also query a table containing numerical and DATS data type columns. This parameter is also used when `Max Rows` is not passed to the SAP ERP system. `ERP_Max_Rows` can be used with single-source and multisource universes. Set `ERP_Max_Rows` to an appropriate value to avoid out-of-memory issues.

### Note

In the case of a multisource universe, you can also set a value to the `Max Rows` parameter of the Query Panel of the data federation administration tool. See the *Data Federator Administration Tool Guide* for more information.

## Related Information

[Array Fetch Size \[page 193\]](#)

[ERP Max Rows \[page 210\]](#)

## 6.5 XML Driver

The Data Access layer allows the BI platform to connect to XML documents as data sources.

XML documents are based on XML schemas. An XML schema is an XSD document that defines the metadata of an XML data source.

The connection wizard provides a workflow to enter the necessary information to connect to XML data sources. XML data sources show up under `XML Files DBMS` and `XML File Connector NetworkLayer`.

You can find the driver configuration files in the `<connectionserver-install-dir>\connectionServer\xml` directory. The `xml.prm` file lists the data access driver capabilities in terms of database operations and functions.

## 6.5.1 XML Driver Capabilities

The data access drivers support the following querying capabilities:

- Basic database operations (SELECT, WHERE, ORDER BY, GROUP BY, DISTINCT)
- Column aliases within the ORDER BY clause (AS)
- Nested queries within the FROM clause
- Filtering operators ( =, !=, <, <=, >, >=, AND, OR, BETWEEN, NOT BETWEEN, IN, NOT IN, LIKE, NOT LIKE, IS NULL, IS NOT NULL)

The data access driver does not support JOIN operations.

The data access driver supports the MIN, MAX, AVG, SUM, and COUNT grouping functions in SELECT statements.

## Related Information

[Local Disk Used as a Cache for Sorting Operations \[page 106\]](#)

## 6.5.2 XML File Location

XML documents used as data sources can be either local or remote. For files on remote systems, the HTTP, FTP, and SMB protocols are supported. The present release also supports the HTTPS and FTPS encrypted protocols based on one certificate.

### Note

SMB is the standard file sharing protocol on Microsoft Windows. Since the jCIFS library provides access to the protocol, you must install the jCIFS JAR file in the Connection Server directory, that is `<connectionserver-install-dir>\connectionServer\sharedLibraries\jcifs`. The version to install is 1.3.15. It is available at <http://jcifs.samba.org/> 📄.

You can set whether the data source is local or remote using the *Location Type* parameter of the connection wizard. If the data source is remote, you can also set the protocol used through the *Protocol* parameter of the wizard. The *Protocol* value must match the protocol specified in the *Filepath or Pattern* parameter value.

## Example: XML File Paths

- `C:\xml\report.xml` or `xml/report.xml` for a local file
- `http://server:8080/path/report.xml` for a file accessible through HTTP
- `ftp://server/path/` for files accessible through FTP
- `smb://server:port/myshare/mydirectory` for files accessible through SMB

## Related Information

[CSV File Location \[page 63\]](#)

### 6.5.3 XML Document and Schema Example

The following examples illustrate the structure of an XML document called `clubdemo.xml` and based on the `clubdemo.xsd` schema.

#### Example: clubdemo.xml Document

```
<?xml version="1.0" encoding="UTF-8"?>
<ClubDemo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="clubdemo.xsd">
  <Countries>
    <Country name="France"/>
    <Country name="US"/>
  </Countries>

  <Customers>
    <Customer ID="204">
      <Name type="first">Christine</Name>
      <Name type="last">Martin</Name>
      <Age>25</Age>
      <Address>12, allée Victor Hugo</Address>
      <ZIP>75016</ZIP>
      <City>Paris</City>
      <Country name="France"/>
      <Invoice>1234</Invoice>
    </Customer>
    <Customer ID="103">
      <Name type="first">Peter</Name>
      <Name type="last">Travis</Name>
      <Age>34</Age>
      <Address>7835 Hartford Drive</Address>
      <ZIP>06108</ZIP>
      <City>Springfield</City>
      <Country name="US"/>
      <Invoice>23204</Invoice>
    </Customer>
    <Customer ID="106">
      <Name type="first">William</Name>
      <Name type="last">Baker</Name>
      <Age>64</Age>
      <Address>2890 Grant Avenue</Address>
      <ZIP>20020</ZIP>
      <City>Washington DC</City>
      <Country name="US"/>
      <Invoice>35306</Invoice>
      <Invoice>44106</Invoice>
    </Customer>
  </Customers>
</ClubDemo>
```

## Example: clubdemo.xsd Schema

```
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:element name="ClubDemo">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="Countries"/>
        <xs:element ref="Customers"/>
      </xs:sequence>
    </xs:complexType>
    <xs:key name="countkey">
      <xs:selector xpath="Countries/Country"/>
      <xs:field xpath="@name"/>
    </xs:key>
    <xs:key name="custkey">
      <xs:selector xpath="Customers/Customer"/>
      <xs:field xpath="@ID"/>
    </xs:key>
    <xs:keyref name="custkeyref" refer="countkey">
      <xs:selector xpath="Customers/Customer"/>
      <xs:field xpath="Country/@name"/>
    </xs:keyref>
  </xs:element>
  <xs:element name="Countries">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="Country" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="Country">
    <xs:complexType>
      <xs:attribute name="name" type="xs:string"/>
    </xs:complexType>
  </xs:element>
  <xs:element name="Customers">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="Customer" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="Customer">
    <xs:complexType>
      <xs:sequence>
        <xs:element name="Name" maxOccurs="2">
          <xs:complexType>
            <xs:simpleContent>
              <xs:extension base="xs:string">
                <xs:attribute name="type" type="xs:string"/>
              </xs:extension>
            </xs:simpleContent>
          </xs:complexType>
        </xs:element>
        <xs:element name="Age" type="xs:integer"/>
        <xs:element name="Address" type="xs:string"/>
        <xs:element name="ZIP" type="xs:string"/>
        <xs:element name="City" type="xs:string"/>
        <xs:element name="Country">
          <xs:complexType>
            <xs:attribute name="name" type="xs:string"/>
          </xs:complexType>
        </xs:element>
        <xs:element name="Invoice" type="xs:integer" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:attribute name="ID" type="xs:integer"/>
    </xs:complexType>
  </xs:element>
</xs:schema>
```



```
</xs:complexType>
</xs:element>
</xs:schema>
```

## 6.5.4 XML Driver - Mapping Multiple Files

You can connect to multiple files if the *Filepath or Pattern* parameter of the connection wizard is set to a pattern, for example `clubdemo_*.xml`, which is matched by files such as `clubdemo_1.xml` and `clubdemo_2.xml`.

### → Remember

You cannot connect to multiples files located on an HTTP server. The HTTP protocol does not support the use of wildcards in patterns.

If the *Merge Files into One* parameter is selected in the connection wizard, identical tables from multiple XML files are merged into one table. The name of the table qualifier is the full path of the pattern, for example `C:\files\xml\clubdemo_*.xml`. It is assumed that all files have the same schema.

If the parameter is not selected, tables are not merged as they do not belong to the same qualifier. Every XML document is then mapped to a database qualifier. The name of the qualifier is the full path of the XML file, for example `C:\files\xml\clubdemo_1.xml`. In that case, each XML file can have its own schema.

No data is mapped to database owners.

## 6.5.5 XML Driver - Mapping Tables

The data access driver exposes XML files as tables to the information design tool.

The XML document root is mapped to a table.

Elements that have `maxOccurs` value greater than 1 are mapped to tables.

The name of the table mapped to an element is the concatenation of all the element names between the root and the element, separated with a slash (/).

### Example

The `clubdemo.xml` document is mapped to the following tables:

- `ClubDemo`
- `ClubDemo/Countries/Country`
- `ClubDemo/Customers/Customer`
- `ClubDemo/Customers/Customer/Invoice`
- `ClubDemo/Customers/Customer/Name`

## Related Information

[XML Document and Schema Example \[page 87\]](#)

### 6.5.6 XML Driver - Mapping Columns

The following objects under an XML element are mapped to columns of the table that represents this element:

- Attributes
- Elements of either `simpleType` or `complexType` with a `simpleContent` element
- Texts which are in a mixed element, that is, whose type defines `mixed=true`
- `any` and `anyAttribute`

If the column represents an attribute, its name is the concatenation of the names of all the elements starting with (but not including) the element with `maxOccurs` greater than 1, up to and including the element hosting this attribute. The attribute name is prefixed with @, to avoid name conflicts with other elements.

If the column represents an element, its name is the concatenation of the names of all the elements starting with (but not including) the element with `maxOccurs` greater than 1.

If the column represents the same element as its table, its name is the element name.

The separator used in concatenations is the slash (/).

Element names are prefixed with a hyphen (-) when they represent parent elements used in paths to build foreign keys.

The following mapping examples refer to the topic on the example of XML document and schema.

### Example

The `ClubDemo` table has the following column:

- `-id`

### Example

The `ClubDemo/Countries/Country` table has the following columns:

- `@name`
- `-Countries/-ClubDemo/-id`

## Example

The `ClubDemo/Customers/Customer` table has the following columns:

- `Age`
- `Address`
- `ZIP`
- `City`
- `Country/@name`
- `@ID`
- `-Customers/-ClubDemo/-id`

## Example

The `ClubDemo/Customers/Customer/Invoice` table has the following columns:

- `-id`
- `Invoice`
- `-Customers/@ID`

## Example

The `ClubDemo/Customers/Customer/Name` table has the following columns:

- `-id`
- `Name`
- `@type`
- `-Customer/@ID`

In the XML schema, `name`, `type`, and `ID` are attribute names of the `Country`, `Name`, and `Customer` elements respectively. The `Invoice` and `Name` columns represent the `Invoice` and `Name` elements respectively. See the topic on mapping primary and foreign keys to learn about the meaning of the other column names.

## Related Information

[XML Document and Schema Example \[page 87\]](#)

[XML Driver - Mapping Primary and Foreign Keys \[page 92\]](#)

[XML Driver - Mapping anyType and simpleType \[page 96\]](#)

## 6.5.7 XML Driver - Mapping Primary and Foreign Keys

### Primary Keys

The following rules apply to mapping primary keys:

- The driver generates the primary key of the table that maps the document root. The associated column is called `-id` and the column value is the document name.
- An attribute or element of type "`xs:ID`" is mapped to a column that represents a primary key.

If the XML schema defines a key with `<xs:key>`, the following rules apply:

- If the key is defined at the root level and if the selector contains an element that has a `maxOccurs` value greater than 1, then the key is mapped to the primary key of the corresponding table.
- If the key is not defined at the root level, then the primary key of the table is the combination of the primary key of the parent element and the field of the key.

If the schema does not define a primary key for a selector element that has a `maxOccurs` value greater than 1, a column with name `-id` is added to the table as primary key.

### Example: Document Root

The `ClubDemo` element is the root of `clubdemo.xml` document. The `-id` column is created and defined as the primary key of the `ClubDemo` table. The `-id` column value is `clubdemo.xml`.

### Example: Explicit Key

The following key set at the root level defines the `@name` column of the `ClubDemo/Countries/Country` table as primary key:

```
<xs:key name="countkey">
  <xs:selector xpath="Countries/Country"/>
  <xs:field xpath="@name"/>
</xs:key>
```

The `ClubDemo/Customers/Customer` table has the `@ID` column as primary key, because the schema defines the `custkey` explicit key:

```
<xs:key name="custkey">
  <xs:selector xpath="Customers/Customer"/>
  <xs:field xpath="@ID"/>
</xs:key>
```

## Example: No Explicit Key

The `ClubDemo/Customers/Customer/Invoice` table has an `-id` column as primary key, because the schema does not define a key for this element.

## Foreign Keys

If the XML schema defines a key reference with `<xs:keyref>`, and if the key reference is defined at the same level as the key it references, then the key reference is mapped to a foreign key of the corresponding table.

For each table that corresponds to an element which is not the root, the foreign key is built from the primary key columns of its parent table and the reverse path from the element to its parent. This enables the mapping of the relationships between parent and child elements.

### ⚠ Restriction

Although data foundations expose foreign keys, the XML driver does not support JOIN operations.

## Example: Keyref

The `ClubDemo/Customers/Customer` table has the following foreign keys:

- `Country/@name`, which is the field of the following keyref:

```
<xs:keyref name="custkeyref" refer="countkey">
  <xs:selector xpath="Customers/Customer"/>
  <xs:field xpath="Country/@name"/>
</xs:keyref>
```

Note that `countkey` is the explicit key defined for a table which is not a parent.

- `-Customers/-ClubDemo/-id`, which is built from the reverse path to its parent table and the primary key of the parent table

## Example: No Keyref

The `ClubDemo/Customers/Customer/Invoice` table has `-Customer/@ID` column defined as a foreign key, which is built from the primary key column of the parent table and the reverse path to its parent table.

## Related Information

[XML Document and Schema Example \[page 87\]](#)

[XML Driver - Mapping Columns \[page 90\]](#)

## 6.5.8 XML Driver - Mapping Mixed Elements

The whole content of a mixed element is mapped to a table column. This includes its children and all data between the children.

Attributes of a mixed element are mapped to columns, independently of how the element is mapped.

### Example

In this example, the `documentation` element has a `complexType` made of three child elements (`name`, `datatype` and `location`).

```
<documentation>
  The <name>XML driver</name> allows you to retrieve <datatype>XML</datatype>
  data
  from documents located on a <location>remote server</location>.
</documentation>
```

The Data Access layer maps such elements as follows:

- The `documentation` element is mapped to a table column.
- The `documentation` element content becomes the column data, including its children and all data between the children. In the example, the column contains the following row:

```
The <name>XML driver</name> allows you to retrieve <datatype>XML</datatype>
data from documents located on a <location>remote server</location>.
```

## 6.5.9 XML Driver - Mapping Recursive Elements

The following schema defines recursive elements:

```
<xs:element name="parent">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="child" minOccurs="0" maxOccurs="5"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="child">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="parent" minOccurs="0" maxOccurs="2"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
```

The XML driver maps the first `parent` element and the `child` element to tables and ignores the `parent child`.

## 6.5.10 XML Driver - Mapping any and anyAttribute

### Example: XSD Schema with any

```
<xs:element name="documentation">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="name" type="xs:string"/>
      <xs:element name="datatype" type="xs:string"/>
      <xs:any minOccurs="0" maxOccurs="1"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
```

- The name and datatype are mapped to columns
- The any element is mapped to the -any column

### Example: XML File with any

```
<documentation>
  <name>Data Access Guide</name>
  <datatype>XML</datatype>
  <audience>
    <type>External</type>
    <name>Administrator</name>
  </audience>
</documentation>
```

The -any column data is the element name and its content. In the example, it contains the following row:

```
<audience><type>External</type><name>Administrator</name></audience>
```

#### ⚠ Restriction

If the any element has maxOccurs greater than 1, the XML driver only maps to the -any column the first element name encountered when parsing the XML document. Other element names are ignored.

In the following example, <format>PDF</format> is ignored.

```
<documentation>
  <name>Data Access Guide</name>
  <datatype>XML</datatype>
  <audience>
    <type>External</type>
    <name>Administrator</name>
  </audience>
  <format>PDF</format>
</documentation>
```

## Example: XSD Schema with anyAttribute

```
<xs:element name="documentation">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="name" type="xs:string"/>
      <xs:element name="datatype" type="xs:string"/>
    </xs:sequence>
    <xs:anyAttribute/>
  </xs:complexType>
</xs:element>
```

- The name and datatype are mapped to columns
- The anyAttribute element is mapped to the -@anyAttribute column

## Example: XML File with anyAttribute

```
<documentation myAttribute="ConnectionString">
  <name>Data Access Guide</name>
  <datatype>XML</datatype>
</documentation>
<documentation myAttribute="DataFederator">
  <name>Data Federator User Guide</name>
  <datatype>any</datatype>
</documentation>
```

The -@anyAttribute column data is the element attribute name and its value. In the example, the column data contains the two following rows:

```
myAttribute="ConnectionString"
myAttribute="DataFederator"
```

## 6.5.11 XML Driver - Mapping anyType and simpleType

The following sections show how anyType and specific arrangements of simpleType in XML schemas are mapped.

### Mapping of anyType Type

The whole content of an element of anyType type is mapped to a table column.



## Example: anyType

In the Club Demo example, the following `Address` element is mapped to the `Address` column.

```
<xs:element name="Address" type="xs:anyType" />
```

## Mapping of Lists of Values

Independently of the base data type of the value, a list of values is always mapped to VARCHAR.

## Example: List of Data Types

The base data type is an integer. The data type of the list of integers is VARCHAR.

```
<intvalues>100 34 56 -23 1567</intvalues>
```

## Mapping of Restrictions to a Type

The value of an element can be restricted to a certain range. This does not impact the data type conversion.

## Example: Restriction

```
<xs:element name="age">
  <xs:simpleType>
    <xs:restriction base="xs:integer">
      <xs:minInclusive value="0"/>
      <xs:maxInclusive value="100"/>
    </xs:restriction>
  </xs:simpleType>
</xs:element>
```

## Mapping of Unions of Types

The XML data type to which the union is mapped is string, that is, CHAR or VARCHAR data types in data foundations.

## Example: Union of Types

```
<xs:element name="jeans_size">
  <xs:simpleType>
    <xs:union memberTypes="xs:string xs:int"/>
  </xs:simpleType>
</xs:element>
```

## 6.5.12 XML Driver - Configuring Column Maximum Size

The `cs.cfg` configuration file provides the following parameters:

- `Binary Max Length` to set the maximum size of table columns whose data type is binary
- `Integer Max Length` to set the maximum size of table columns whose data type is integer, `nonPositiveInteger`, `negativeInteger`, `noNegativeInteger`, and `positiveInteger`
- `String Max Length` to set the maximum size of table columns whose data type is string or any of the following: `anyURI`, `QName`, `NOTATION`, `duration`, `gYearMonth`, `gYear`, `gMonthDay`, `gDay`, `gMonth`, `TYPE_NORMALIZEDSTRING`, `token`, `language`, `Name`, `NCName`, `XSD_TYPE_ID`, `IDREF`, `IDREFS`, `ENTITY`, `ENTITIES`

## Related Information

[Binary Max Length \[page 195\]](#)

[Integer Max Length \[page 201\]](#)

[String Max Length \[page 206\]](#)

## 6.6 Web Service Driver

The Data Access layer allows the BI platform to connect to services available on the Internet over HTTP or FTP. It provides a data access driver called Web Service driver to communicate with web services using SOAP 1.1 messages.

Web services are defined in documents which describe data types, messages, and bindings with the Web Services Description Language (WSDL) 1.1.

The Web Service driver supports web services of SOAP 1.1 binding and `document` or `rpc` style with `literal` body. For example:

```
<wsdl:operation ...>
  <soap:operation ... style="document"/>
  <wsdl:input>
    <soap:body use="literal"/>
  </wsdl:input>
  ...
</wsdl:operation>
```

```
</wsdl:operation>
```

or

```
<wsdl:operation ...>
  <soap:operation ... style="rpc"/>
  <wsdl:input>
    <soap:body use="literal"/>
  </wsdl:input>
  ...
</wsdl:operation>
```

#### → Remember

The driver does not support other SOAP protocol versions and services of styles other than document and rpc.

The connection wizard provides a workflow to enter the necessary information to connect to web services. Web services show up under `Web Services (WSDL 1.1) DBMS` and `Web Services Connector NetworkLayer`.

You can find the driver configuration files in the `<connectionserver-install-dir>\connectionServer\xml` directory. The `xml.prm` file lists the data access driver capabilities in terms of database operations and functions.

## 6.6.1 Web Service Driver Capabilities

The XML and Web Service drivers share the same capabilities.

### Related Information

[XML Driver Capabilities \[page 86\]](#)

## 6.6.2 Web Service Location

You set the Web Service location using the `Web Service URL` parameter in the connection wizard, with the following information:

- User name and password if required for authentication
- Proxy server address
- Proxy user name and password if required for authentication

The present release also supports the HTTPS and FTPS encrypted protocol based on one certificate.

#### → Remember

The Web Service driver only supports the web service definition document and the associated services hosted on the same HTTP server.

## Example

<http://wsf.cdyne.com/WeatherWS/Weather.asmx?WSDL> ➡

### 6.6.3 Web Service Definition Example

The following example illustrates the `ClubDemo.wsdl` document which defines the `CustomerService` web service of document style. The sample URL of this web service is `http://ws.myexample.com/ClubDemo/ClubDemo.wsdl`.

## Example

The WSDL document defines the following details:

- The `CustomerService` service
- The `Customer` port
- The `GetCustomer` binding
- The `CustomerType` portType
- The `GetCustomerList` operation
- The `GetCustomerListByCountryRequest` input message, which contains the `Country` element
- The `GetCustomerListByCountryResponse` output message, which contains the `GetCustomerListReturn` element of `Customer` complex type

```
<wsdl:definitions targetNamespace="http://ws.myexample.com/ClubDemo/"
  xmlns:apachesoap="http://xml.apache.org/xml-soap"
  xmlns:impl="http://ws.myexample.com/ClubDemo/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
  xmlns:wsdlsoap="http://schemas.xmlsoap.org/wsdl/soap/"
  xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/">

  <wsdl:types>
    <schema targetNamespace="http://ws.myexample.com/ClubDemo/">
      <complexType name="Customer">
        <sequence>
          <element name="Name" maxOccurs="2">
            <complexType>
              <simpleContent>
                <extension base="xsd:string">
                  <attribute name="type" type="xsd:string"/>
                </extension>
              </simpleContent>
            </complexType>
          </element>
          <element name="Age" type="xsd:integer"/>
          <element name="Address" type="xsd:string"/>
          <element name="ZIP" type="xsd:string"/>
          <element name="City" type="xsd:string"/>
          <element name="Country">
            <complexType>
              <attribute name="name" type="xsd:string"/>
            </complexType>
          </element>
        </sequence>
      </complexType>
    </schema>
  </wsdl:types>

```

```

        </element>
        <element name="Invoice" type="xsd:integer" maxOccurs="unbounded" />
    </sequence>
    <attribute name="ID" type="xsd:integer" />
</complexType>

<element name="GetCustomerListByCountry">
    <element name="Country">
        <complexType>
            <attribute name="name" type="xsd:string" />
        </complexType>
    </element>
</element>
<element name="GetCustomerListResponse">
    <complexType>
        <sequence>
            <element name="GetCustomerListReturn" type="impl:Customer"
maxOccurs="unbounded" />
        </sequence>
    </complexType>
    <key name="custkey">
        <selector xpath="GetCustomerListReturn" />
        <field xpath="@ID" />
    </key>
</element>
</schema>
</wsdl:types>
<wsdl:message name="GetCustomerListByCountryRequest">
    <wsdl:part name="request" element="impl:GetCustomerListByCountry"></
wsdl:part>
</wsdl:message>
<wsdl:message name="GetCustomerListByCountryResponse">
    <wsdl:part name="response" element="impl:GetCustomerListResponse"></
wsdl:part>
</wsdl:message>
<wsdl:portType name="CustomerType">
    <wsdl:operation name="GetCustomerList">
        <wsdl:documentation>Gets Information on ClubDemo Customers</
wsdl:documentation>
        <wsdl:input message="impl:GetCustomerListByCountryRequest" />
        <wsdl:output message="impl:GetCustomerListByCountryResponse" />
    </wsdl:operation>
</wsdl:portType>
<wsdl:binding name="GetCustomer" type="impl:CustomerType">
    <soap:binding transport="http://schemas.xmlsoap.org/soap/http" />
    <wsdl:operation name="GetCustomerList">
        <soap:operation soapAction="http://ws.myexample.com/ClubDemo/"
style="document" />
        <wsdl:input>
            <soap:body use="literal" />
        </wsdl:input>
        <wsdl:output>
            <soap:body use="literal" />
        </wsdl:output>
    </wsdl:operation>
</wsdl:binding>

<wsdl:service name="CustomerService">
    <wsdl:port name="Customer" binding="impl:GetCustomer">
        <soap:address location="http://ws.myexample.com/ClubDemo/" />
    </wsdl:port>
</wsdl:service>
</wsdl:definitions>

```

## 6.6.4 Mapping Rules for Web Services

The Web Service driver uses the same table and column mapping rules as the XML driver. The driver also supports the following, specific rules to web services.

### Qualifiers

The Data Access layer can connect to one web service at a time. The service is mapped to the database qualifier. In the ClubDemo example, qualifier name is `CustomerService` service name.

### Owners

The `port` attribute is mapped to the database owner. In the example, owner is `Customer`.

### Tables

In the Data Access layer, every operation is represented as a root. Every output message represents a child element of an operation. The Web Service driver exposes output messages as tables.

Table names are the concatenation of the names of the operation, the output message, and the XML elements contained in the response, separated with a slash (/).

### Example

In the ClubDemo example, the tables are the following:

- `GetCustomerList/GetCustomerListByCountryResponse/GetCustomerListResponse`
- `GetCustomerList/GetCustomerListByCountryResponse/GetCustomerListResponse/GetCustomerListReturn`
- `GetCustomerList/GetCustomerListByCountryResponse/GetCustomerListResponse/GetCustomerListReturn/Name`
- `GetCustomerList/GetCustomerListByCountryResponse/GetCustomerListResponse/GetCustomerListReturn/Invoice`

### Columns and Input Columns

The XML mapping rules for columns also apply to web services.

The Web Service driver only accepts tables with a single row as input messages. Each entry of that table is mapped to an input column of the result table. The driver maps all input messages, even if they are defined as optional in the WSDL document.

### Restriction

The driver does not support `any` and `anyAttribute` in input columns.

In the following examples, the `GetCustomerListByCountryRequest/GetCustomerListByCountry` column is an input column. The other column names result from the mapping rules of XML elements. See the XML driver section for more information.

## Example

The columns of the `GetCustomerList/GetCustomerListByCountryResponse/GetCustomerListResponse` table are the following:

- `-id`
- `GetCustomerListByCountryRequest/GetCustomerListByCountry`

## Example

The columns of the `GetCustomerList/GetCustomerListByCountryResponse/GetCustomerListResponse/GetCustomerListReturn` table are the following:

- `Age`
- `Address`
- `ZIP`
- `City`
- `Country/@name`
- `@ID`
- `-GetCustomerListResponse/-id`
- `GetCustomerListByCountryRequest/GetCustomerListByCountry`

## Example

The columns of the `GetCustomerList/GetCustomerListByCountryResponse/GetCustomerListResponse/GetCustomerListReturn/Name` table are the following:

- `-id`
- `Name`
- `@type`

- -GetCustomerListReturn/@ID
- GetCustomerListByCountryRequest/GetCustomerListByCountry

## Example

The columns of the GetCustomerList/GetCustomerListByCountryResponse/GetCustomerListResponse/GetCustomerListReturn/Invoice table are the following:

- -id
- Invoice
- -GetCustomerListReturn/@ID
- GetCustomerListByCountryRequest/GetCustomerListByCountry

## Primary Keys and Foreign Keys

The XML mapping rules for primary and foreign keys also apply to web services. In addition, an input column is always part of the definition of a primary key.

### Restriction

Although data foundations expose foreign keys, the Web Service driver does not support JOIN operations.

## Example: Primary Keys

The -id column of the GetCustomerList/GetCustomerListByCountryResponse/GetCustomerListResponse table is generated because the schema does not define any primary key.

The schema defines an explicit primary key for the @ID column of the GetCustomerList/GetCustomerListByCountryResponse/GetCustomerListResponse/GetCustomerListReturn table.

The GetCustomerListByCountryRequest/GetCustomerListByCountry input column is used as primary key.

## Example: Foreign Keys

The -GetCustomerListResponse/@ID and -GetCustomerListReturn/@ID columns are built from the reverse path to the parent table and the primary key of the parent table.



## Array Data Types

Web services support data types in the format of an array made of a series of primitive or complex types. An element of this type is mapped to a one-row table. It is mapped as part of column or table names as `-arrayElement`. The array data type does not define the element name and accepts any name.

See the link below for more information on array data types.

### Example: Array Data Types

The `arrayType="xsd:int[2]"` is a data type of an element that has two occurrences and whose value is an integer. For example, the following complex type applies to the `CustomerIDs` element and defines it as parent of a `CustomerID` element that accepts integer values:

```
<complexType name="ArrayOfIntegers">
  <complexContent>
    <restriction base="soapenc:Array">
      <attribute ref="soapenc:arrayType" wsdl:arrayType="xsd:int[2]" />
    </restriction>
  </complexContent>
</complexType>
<element name="CustomerIDs" type="ArrayOfIntegers">
  <CustomerID>103</CustomerID>
  <CustomerID>204</CustomerID>
</element>
```

## Related Information

[Details on arrays in SOAP 1.1 note](#) ➔

[XML Driver - Mapping Columns \[page 90\]](#)

[XML Driver - Mapping Primary and Foreign Keys \[page 92\]](#)

## 6.6.5 Web Service Driver - Configuring Column Maximum Size

Like the XML driver, the Web Service driver also uses the `Binary Max Length`, `Integer Max Length` and `String Max Length` parameters in the `cs.cfg` file to deal with large values of these data types.

## Related Information

[Binary Max Length \[page 195\]](#)

[Integer Max Length \[page 201\]](#)

## 6.7 Local Disk Used as a Cache for Sorting Operations

The CSV OpenDriver and the OData, SAP ERP, XML and Web Service drivers can use the local disk as a cache for sorted rows.

The data access drivers perform the sorting operations (ORDER BY, GROUP BY and DISTINCT) as follows:

- In the main memory if there is a small amount of data to be sorted
- By writing the data in a temporary directory on the local disk

The sorted rows are written on the disk either when the free main memory is too small, or when the number of rows defined using the `Bucket Split Size` SBO parameter is reached.

The local disk is used as a cache and the data is written in the default temporary folder of your machine. You can configure the directory path in the `cs.cfg` file using the `Temp Data Dir` parameter when the operating system does not specify a temporary folder.

### Related Information

[CSV OpenDriver \[page 60\]](#)

[OData Driver \[page 65\]](#)

[SAP ERP Driver \[page 79\]](#)

[XML Driver \[page 85\]](#)

[Web Service Driver \[page 98\]](#)

[Bucket Split Size \[page 195\]](#)

[Temp Data Dir \[page 207\]](#)


## 6.8 For OData and Web Services with One-way Authentication

This is an additional security feature that ensures whether communication happens with the valid server.

Keystore is a file, where certificates are stored. For example: `JRE_DIR\lib\security\cacerts`

### Note

- This security feature is supported in OData and Web Service Drivers (HTTPS Connections) only. Keystore is loaded from JVM default path along with SAP BusinessObjects Business Intelligence Platform applications consuming Connection Server.

If you want to add a certificate to the keystore, use the key tool command from <https://docs.oracle.com/javase/tutorial/security/toolsign/rstep2.html>  .

## Example

```
keytool -import -keystore "JRE_DIR\lib\security\cacerts" -file <Certificate  
Location>\Odata.cer"
```

. You can obtain the path of the keystore that is mentioned above through enabling the logs. If the server certificate verification fails, the connection also fails.

# 7 Connection Reference

## 7.1 Amazon Athena

Amazon Athena is an ETL-like cloud service which allows serverless querying of Amazon Simple Storage Service (Amazon S3) content.

Amazon Athena requires AWS Athena JDBC Driver. Amazon Athena is available as an entry in the Data Access driver list: ► [Amazon](#) ► [Amazon Athena](#) ►.

Connection Settings

Connection property	Mandatory/Optional	Value(s)
Authentication Mode	Mandatory	User/pass BO Credential Mapping
Username	Enabled when Authentication Mode = User/pass	
Password	Enabled when Authentication Mode = User/pass	
AWS Region	Mandatory	Amazon Region
S3 Output Location	Optional	S3 Output Location

You may be able to set additional connection properties from the JDBC Driver Properties field in the connection wizard.

### ⓘ Note

Amazon Athena JDBC connector does not support all Amazon Athena data types.

- Structural data types (`ARRAY`, `MAP`, `STRUCT`) are not supported.
- The Blob data type `BINARY` is not supported.
- The date and time element `Timestamp` is not supported.

### ⓘ Note

Stored procedures are not supported in Amazon Athena.

## 7.2 Amazon Aurora

How to create an Amazon Aurora JDBC connection.

Amazon Aurora is a fully managed relational database engine built for the Cloud that's compatible with MySQL and PostgreSQL. It combines the performance and availability of traditional enterprise databases with the simplicity and cost-effectiveness.

Amazon Aurora is fully managed by Amazon Relational Database Service (RDS). The Data Access layer allows the BI platform to connect to the Amazon Aurora through MySQL and PostgreSQL JDBC connectors to query on Amazon Aurora for MySQL and PostgreSQL respectively on all platforms.

Amazon Aurora is available as two entries in the Data Access driver list:

- [Amazon > MySQL in Amazon Aurora](#) ➤
- [Amazon > PostgreSQL in Amazon Aurora](#) ➤

### Note

Multi-source universes are not supported.

## 7.3 Amazon Relational Database Service (RDS)

Amazon Relational Database Service (Amazon RDS) is a collection of managed services that makes it simple to set up, operate, and scale SQL databases in the cloud.

We support the following databases on Amazon RDS:

- MariaDB
- MySQL
- PostgreSQL
- Oracle
- SQL Server

To access these databases in Amazon RDS, use directly the same driver connections already available for each database: MariaDB, MySQL, PostgreSQL, Oracle or SQL Server.

## 7.4 AWS (Amazon Web Service) Connections

The following sections describe how to create connections to AWS databases.

## 7.4.1 To Create Simba JDBC Connection to Amazon RedShift

The Data Access layer allows BI platform to connect to the Amazon RedShift databases through JDBC on all platforms.

1. While installing BI Platform, the Amazon jar get saved at `<connectionserver-install-dir>\connectionServer\jdbc\drivers\amazonsimba4` directory.

Database	JAR File
Amazon Redshift	RedshiftJDBC4.jar

2. In the connection wizard, specify **Server Name** for server and **Port Number** for port and the **Database Schema** for database schema in the *Server (host:port)* field.

You have created a connection to the Amazon RedShift database.

## 7.4.2 To Create Simba ODBC Connection to Amazon RedShift

The Data Access layer allows BI platform to connect to the Amazon RedShift databases through ODBC using SAP Amazon ODBC Driver on all supported platforms. After BOE client or server installation, you need to update the host and port number details.

### Prerequisite:

You must install the Visual C++ 2012 redistributable Update 4. The redistributable is available here: <http://www.microsoft.com/en-ca/download/details.aspx?id=30679>

### Windows System

Sample SAP Amazon RedShift DSN is the Sample DSN found in the *ODBC Data Source Administrator*, refer to this for further configuration assistance.

### UNIX System

For Amazon RedShift ODBC configuration on UNIX System, see *Simba ODBC Driver for Amazon Redshift Install Guide.pdf*, which is shipped along with the product.

### Amazon ODBC configuration on UNIX System

After installation, you can configure the ODBC Driver for UNIX Platform by referring to the ini file sample present in: `<install_directory>/sap_bobj/enterprise_xi40/simbaconf`

- To change the *Host* and *Port* number, ODBCInstLib information, you need to configure the `simba.amazonodbc.ini.sample` by renaming it to `simba.amazonodbc.ini`. For more information on how to modify `simba.amazonodbc.ini`, see *Simba ODBC Driver for Amazon Install Guide.pdf*
- You can set the environment variables `SIMBAINI`, `ODBCINI` to the path where `simba.hiveodbc.ini` file (inclusive of filename) is present.  
For example: `export SIMBAINI=<install_directory>/sap_bobj/enterprise_xi40/simbaconf/<configuration file>.ini`

- Driver libraries path: <install\_directory>/sap\_bobj/enterprise\_xi40/linux\_x64/odbc/simbaamazon/2.0/lib, must be set to the environment variables LD\_LIBRARY\_PATH (LINUX), LIBPATH (AIX).
- The Simba ODBC Driver for Amazon Install Guide.pdf can be found in the location: <install\_directory>/sap\_bobj/enterprise\_xi40/<Platform>/odbc/simbaamazon/2.0/help

## 7.5 Cloudera Data Platform

Cloudera Data Platform (CDP) is the next generation of Cloudera CDH, combining the best CDH and HDP (Hortonworks Data Platform) services.

Cloudera CDP can manage data in any environment, including public clouds like AWS, Azure and GCP (Google Cloud Platform), and it is able to intelligently auto-scale workloads and infrastructure up and down to maximize efficiency and minimize costs. The Data Access layer allows the BI platform to connect to the Cloudera Data Platform through the Simba Hive and Impala JDBC connectors. Cloudera Data Platform is available as two entries in the Data Access driver list:

- [▶ Cloudera ▶ Hive in CDP 7.2 ▶](#)
- [▶ Cloudera ▶ Impala in CDP 7.2 ▶](#)

### ⓘ Note

Multi-source universes are not supported.

## 7.6 Databricks

Databricks is a data lakehouse that unifies data warehouses and data lakes on one platform, handling data, analytics, and Artificial Intelligence requirements. Databricks is supported on AWS, Azure, and Google Cloud Platform environments.

Databricks platform is available as the following entry in the Data Access driver list:


- [▶ Databricks ▶ Databricks ▶](#)

## 7.7 Denodo

Denodo is a data virtualization platform. We support Denodo 7 (JDBC only) and Denodo 8 (JDBC and ODBC). Denodo 8 acts like a relational database and provides ODBC and JDBC drivers for connection.

The Denodo ODBC connector is supported on Windows, Linux, and Unix platforms. The Denodo ODBC connector supports stored procedures provided by Denodo. Denodo stored procedures are callable via CALL. Details are available on the Denodo community website.

Denodo 8 appears as two entries in the Data Access driver list:

-  [Denodo](#)  [Denodo 8](#) 
  - [JDBC Drivers](#)
  - [ODBC Drivers](#)

## 7.8 Google BigQuery Connections

You can run queries against the Google BigQuery data sources, but to do this, you must download the appropriate Google libraries and save them to a designated folder. Our BigQuery driver is a read-only driver which only supports SELECT statements. Our driver supports the following usage:

- Relative file paths.
- Use of the / character as the folder separator, regardless of the operating system.
- Reading the key file from a Windows network share.

Query specifics:

- We support the following datatypes:

Supported Datatypes

BigQuery datatype	Connection server datatype
INT64	Long (64-bit integer)
NUMERIC	BigDecimal (BigDecimal)
FLOAT64	Double (floating-point double)
BOOL	Byte (byte, as we have no Boolean type)
STRING	String
BYTES	Binary (binary data)
DATE	Date
DATETIME	Timestamp
GEOGRAPHY	Not supported, or JAVA_String of the data can be retrieved as a string
TIME	Time
TIMESTAMP	Timestamp (timezone information is lost)
ARRAY	Not supported
STRUCT	Not supported

- Our tool uses column sizes to allocate buffer space. The Default Character Column Size parameter is set in the BigQuery SBO file. Adjust this value to allow for the maximum expected number of characters in a column. If the value is too low, your result will be truncated.



- Stored procedures are not supported.
- You can specify the parameter values in the PRM file according to your requirements.
- Refer to the Google BigQuery documentation for the list of supported SQL functions.

## Related Information

[Google BigQuery jars and drivers \[page 113\]](#)

### 7.8.1 Google BigQuery jars and drivers

Get the drivers listed in the table below and then, in order for the BigQuery driver to work, create a google folder in the <Install Dir>\SAP BusinessObjects Enterprise XI 4.0\dataAccess\connectionServer\sharedLibraries folder, then drop the google jars in that folder you just created.

The drivers you need

Library	Download path
api-common-1.7.0.jar	<a href="https://repo1.maven.org/maven2/com/google/api/api-common/1.7.0/api-common-1.7.0.jar">https://repo1.maven.org/maven2/com/google/api/api-common/1.7.0/api-common-1.7.0.jar</a> ➡
auto-value-1.4.jar	<a href="https://repo1.maven.org/maven2/com/google/auto/value/auto-value/1.4/auto-value-1.4.jar">https://repo1.maven.org/maven2/com/google/auto/value/auto-value/1.4/auto-value-1.4.jar</a> ➡
commons-codec-1.12.jar	<a href="https://repo1.maven.org/maven2/commons-codec/commons-codec/1.12/commons-codec-1.12.jar">https://repo1.maven.org/maven2/commons-codec/commons-codec/1.12/commons-codec-1.12.jar</a> ➡
error_prone_annotations-2.1.3.jar	<a href="https://repo1.maven.org/maven2/com/google/error-prone/error_prone_annotations/2.1.3/error_prone_annotations-2.1.3.jar">https://repo1.maven.org/maven2/com/google/error-prone/error_prone_annotations/2.1.3/error_prone_annotations-2.1.3.jar</a> ➡
failureaccess-1.0.1.jar	<a href="https://repo1.maven.org/maven2/com/google/guava/failureaccess/1.0.1/failureaccess-1.0.1.jar">https://repo1.maven.org/maven2/com/google/guava/failureaccess/1.0.1/failureaccess-1.0.1.jar</a> ➡
gax-1.37.0.jar	<a href="https://repo1.maven.org/maven2/com/google/api/gax/1.37.0/gax-1.37.0.jar">https://repo1.maven.org/maven2/com/google/api/gax/1.37.0/gax-1.37.0.jar</a> ➡
gax-httpjson-0.54.0.jar	<a href="https://repo1.maven.org/maven2/com/google/api/gax-httpjson/0.54.0/gax-httpjson-0.54.0.jar">https://repo1.maven.org/maven2/com/google/api/gax-httpjson/0.54.0/gax-httpjson-0.54.0.jar</a> ➡
google-api-client-1.27.0.jar	<a href="https://repo1.maven.org/maven2/com/google/api-client/google-api-client/1.27.0/google-api-client-1.27.0.jar">https://repo1.maven.org/maven2/com/google/api-client/google-api-client/1.27.0/google-api-client-1.27.0.jar</a> ➡
google-api-services-bigquery-v2-rev20181104-1.27.0.jar	<a href="https://repo1.maven.org/maven2/com/google/apis/google-api-services-bigquery/v2-rev20181104-1.27.0/google-api-services-bigquery-v2-rev20181104-1.27.0.jar">https://repo1.maven.org/maven2/com/google/apis/google-api-services-bigquery/v2-rev20181104-1.27.0/google-api-services-bigquery-v2-rev20181104-1.27.0.jar</a> ➡
google-auth-library-credentials-0.12.0.jar	<a href="https://repo1.maven.org/maven2/com/google/auth/google-auth-library-credentials/0.12.0/google-auth-library-credentials-0.12.0.jar">https://repo1.maven.org/maven2/com/google/auth/google-auth-library-credentials/0.12.0/google-auth-library-credentials-0.12.0.jar</a> ➡

Library	Download path
google-auth-library-oauth2-http-0.12.0.jar	<a href="https://repo1.maven.org/maven2/com/google/auth/google-auth-library-oauth2-http/0.12.0/google-auth-library-oauth2-http-0.12.0.jar">https://repo1.maven.org/maven2/com/google/auth/google-auth-library-oauth2-http/0.12.0/google-auth-library-oauth2-http-0.12.0.jar</a> ➡
google-cloud-bigquery-1.82.0.jar	<a href="https://repo1.maven.org/maven2/com/google/cloud/google-cloud-bigquery/1.82.0/google-cloud-bigquery-1.82.0.jar">https://repo1.maven.org/maven2/com/google/cloud/google-cloud-bigquery/1.82.0/google-cloud-bigquery-1.82.0.jar</a> ➡
google-cloud-core-1.61.0.jar	<a href="https://repo1.maven.org/maven2/com/google/cloud/google-cloud-core/1.61.0/google-cloud-core-1.61.0.jar">https://repo1.maven.org/maven2/com/google/cloud/google-cloud-core/1.61.0/google-cloud-core-1.61.0.jar</a> ➡
google-cloud-core-http-1.61.0.jar	<a href="https://repo1.maven.org/maven2/com/google/cloud/google-cloud-core-http/1.61.0/google-cloud-core-http-1.61.0.jar">https://repo1.maven.org/maven2/com/google/cloud/google-cloud-core-http/1.61.0/google-cloud-core-http-1.61.0.jar</a> ➡
google-http-client-1.27.0.jar	<a href="https://repo1.maven.org/maven2/com/google/http-client/google-http-client/1.27.0/google-http-client-1.27.0.jar">https://repo1.maven.org/maven2/com/google/http-client/google-http-client/1.27.0/google-http-client-1.27.0.jar</a> ➡
google-http-client-appengine-1.27.0.jar	<a href="https://repo1.maven.org/maven2/com/google/http-client/google-http-client-appengine/1.27.0/google-http-client-appengine-1.27.0.jar">https://repo1.maven.org/maven2/com/google/http-client/google-http-client-appengine/1.27.0/google-http-client-appengine-1.27.0.jar</a> ➡
google-http-client-jackson2-1.27.0.jar	<a href="https://repo1.maven.org/maven2/com/google/http-client/google-http-client-jackson2/1.27.0/google-http-client-jackson2-1.27.0.jar">https://repo1.maven.org/maven2/com/google/http-client/google-http-client-jackson2/1.27.0/google-http-client-jackson2-1.27.0.jar</a> ➡
google-oauth-client-1.27.0.jar	<a href="https://repo1.maven.org/maven2/com/google/oauth-client/google-oauth-client/1.27.0/google-oauth-client-1.27.0.jar">https://repo1.maven.org/maven2/com/google/oauth-client/google-oauth-client/1.27.0/google-oauth-client-1.27.0.jar</a> ➡
gson-2.8.9.jar	<a href="https://repo1.maven.org/maven2/com/google/code/gson/gson/2.8.9/gson-2.8.9.jar">https://repo1.maven.org/maven2/com/google/code/gson/gson/2.8.9/gson-2.8.9.jar</a> ➡
guava-26.0-android.jar	<a href="https://repo1.maven.org/maven2/com/google/guava/guava/26.0-android/guava-26.0-android.jar">https://repo1.maven.org/maven2/com/google/guava/guava/26.0-android/guava-26.0-android.jar</a> ➡
j2objc-annotations-1.1.jar	<a href="https://repo1.maven.org/maven2/com/google/j2objc/j2objc-annotations/1.1/j2objc-annotations-1.1.jar">https://repo1.maven.org/maven2/com/google/j2objc/j2objc-annotations/1.1/j2objc-annotations-1.1.jar</a> ➡
jackson-core-2.2.3.jar	<a href="https://repo1.maven.org/maven2/com/fasterxml/jackson/core/jackson-core/2.2.3/jackson-core-2.2.3.jar">https://repo1.maven.org/maven2/com/fasterxml/jackson/core/jackson-core/2.2.3/jackson-core-2.2.3.jar</a> ➡
jsr305-2.0.1.jar	<a href="https://repo1.maven.org/maven2/com/google/code/findbugs/jsr305/2.0.1/jsr305-2.0.1.jar">https://repo1.maven.org/maven2/com/google/code/findbugs/jsr305/2.0.1/jsr305-2.0.1.jar</a> ➡
jsr305-3.0.2.jar	<a href="https://repo1.maven.org/maven2/com/google/code/findbugs/jsr305/3.0.2/jsr305-3.0.2.jar">https://repo1.maven.org/maven2/com/google/code/findbugs/jsr305/3.0.2/jsr305-3.0.2.jar</a> ➡
protobuf-java-3.6.1.jar	<a href="https://repo1.maven.org/maven2/com/google/protobuf/protobuf-java/3.6.1/protobuf-java-3.6.1.jar">https://repo1.maven.org/maven2/com/google/protobuf/protobuf-java/3.6.1/protobuf-java-3.6.1.jar</a> ➡
protobuf-java-util-3.6.1.jar	<a href="https://repo1.maven.org/maven2/com/google/protobuf/protobuf-java-util/3.6.1/protobuf-java-util-3.6.1.jar">https://repo1.maven.org/maven2/com/google/protobuf/protobuf-java-util/3.6.1/protobuf-java-util-3.6.1.jar</a> ➡
proto-google-common-protos-1.12.0.jar	<a href="https://repo1.maven.org/maven2/com/google/api/grpc/proto-google-common-protos/1.12.0/proto-google-common-protos-1.12.0.jar">https://repo1.maven.org/maven2/com/google/api/grpc/proto-google-common-protos/1.12.0/proto-google-common-protos-1.12.0.jar</a> ➡

Library	Download path
proto-google-iam-v1-0.12.0.jar	<a href="https://repo1.maven.org/maven2/com/google/api/grpc/proto-google-iam-v1/0.12.0/proto-google-iam-v1-0.12.0.jar">https://repo1.maven.org/maven2/com/google/api/grpc/proto-google-iam-v1/0.12.0/proto-google-iam-v1-0.12.0.jar</a> 📄
threetenbp-0.7.2.jar	<a href="https://repo1.maven.org/maven2/org/threeten/threetenbp/0.7.2/threetenbp-0.7.2.jar">https://repo1.maven.org/maven2/org/threeten/threetenbp/0.7.2/threetenbp-0.7.2.jar</a>

## 7.8.2 Getting the BigQuery key file

To get the JSON key file to use Google BigQuery.

You use a key file for connection rather than a user/password pair.

1. Go to the Google Cloud Console.
2. In the IAM (Identity and Access Management) tab, go to the Service Accounts section.
3. Create a service account which will be used to connect to BigQuery.
4. From this service account, create a key and download the JSON provided by Google.

Do not try to edit this file.

## 7.8.3 Creating the connection to the Google BigQuery Service

How to connect to the Google cloud.

Connecting to the Google Cloud is different from connecting to a classic relational database engine. Instead of relying on a server name, user, and password, Google allows its users to serialize all required connection information into a JSON key file. The client libraries can rely on the information contained in the file to connect to the Google cloud and the relevant services.

To connect to BigQuery provide the path to the JSON key file. In addition to the usual file paths, our driver must also support:

- Relative file paths: this allows user to store the key file in the same (relative) location on client and server machines: replace the `$CS$` pattern with the current base `connectionServer` folder (`dataAccess/connectionServer`), and rely on the same connection information on clients and servers.
- Using `/` as folder separator, regardless of the operating system we are running on. This allows to deploy a connection from a Windows client to a Unix server without having to edit the connection information.
- Reading the key file from a network share (Windows only). This allows users to store one key file in a central location and reuse it across clients and servers.

## 7.8.4 Creating a JDBC Connection for Google BigQuery

You'll find the JDBC driver in the following location in the driver list: ► [Google](#) ► [Google BigQuery](#) ► [JDBC Drivers](#) ►.

Define the connection properties:

Connection Property	Mandatory/Optional	Notes
Authentication mode	Mandatory	Possible values: <ul style="list-style-type: none"><li>• Service Account</li><li>• SSO with OAuth 2.0</li></ul>
Authorization reference	Mandatory	OAuth authorization reference enabled if Authentication mode = SSO with OAuth 2.0 * see note below.
Service Account Key File Path	Mandatory	JSON key file path enabled if Authentication mode = Service Account
Project Id	Optional	Google project id

BigQuery JDBC relies on the concept of Jobs. To run a query, create a job with the desired SQL sentence, and execute it.

### ⓘ Note

For SSO with OAuth 2.0, when in the Edit Server Authorization Configuration pane of BOE authorization reference ID, `access_type=offline` must be added in the [Custom parameters](#) section in order to successfully generate the `access_token` in launch pad.

### ⓘ Note

The Service Account Key file can be accessed from a network share (Windows only). This allows users to store one key file in a central location and reuse it across clients and servers.

## 7.8.5 Creating an ODBC Connection for Google BigQuery

You'll find the JDBC driver in the following location in the driver list: ► [Google](#) ► [Google BigQuery](#) ► [ODBC Drivers](#) ►.

Define the connection properties:

ODBC Connection for Google BigQuery

Connection Property	Mandatory/Optional	Notes
Authentication Mode	Mandatory	'Service Account'

Connection Property	Mandatory/Optional	Notes
Data Source Name	Mandatory	ODBC data source name

BigQuery ODBC relies on the concept of Jobs. To run a query, create a job with the desired SQL sentence, and execute it.

## 7.9 Google Cloud SQL

Google Cloud SQL is a fully managed relational database service for MySQL, PostgreSQL, and SQL Server.

## 7.10 HIVE, Impala and Spark Connections

The following sections describe how to create connections to HIVE, Impala and Spark databases. You can create connections to different versions of the HIVE, Impala and Spark databases simultaneously.

### BigData support

In order to simplify BigData support, the following distributions are supported:

- HIVE and Impala are supported in the Cloudera CDH 6.1 distribution.
- HIVE and Spark are supported in the HortonWorks HDP 3.1 distribution.
- HIVE, Spark, and Impala are supported in the MapR MEP 6.1 distribution.

### 7.10.1 Single Sign-On(SSO) to Windows AD with Kerberos Support

The BI platform provides SSO to database using either Windows AD with Kerberos on Microsoft Windows platforms. The SSO with Kerberos is available for JDBC and ODBC connections. Once users have logged on to the BI platform from an SAP BusinessObjects application, they can perform actions that require database access, such as refreshing Web Intelligence documents, without providing their database credentials.

#### Pre-Configuration Requirements:

Before setting up the necessary Java VM options, you must create the `bscLogin.conf` and Kerberos `krb5.ini` configuration files to prepare your application for Windows AD authentication. For more information, see the *SAP BusinessObjects Business Intelligence platform Administrator Guide*.

To enable the SSO, you need to change the configuration file(*cs.cfg*), update the following details between the `<JavaVM>` tag:

#### Sample Code

```
<Options>
    <Option>-
Djava.security.auth.login.config=C:\WINNT\bscLogin.conf</Option>
    <Option>-Djava.security.krb5.conf=C:\WINNT\krb5.ini</Option>
</Options>
```

#### JDBC Connection

In order to use the SSO keberos authentication feature, you need to specify the following configuration parameters for the connection in JDBC Driver Properties:

```
(KrbRealm=<Realm_Name>,KrbHostFQDN=<DB_Server_FQDN_Name>,KrbServiceName=hive,AuthMech=1)
```

#### ODBC Connection

In order to use the SSO keberos authentication feature using ODBC network layer, configure the following DSN in *ODBC Data Source Administrator* application:

1. In *ODBC Data Source Administrator*, click on *Add* and choose *SAP Hive ODBC Driver in the Create New Data Source* window.
2. Click Finish.
3. Configure the properties as shown in the below screen shot:

4. Click on [Test](#), to validate the connection.
5. Click [Ok](#).

## 7.10.2 To Create JDBC Connection to Apache Hadoop HIVE

The Data Access layer allows the BI platform to connect to the Apache Hadoop HIVE 0.12 and above databases through JDBC on all platforms.

### ⓘ Note

- [HiveServer1](#) is supported on Apache Hadoop HIVE 0.12
- [HiveServer2](#) is supported only on Apache Hadoop HIVE 0.13 and above.
- Apache Hadoop Hive JARS are also supported till Hive 0.12 version.
- Help documents for Apache Hadoop HIVE is found in the following path:  
`<connectionserver-install-dir\connectionServer\jdbc\drivers\hive012simba4server1`
- Apache Hadoop Hive driver does not support complex data types.

1. To create a connection to the Apache Hive Server, place the following sets of JAR files in the `<connectionserver-install-dir>\connectionServer\jdbc\drivers\<hive012simba4server1>` directory.

Apache Hadoop HIVE Database Version	JAR Files
0.12.0	commons-logging-1.1.1.jar hadoop-core-1.2.1.jar hive-exec-0.12.0.jar hive-jdbc-0.12.0.jar hive-metastore-0.12.0.jar hive-service-0.12.0.jar libfb303-0.9.0.jar log4j-1.2.16.jar slf4j-api-1.6.1.jar slf4j-log4j12-1.6.1.jar
0.12 (Simba JDBC4)	hive_metastore.jar hive_service.jar HiveJDBC4.jar libfb303-0.9.0.jar libthrift-0.9.0.jar log4j-1.2.14.jar ql.jar slf4j-api-1.5.11.jar slf4j-log4j12-1.5.11.jar TCLIServiceClient.jar commons-logging-1.1.1.jar commons-codec-1.3.jar httpclient-4.1.3.jar httpcore-4.1.3.jar zookeeper-3.4.6.jar



Apache Hadoop HIVE Database Version	JAR Files
0.13 (Simba JDBC4)	hive_metastore.jar
	hive_service.jar
	HiveJDBC4.jar
	libfb303-0.9.0.jar
	libthrift-0.9.0.jar
	log4j-1.2.14.jar
	ql.jar
	slf4j-api-1.5.11.jar
	slf4j-log4j12-1.5.11.jar
	TCLIServiceClient.jar
	commons-logging-1.1.1.jar
	commons-codec-1.3.jar
	httpclient-4.1.3.jar
	httpcore-4.1.3.jar
	zookeeper-3.4.6.jar
0.14 (Simba JDBC4)	hive_metastore.jar
	hive_service.jar
	HiveJDBC4.jar
	libfb303-0.9.0.jar
	libthrift-0.9.0.jar
	log4j-1.2.14.jar
	ql.jar
	slf4j-api-1.5.11.jar
	slf4j-log4j12-1.5.11.jar
	TCLIServiceClient.jar
	commons-logging-1.1.1.jar
	commons-codec-1.3.jar
	httpclient-4.1.3.jar
	httpcore-4.1.3.jar
	zookeeper-3.4.6.jar

**Apache Hadoop HIVE Database**  
**Version**

**JAR Files**

---

1.0 (Simba JDBC4)	hive_metastore.jar
	hive_service.jar
	HiveJDBC4.jar
	libfb303-0.9.0.jar
	libthrift-0.9.0.jar
	log4j-1.2.14.jar
	ql.jar
	slf4j-api-1.5.11.jar
	slf4j-log4j12-1.5.11.jar
	TCLIServiceClient.jar
	commons-logging-1.1.1.jar
	commons-codec-1.3.jar
	httpclient-4.1.3.jar
	httpcore-4.1.3.jar
	zookeeper-3.4.6

---

Amazon EMR 0.11

HiveJDBC4.jar
hive_metastore.jar
hive_service.jar
libfb303-0.9.0.jar
libthrift-0.9.0.jar
log4j-1.2.14.jar
ql.jar
slf4j-api-1.5.11.jar
slf4j-log4j12-1.5.11.jar
TCLIServiceClient.jar
commons-logging-1.1.1.jar
commons-codec-1.3.jar
httpclient-4.1.3.jar
httpcore-4.1.3.jar
zookeeper-3.4.6

---

**Apache Hadoop HIVE Database  
Version**

**JAR Files**

---

Amazon EMR 0.13	HiveJDBC4.jar hive_metastore.jar hive_service.jar libfb303-0.9.0.jar libthrift-0.9.0.jar log4j-1.2.14.jar ql.jar slf4j-api-1.5.11.jar slf4j-log4j12-1.5.11.jar TCLIServiceClient.jar commons-logging-1.1.1.jar commons-codec-1.3.jar httpclient-4.1.3.jar httpcore-4.1.3.jar zookeeper-3.4.6.jar
-----------------	--

---

Hortonworks Data Platform 2.3	hive_metastore.jar hive_service.jar libfb303-0.9.0.jar libthrift-0.9.0.jar log4j-1.2.14.jar ql.jar slf4j-api-1.5.11.jar slf4j-log4j12-1.5.11.jar TCLIServiceClient.jar commons-logging-1.1.1.jar commons-codec-1.3.jar httpclient-4.1.3.jar httpcore-4.1.3.jar zookeeper-3.4.6.jar
-------------------------------	---

---

2. Run the connection wizard.

3. Select the Apache Hadoop HIVE driver version you want to use.
4. Use the wizard to configure the connection.

You have created a connection to the Apache Hadoop HIVE database.

#### 📘 Note

- The connections created from the BI platform 4.1 continue to work in this release.
- You need not perform any additional configuration to create a connection to Apache Hadoop Hive 0.12 Simba JDBC4 and above, as the drivers are installed as part of the BI platform in the <connectionserver-install-dir>\connectionServer\jdbc\drivers\hive012simba4server1 directory.

#### 📘 Note

When you enter an incorrect combination of server name and server details in the Information Design Tool, you receive the error message: *Error connecting to HiveServer1/ Hive Server2, please verify connection settings.*

## Related Information

[JAR File Location Reference \[page 49\]](#)

## 7.10.3 To Create ODBC Connection to Apache Hadoop HIVE

The Data Access layer allows BI platform to connect to the Apache Hadoop HIVE 0.12 and above databases through ODBC using SAP Hive ODBC Driver on all supported platforms. After BOE client or server installation, you need to update the host and port number details.

#### 📘 Note

- *HiveServer2* is supported on Apache Hadoop HIVE 0.13 and above. You must choose *Hive Server2* as *Hive Server Type* in ODBC Data Source Administrator
- Refer to the *Simba ODBC Driver for Hive Install Guide* to check for the authentication modes for further details

### Windows System

#### 📘 Note

- SAP Hive ODBC Driver is the driver that must be used to create DSN
- Sample SAP Hive DSN is the Sample DSN found in the *ODBC Data Source Administrator*, refer this for further configuration assistance
- If you select Sample SAP Hive DSN for ODBC connectivity, possible values for <Platform> is win32\_x86(BOE Client) or win64\_x64(BOE server)

- The driver specific libraries are present in the path:  
<BIP\_INSTALL\_DIR>\<Platform>\odbc\simbahive\2.0\lib
- Simba ODBC Driver for Hive `Install Guide.pdf` is found in the path:  
<BIP\_INSTALL\_DIR>\<Platform>\odbc\simbahive\2.0\help for further configuration steps

## UNIX System

After installation, you can find SAP Hive ODBC driver specific libraries in the path: <install\_directory>/sap\_bobj/enterprise\_xi40/<Platform>/odbc/simbahive/2.0/lib

### Note

- Till Hive 0.13 and Amazon EMR hive 0.11, the path for the SAP Hive ODBC driver specific libraries is: <install\_directory>/sap\_bobj/enterprise\_xi40/<Platform>/odbc/simbahive/1.0/lib
- After the installation of 4.2, the path for the libraries must be changed manually in all the configuration files as mentioned in the below section.

## Hive ODBC configuration on UNIX System

After installation, you can configure the ODBC Driver for UNIX Platform by referring to the ini file sample present in: <install\_directory>/sap\_bobj/enterprise\_xi40/simbaconf

- To change the *Host* and *Port* number, ODBCInstLib information, you need to configure the `simba.hiveodbc.ini.sample` by renaming it to `simba.hiveodbc.ini`. For more information on how to modify `simba.hiveodbc.ini`, see `Simba ODBC Driver for Hive Install Guide.pdf`
- You can set the environment variables `SIMBAINI`, `ODBCINI` to the path where `simba.hiveodbc.ini` file (inclusive of filename) is present.  
For example: `export SIMBAINI=<install_directory>/sap_bobj/enterprise_xi40/simbaconf/<configuration file>.ini`
- Driver libraries path: <install\_directory>/sap\_bobj/enterprise\_xi40/linux\_x64/odbc/simbahive/2.0/lib, must be set to the environment variables `LD_LIBRARY_PATH` (LINUX), `LIBPATH` (AIX).
- The `Simba ODBC Driver for Hive Install Guide.pdf` can be found in the location:  
<install\_directory>/sap\_bobj/enterprise\_xi40/<Platform>/odbc/simbahive/2.0/help

## 7.10.4 To Make HIVE Connections Work After Platform Update

As a prerequisite, your production environment runs an SAP BusinessObjects BI platform 4.0 release up to Support Package 8 on a Microsoft Windows or UNIX operating system.

After the update of the platform servers or client tools to a 4.1 release, the Apache Hadoop HIVE driver has been uninstalled. You must modify the installation of the platform to make Apache Hadoop HIVE connections work.

The following procedure shows the steps to perform on Microsoft Windows.

1. In the Control Panel, locate the latest full installation program of the BI platform.

#### → Remember

You cannot perform the next step on a program update of the platform.

2. Right-click and select *Uninstall/Change*.
3. In the *Application Maintenance* screen of the *SAP BusinessObjects BI platform setup* dialog box, select *Modify* and click *Next*.
4. In the *Select Features* screen, select the *Hadoop HIVE* option under *Database Access and Security*.
5. Click *Next* and complete the installation.

You have installed the Apache Hadoop HIVE driver on the platform. You can now create connections to the HIVE databases.

## 7.10.5 To Create JDBC Connection to Amazon EMR HIVE

The Data Access layer allows BI platform to connect to the Amazon Elastic MapReduce (EMR) HIVE 0.11 and 0.13 databases through JDBC on all platforms.

1. Set up an SSH tunnel to the Amazon master node.  
See the Amazon documentation for more information.
2. Download the required JAR files from the Amazon website and place them in the `<connectionserver-install-dir>\connectionServer\jdbc\drivers\<hive012simba4server1>` directory.
3. In the connection wizard, specify `localhost` for server and `10002` for port in the *Server (host:port)* field.

You have created a connection to the Amazon EMR HIVE database.

#### ⓘ Note

- Connections created from the BI platform 4.1 continue to work in this release. The `hive` folder for JAR files is still supported.
- *HiveServer1* is supported only for Amazon EMR Hive 0.11
- *HiveServer2* is supported only for Amazon EMR Hive 0.13
- Help documents for Amazon EMR HIVE is found in the following path:  
`<connectionserver-install-dir>\connectionServer\jdbc\drivers\hive012simba4server1`

## Related Information

[Creating an SSH tunnel to the master node](#) ➡  
[JAR File Location Reference \[page 49\]](#)

## 7.10.6 To Create ODBC Connection to Amazon EMR HIVE

The Data Access layer allows BI platform to connect to the Amazon EMR Hive 0.11 databases through ODBC using SAP Hive ODBC Driver on all supported platforms. After BOE client or server installation, you need to update the host and port number details. For more information, refer to the Simba guide.

### Note

*HiveServer1* is the only server supported for Amazon EMR Hive 0.11. You must choose *Hive Server1* as *Hive Server Type* in ODBC Data Source Administrator.

### Windows System

Sample Amazon EMR Hive DSN is the Sample DSN found in the *ODBC Data Source Administrator*, refer to this for further configuration assistance.

### UNIX System

For Hive ODBC configuration on UNIX System, see [To Create ODBC Connection to Apache Hadoop HIVE \[page 124\]](#) section.

## 7.10.7 To Create JDBC Connection to Cloudera Impala

The Cloudera Impala 1.0 and 2.0 Simba JDBC4 drivers are installed as part of the BI platform in the <connectionserver-install-dir>\connectionServer\jdbc\drivers\impala10simba4 directory. You need not perform any additional configuration to create a connection to the Cloudera Impala database.

The following are the JAR files supported for Impala 1.0 and 2.0 databases:

Cloudera Impala Database Version	JAR Files
Impala 1.0 (Simba JDBC4)	hive_metastore.jar
	hive_service.jar
	ImpalaJDBC4.jar
	libfb303-0.9.0.jar
	libthrift-0.9.0.jar
	log4j-1.2.14.jar
	ql.jar
	slf4j-api-1.5.8.jar
	slf4j-log4j12-1.5.8.jar
	TCLIServiceClient.jar
	zookeeper-3.4.6.jar

Cloudera Impala Database Version	JAR Files
Impala 2.0 (Simba JDBC4)	hive_metastore.jar hive_service.jar ImpalaJDBC4.jar libfb303-0.9.0.jar libthrift-0.9.0.jar log4j-1.2.14.jar ql.jar slf4j-api-1.5.11.jar slf4j-log4j12-1.5.11.jar TCLIServiceClient.jar zookeeper-3.4.6.jar

#### ⓘ Note

Help documents for Cloudera Impala is found in the following path:

```
<connectionserver-install-dir\connectionServer\jdbc\drivers\impala10simba4
```

## 7.10.8 To Create ODBC Connection to Cloudera Impala

In this release, we are supporting SAP Impala ODBC drivers. After BOE client or server installation, you need to change the host and port number details to connect to the corresponding Impala server. For more information, see Simba guide.

#### ⓘ Note

- Refer to [Simba guide](#) to check for the authentication modes and perform the required changes
- The Sample SAP Impala DSN is found in the [ODBC Data Source Administrator](#)
- You can find libraries for ODBC drivers in the path:  
<BIP\_INSTALL\_DIR>\<Platform>\odbc\simbaimpala\1.0 , possible values for <Platform> is win32\_x86(BOE Client) or win64\_x64(BOE server).
- The driver specific libraries are present in the path:  
<BIP\_INSTALL\_DIR>\<Platform>\odbc\simbaimpala\1.0\lib
- Simba ODBC Driver for Impala Install Guide.pdf is found in the location:  
<BIP\_INSTALL\_DIR>\<Platform>\odbc\simbaimpala\1.0\help

### Impala ODBC configuration on UNIX System

After installation, you can configure the ODBC Driver for UNIX Platform by referring to the ini file sample present in: <install\_directory>/sap\_bobj/enterprise\_xi40/simbaconf



- To change the [Host](#) and [Port](#) number, ODBCInstLib information, you need to configure the `simba.impalaodbc.ini.sample` by renaming it to `simba.impalaodbc.ini`. For more information on how to modify the `simba.impalaodbc.ini`, see [Simba ODBC Driver for Impala Install Guide.pdf](#)
- You can find driver specific libraries for ODBC drivers in the path: `<install_directory>/sap_bobj/enterprise_xi40/<Platform>/odbc/simbaimpala/1.0/lib`
- Driver libraries must be set to the environment variables `LD_LIBRARY_PATH` (LINUX), `LIBPATH` (AIX)
- Set the environment variables `SIMBAINI`, `ODBCINI` to the path where `simba.impalaodbc.ini` file (inclusive of filename) is present.  
For example: `export SIMBAINI= <install_directory>/sap_bobj/enterprise_xi40/simbaconf/<Configuration File>.ini`
- [Simba ODBC Driver for Impala Install Guide.pdf](#) is found in the path: `<install_directory>/sap_bobj/enterprise_xi40/<Platform>/odbc/simbaimpala/1.0/help`

## 7.10.9 To Create JDBC Connection to Apache Spark

The Apache Spark Connector Simba JDBC4 driver is installed as part of the BI platform in the `<connectionserver-install-dir>\connectionServer\jdbc\drivers\spark12simba4` directory. You need not perform any additional configuration to create a connection to the Apache Spark Connector database.

### Note

Help documents for Apache Spark is found in the following path: `<connectionserver-install-dir>\connectionServer\jdbc\drivers\spark12simba4`

The following are the JAR files supported for Apache Spark Connector database:

Cloudera Impala Database Version	JAR Files
Apache Spark 1.0 (Simba JDBC4)	<code>hive_metastore.jar</code>
	<code>hive_service.jar</code>
	<code>libfb303-0.9.0.jar</code>
	<code>libthrift-0.9.0.jar</code>
	<code>log4j-1.2.14.jar</code>
	<code>ql.jar</code>
	<code>slf4j-api-1.5.11.jar</code>
	<code>slf4j-log4j12-1.5.11.jar</code>
	<code>SparkJDBC4.jar</code>
	<code>TCLIServiceClient.jar</code>
	<code>zookeeper-3.4.6.jar</code>

## 7.10.10 To Create ODBC Connection to Apache Spark

After BOE client or server installation, you need to change the host and port number details to connect to the corresponding Apache Spark server. For more information, see Simba guide.

### Note

- Refer to [Simba guide](#) to check for the authentication modes and perform the required changes
- The Sample Apache Spark DSN is found in the [ODBC Data Source Administrator](#)
- You can find libraries for ODBC drivers in the path:  
`<BIP_INSTALL_DIR>\<Platform>\odbc\simbaspark\1.0` , possible values for <Platform> is win32\_x86(BOE Client) or win64\_x64(BOE server).
- The driver specific libraries are present in the path:  
`<BIP_INSTALL_DIR>\<Platform>\odbc\simbaspark\1.0\lib`
- Simba ODBC Driver for Spark Install Guide.pdf is found in the location:  
`<BIP_INSTALL_DIR>\<Platform>\odbc\simbaspark\1.0\help`

### Apache Spark ODBC configuration on UNIX System

After installation, you can configure the ODBC Driver for UNIX Platform by referring to the ini file sample present in: `<install_directory>/sap_bobj/enterprise_xi40/simbaconf`

- To change the [Host](#) and [Port](#) number, ODBCInstLib information, you need to configure the `simba.sparkodbc.ini.sample` by renaming it to `simba.sparkodbc.ini`. For more information on how to modify the `simba.sparkodbc.ini`, see [Simba ODBC Driver for Spark Install Guide.pdf](#)
- You can find driver specific libraries for ODBC drivers in the path: `<install_directory>/sap_bobj/enterprise_xi40/<Platform>/odbc/simbaspark/1.0/lib`
- Driver libraries must be set to the environment variables `LD_LIBRARY_PATH` (LINUX), `LIBPATH` (AIX)
- Set the environment variables `SIMBAINI`, `ODBCINI` to the path where `simba.sparkodbc.ini` file (inclusive of filename) is present.  
For example: `export SIMBAINI= <install_directory>/sap_bobj/enterprise_xi40/simbaconf/<Configuration File>.ini`
- Simba ODBC Driver for Spark Install Guide.pdf is found in the path: `<install_directory>/sap_bobj/enterprise_xi40/<Platform>/odbc/simbaspark/1.0/help`

## 7.10.11 To Create JDBC Connection to Hortonworks Data Platform

The Data Access layer allows the BI platform to connect to Hive on Hortonworks Data Platform through JDBC.

For details on how to create JDBC connection refer: [To Create JDBC Connection to Apache Hadoop HIVE \[page 119\]](#)

## 7.10.12 To Create ODBC Connection to Hortonworks Data Platform

The Data Access layer allows BI platform to connect to Hive on Hortonworks Data Platform through ODBC using SAP Hive ODBC Driver on all supported platforms. After BOE client or server installation, you need to update the host and port number details.

For details on how to create ODBC connection, refer: [To Create ODBC Connection to Apache Hadoop HIVE \[page 124\]](#)

## 7.11 IBM DB2 Connections - Reference Keys Mapped to Null

### ⚠ Restriction

Due to a database driver restriction, reference key names of IBM DB2 10 for z/OS database tables are mapped to NULL.

## 7.12 IBM Informix Connections

The following sections describe the actions to perform when problems with IBM Informix connections happen.

### Related Information

[To Set the JVM Timezone for IBM Informix Connections \[page 131\]](#)

[To Set the Transaction Mode for IBM Informix Connections \[page 132\]](#)

### 7.12.1 To Set the JVM Timezone for IBM Informix Connections

In the information design tool, queries to IBM Informix Dynamic Server 11 using JDBC may return wrong date type values if the client tool and server are located in different timezones. To avoid this problem, you must set the timezone value of the JVM to the same timezone set at the database server level.

1. Exit the information design tool.
2. Go to the `<bip-install-dir>\win32_x86` directory.
3. Open the `InformationDesignTool.ini` for editing.

4. Add the following line at the end of the file:

```
-Duser.timezone=<server_timezone_value>
```

where `<server_timezone_value>` is the timezone value set on the database server. For example: GMT.

5. Save the file.
6. Restart the application.

When you complete this task, connections to an IBM Informix database using JDBC are properly configured.

## 7.12.2 To Set the Transaction Mode for IBM Informix Connections

The Data Access layer allows SQL operations to be run as a transaction block by default. If the Informix Dynamic Server does not support transactions, you may expect connection failure. To avoid this problem, specify in the driver configuration file that the transaction mode is not available.

1. Exit the client tool.
2. Open the `informix.sbo` file for editing.  
It is located in the `<connectionserver-install-dir>\connectionServer\jdbc` directory.
3. Add the following line under the appropriate Database section:

```
<Parameter Name="Transactional Available">No</Parameter>
```

4. Save the file.
5. Restart the service and application.



When you complete this task, connections to IBM Informix are properly configured.

## Related Information

[Transactional Available \[page 207\]](#)

## 7.13 IBM Netezza Performance Server 11

The IBM Netezza Performance Server 11 is a new data source for the Connection Server.

Support for IBM Netezza Performance Server 11 is added as a new entry in Connection Server driver list:  [IBM Netezza Performance Server 11](#) 

- Driver Version: 7.2.1.9-P1 [Build 18]
- Database Version: 11.01.0000 Release 11.1.0.0 [Build 35]

Connectors for Netezza Performance Server 11 are based on Netezza Performance Server JDBC and ODBC drivers available in the market.

- Connection using SSO is supported.
- JDBC connections are supported
- ODBC connections on Windows are supported
- ODBC connections on UNIX are supported

#### Note

Multi-source universes are not supported.

## 7.14 MariaDB

MariaDB is an open-source database that offers more performance, more security, and ready for the cloud.

MariaDB is the successor to MySQL. The driver is a new entry in the JDBC driver list:

-  [MariaDB](#)  [MariaDB 10](#) 

This database is now supported in Amazon RDS. Amazon Relational Database Service (Amazon RDS) is a collection of managed services that makes it simple to set up, operate, and scale SQL databases in the cloud.

To access a MariaDB database in Amazon RDS, use the MariaDB driver.

Supported Datatypes

Datatype	Connection server datatype
BOOLEAN	Supported as 0 (false) or 1 (true)
TINYINT	Supported as Number
SMALLINT	
MEDIUMINT	
INTEGER / INT	
BIGINT	
REAL	Supported as Number
DOUBLE	
DECIMAL	Supported as BigDecimal
DEC, NUMERIC, FIXED	
VARCHAR	Supported as String
CHAR	
STRING	
DATE	Supported
DATETIME	
	YYYY-MM-DD for Date

Datatype	Connection server datatype
TIMESTAMP	yyyy-MM-dd HH:mm:ss for Timestamp (time zone part not supported)
BINARY	Not supported

## 7.15 Microsoft Analysis Services Connections

### ⚠ Caution

Connections to Microsoft Analysis Services through XMLA do not use Connection Server.

This section only relates to connections to be created in the information design tool.

In the information design tool, users can create connections to Microsoft Analysis Services over HTTP through an XMLA driver.

To configure these connections, you first need to enable the HTTP access. For more information, refer to the Microsoft TechNet website.

### Related Information

<http://technet.microsoft.com/en-us/library/cc917711.aspx> ➡

<http://technet.microsoft.com/en-us/library/cc917712.aspx> ➡

## 7.16 Microsoft Azure SQL Database

Microsoft Azure SQL Database is a new data source for the Connection Server.

Connectors for Microsoft Azure SQL Database are based on SQL Server 2009 JDBC and ODBC drivers available in the market.

- Driver Version: 17.06.0001
- Database Version: 12.00.2000
- Connection using SSO is supported.
- JDBC connections are supported
- ODBC connections on Windows are supported
- ODBC connections on UNIX are supported

### Note

Multi-source universes are not supported.

## 7.17 Microsoft SQL Server Connections

The following sections provide information for Microsoft SQL Server connections.

This database is now supported in Amazon RDS. Amazon Relational Database Service (Amazon RDS) is a collection of managed services that makes it simple to set up, operate, and scale SQL databases in the cloud.

To access a SQL Server database in Amazon RDS, use the SQL Server driver.

### Related Information

[Synonym Support for OLE DB Connections to Microsoft SQL Server \[page 135\]](#)

[To Set the JVM Options for Connections to Microsoft SQL Server on UNIX \[page 136\]](#)

### 7.17.1 Synonym Support for OLE DB Connections to Microsoft SQL Server

Synonym columns do not display in reporting tools.

Microsoft SQL Server Native Client middleware does not support metadata of Synonym columns. Consequently, Synonym columns from the Microsoft SQL Server database do not display in the universe design tool or information design tool when connecting through OLE DB.

### Related Information

[SQL Server Native Client \(OLE DB\) !\[\]\(0d7ca0919e6c47bbd874bfa0189fe22e\_img.jpg\)](#)

## 7.17.2 To Set the JVM Options for Connections to Microsoft SQL Server on UNIX

After you install the JDBC driver for Microsoft SQL Server on UNIX and configure the `jdbc.sbo` file, you set the JVM information in the `cs.cfg` file.

1. Open the `cs.cfg` file for editing.
2. Add the following file path to the `JavaVM` section in order to overwrite the default JVM configuration:

```
<LibraryName JNIVersion="JNI_VERSION_1_4">$BOBJEDIR/jdk/jre/lib/i386/server/libjvm.so</LibraryName>
```

3. Add one of the following options to the `JavaVM` section:

Option	Description
Solaris or Linux	<pre>&lt;Options&gt; &lt;Option&gt;-Xmx512m&lt;/Option&gt; &lt;/Options&gt;</pre>
AIX	<pre>&lt;Options&gt; &lt;Option&gt;-Xmx511m&lt;/Option&gt; &lt;/Options&gt;</pre>

### Note

You can allow 512 MB or higher to the Java Virtual Machine on Solaris or Linux, but no more than 511 MB on AIX.

4. Save the file.

## Related Information

[JVM Settings \[page 170\]](#)

## 7.17.3 To Configure SQL Server ODBC on Linux with DataDirect

For UNIX, DataDirect 8.0.2 comes with the build: `/build_location/sap_bobj/enterprise_xi40/linux_x64/odbc/8.0.2/sql/lib/CRsqls28.so`. Perform the following steps:

1. Modify `.bash_profile` and enter the following and source the file:

### Sample Code

```
#DataDirect for sql server 2019
```



```
export DataDirect_Home=/build_location/sap_bobj/enterprise_xi40/linux_x64/
odbc/8.0.2/sql
export LD_LIBRARY_PATH=$DataDirect_Home/lib:$LD_LIBRARY_PATH
```

2. Modify the `.odbc.ini` file and enter the following:

#### Sample Code

```
[DDmssql2019]
Driver=/build_location/sap_bobj/enterprise_xi40/linux_x64/odbc/
8.0.2/sql/lib/CRsqsls28.so
Server=ServerName
Port=PortNumber
User=User
Password=Password
Database=Database
```

3. Test the configuration through the `isql` execute command: `isql DDmssql2019 evalkit evalkit`
4. Test the connection server in local mode, the command is:

#### Sample Code

```
./isimple -l
"DRIVER=;DSN_MODE=true;DATASOURCE=DDmssql2019;USER=*****;PASSWORD=*****"
"ODBC" "MS SQL Server 2019" "SELECT * FROM Table_Name"
```

## 7.18 MongoDB 4.2

MongoDB 4.2 is a new data source for the Connection Server.

MongoDB 4.2 is added as a new entry in Connection Server driver list: [MongoDB](#) > [MongoDB 4.2](#).

- Driver Version: 2.3.11.1012
- Database Version: 00.00.0000

Connection Server connectors for MongoDB 4.2 are based on Simba MongoDB 4.2 JDBC and ODBC drivers.

- Connection using SSO is supported.
- JDBC connections are supported
- ODBC connections on Windows are supported
- ODBC connections on UNIX are supported

#### Note

Multi-source universes are not supported.

## 7.19 MySQL Connections - Database Privileges Needed for Some Workflows in the Information Design Tool

When working with a universe in the information design tool based on a MySQL JDBC connection, if the data foundation includes a table based on a view in the MySQL database, the user needs the `SHOW VIEW` or equivalent privilege granted in the database on this view.

If the privilege is not granted, the information design tool user may receive a database exception (`SHOW VIEW` command denied) when doing certain workflows, for example showing values or detecting keys.

This database is now supported in Amazon RDS. Amazon Relational Database Service (Amazon RDS) is a collection of managed services that makes it simple to set up, operate, and scale SQL databases in the cloud.

To access a MySQL database in Amazon RDS, use the MySQL driver.

## 7.20 Oracle Connections

The following sections provide configuration information for Oracle connections.

This database is now supported in Amazon RDS. Amazon Relational Database Service (Amazon RDS) is a collection of managed services that makes it simple to set up, operate, and scale SQL databases in the cloud.

To access a Oracle database in Amazon RDS, use the appropriate Oracle driver.

### Related Information

[Connections to Clusters of Oracle Servers \[page 138\]](#)

[To Set the Oracle CURSOR\\_SHARING Parameter Value \[page 139\]](#)

### 7.20.1 Connections to Clusters of Oracle Servers

Connections to clusters of Oracle servers that work in failover mode is supported through JDBC. The driver chooses one of these servers, and if it is not available, the next server is used. A connection error raises if all servers are unavailable.

In the connection wizard, enter the server host and port separated by a semi-colon in [Server\(s\)](#) `(host:port{,host:port})` to create a JDBC connection. Enter information for either one server or multiple servers if you want to take advantage of the failover mechanism.

## 7.20.2 To Set the Oracle CURSOR\_SHARING Parameter Value

The databases Oracle 10 and higher use the `CURSOR_SHARING` parameter. The BI platform and SAP BusinessObjects reporting tools support only the `EXACT` value for `CURSOR_SHARING`.

If you use the `FORCE` value, this may cause some performance issues of the reporting tools.

Do one of the following:

Option	Description
To set the <code>CURSOR_SHARING</code> value to the universe connection	<ol style="list-style-type: none"><li>1. Open the universe connection for editing.</li><li>2. Click <a href="#">Next</a> to go to the <a href="#">Custom Parameters</a> screen.</li><li>3. Click <a href="#">Add Parameter</a>.</li><li>4. Enter <b>ConnectInit</b> and click <a href="#">OK</a>.</li><li>5. Enter "<b>alter session set CURSOR_SHARING=EXACT</b>" as ConnectInit value.</li><li>6. Click <a href="#">Finish</a>.</li></ol>
To set the <code>CURSOR_SHARING</code> value to all Oracle connections	<ol style="list-style-type: none"><li>1. Browse to the directory that stores the <code>oracle.prm</code> file: <code>&lt;connectionserver-install-dir&gt;\connectionServer\Oracle</code>.</li><li>2. Open the file in an XML editor.</li><li>3. Under the Configuration section, add the following parameter:<div><pre>&lt;Parameter Name="CURSOR_SHARING"&gt;EXACT&lt;/Parameter&gt;</pre></div></li><li>4. Save the file.</li><li>5. Restart the connectivity and reporting services from the CMC.</li></ol>

### Note

For the definition of `CURSOR_SHARING`, see the Oracle documentation.

## 7.20.3 Using Oracle JDBC Connections in the Information Design Tool in Norwegian Bokmål Interface Language

To use Oracle JDBC connections in the information design tool when using the interface language Norwegian Bokmål, you need to set the default locale by making the following changes to the `InformationDesignTool.ini` file.

1. Exit the information design tool.
2. In the directory `<BIP_INSTALL_DIR>\SAP BusinessObjects Enterprise XI 4.0\win32_x86\`, find the `InformationDesignTool.ini` file and open it in an editor.

### Note

Replace `<BIP_INSTALL_DIR>` with the directory path where the BI platform is installed.

3. Add the following lines to the `InformationDesignTool.ini` and save the file.

```
-Duser.language=nb  
-Duser.country=NO
```

4. Restart the information design tool.
5. Perform the following steps in the information design tool to set the product language to the *Default Locale*:
  - a. From the information design tool main menu, select **Window > Preferences**.
  - b. In the *Preferences* dialog box, expand the *Information Design Tool* node and select *Languages*.
  - c. Select *Default Locale* from the *Product Languages* list.  
The *Default Locale* should be *(Norwegian Bokmål (Norway))*. Make sure you don't select the Product Language *Norwegian Bokmål*.
  - d. Click *OK*.
6. Exit and restart the information design tool for the language change to take effect.

## 7.21 Oracle Essbase Connections

The Data Access layer allows the BI platform to access the Oracle Essbase data source.

Connections to Oracle Essbase are OLAP connections. You can create .unx universes based on Oracle Essbase 11 through ESSJAPI or the Native API in a 64-bit environment.

To use Oracle Essbase with SAP BusinessObjects BI Platform version 4.3, you must update the `informationdesigntool.ini` file.

### Updating the InformationDesignTool.ini file

You must update the `InformationDesignTool.ini` file to ensure that the Essbase middleware is correctly loaded in information design tool. When you install the Essbase middleware, `EPM_ORACLE_HOME` is added to system environment variables; You must add the two following additional lines at the end of the `InformationDesignTool.ini` file, replacing the `$EPM_ORACLE_HOME` variable by its content:

```
-Dessbase.api.dir=$EPM_ORACLE_HOME\common\EssbaseJavaAPI\11.1.2.0\lib  
-Dessbase.logger.dir=$EPM_ORACLE_HOME\common\loggers\ODL\1.0.0\lib
```

The `InformationDesignTool.ini` file should look like this:

#### Sample Code

```
-clean  
-startup  
..\Information Design  
Tool\plugins\org.eclipse.equinox.launcher_1.5.200.v20180922-1751.jar  
--launcher.library  
..\Information Design  
Tool\plugins\org.eclipse.equinox.launcher.win32.win32.x86_64_1.1.900.v20180922  
-1751  
-vm
```

```

sapjvm\jre\bin
--launcher.XXMaxPermSize
128m
-vmargs
-Xms64M
-Xmx768M
-Dsap.sl.bics.useDesignTimeServices=true
-Dessbase.api.dir=C:\middleware\oracle_ESSBASE_x64\EPMSysstem11R1\common\Essbas
eJavaAPI\11.1.2.0\lib
-Dessbase.logger.dir=C:\middleware\oracle_ESSBASE_x64\EPMSysstem11R1\common\log
gers\ODL\1.0.0\lib

```

### Note

If you have not updated the `informationdesignntool.ini` file and you try to use an Essbase connection or universe, you will get the following error:

The required Essbase Client JARs were not found:  
`ess_japi.jar`, `ess_es_server.jar`, `ojdl.jar`. Please check your configuration  
 classpath.

## Related Information

## 7.22 Oracle RAC Connections

The Data Access layer allows the BI platform to connect to Oracle Real Application Clusters (RAC) through JDBC.

To create a connection from your application using the connection wizard, you need to provide the Oracle RAC data source entry, which has the following format:

```
<host>:<port>,<host>:<port>,...,<host>:<port>
```

The number of host and port pairs depends on the number of machines involved in the cluster.

### Example

```
pmrac1.us.oracle.com:1521,pmrac2.us.oracle.com:1521
```

## 7.23 Oracle Cloud Connections

Oracle Cloud provides servers, storage, applications and services through a global network managed by Oracle Corporation. In Oracle Cloud, Oracle Databases can be deployed on demand as managed cloud services.

To access your Oracle databases hosted in Oracle Cloud, you must first install Oracle middleware (i.e. Oracle JDBC, ODBC or native client drivers).

## 7.24 Presto DB

Presto is a high performance, distributed SQL query engine for big data. Its architecture allows users to query a variety of data sources such as Hadoop, MySQL, PostgreSQL, MongoDB, Cassandra, Redis, Teradata etc. You can even query data from multiple data sources within a single query.

Presto connections require Presto JDBC Driver supporting Presto Server versions 0.240 and earlier, Teradata Presto Server versions 0.208-t and earlier, and Presto Foundation Server 341 and earlier.

Stored Procedures provided by Presto connectors are supported.

Presto DB is available as a single entry in the Data Access driver list:

- [Presto](#) > [PrestoDB](#)

The Presto DB JDBC connector is supported on all platforms.

Connection Settings

Connection property	Mandatory/Optional	Value(s)
Authentication Mode	Mandatory	User/pass BO Credential Mapping SSO (for Kerberos support)
Username	Enabled when Authentication Mode = User/pass	Username
Password	Enabled when Authentication Mode = User/pass	Password
Server (host:port)	Mandatory	host:port
Catalog	Optional	Catalog
Schema	Optional	Schema
Use SSL	Optional	To enable SSL

You can set additional connection properties in the JDBC Driver Properties field in the connection wizard. For more details, refer to the *Presto JDBC Driver* documentation.

### Note

For Date filters in SQL, the USER\_INPUT\_DATE\_FORMAT PRM parameter should be defined as following in the PRM files: <Parameter Name="USER\_INPUT\_DATE\_FORMAT">\C\A\S\T('yyyy-MM-dd

`HH:mm:ss' \A\S \t\i\m\e\s\t\a\m\p)</Parameter>`. Refer to the *SQL Generation Parameters* chapter of the *Information Design Tool User Guide*.

The Presto JDBC connector supports the following data types:

#### Supported Datatypes

Data Type	Notes
Boolean	Supported as 0 (false) or 1 (true)
Integer <ul style="list-style-type: none"><li>TINYINT</li><li>SMALLINT</li><li>INTEGER</li><li>BIGINT</li></ul>	Supported as Number
Floating-Point <ul style="list-style-type: none"><li>REAL</li><li>DOUBLE</li></ul>	Supported as Number
Fixed-Precision <ul style="list-style-type: none"><li>DECIMAL</li></ul>	Supported as BigDecimal
String <ul style="list-style-type: none"><li>VARCHAR</li><li>CHAR</li><li>JSON</li><li>VARBINARY</li></ul>	Supported as String
Date and Time <ul style="list-style-type: none"><li>DATE</li><li>TIME</li><li>TIMESTAMP</li></ul>	Supported
Date and Time with Time Zone <ul style="list-style-type: none"><li>TIME WITH TIMEZONE</li><li>TIMESTAMP WITH TIMEZONE</li></ul>	Not supported
Structural <ul style="list-style-type: none"><li>ARRAY</li><li>MAP</li><li>ROW</li></ul>	<ul style="list-style-type: none"><li>ARRAY not supported</li><li>MAP not supported</li><li>ROW supported</li></ul>

#### Note

Multi-source universes are not supported.

## 7.25 Salesforce.com Connections

### 7.25.1 To Configure the Environment

You must first configure your environment to make salesforce.com connections work either in the universe design tool or in the information design tool.

1. Stop the Connectivity Service from the CMC and the client application.
2. Run `regedit.exe` in the Microsoft Windows command line to open the Registry Editor.
3. Go to the Salesforce ODBC data source under `HKEY_LOCAL_MACHINE > SOFTWARE > ODBC > ODBC.INI > <SALESFORCE_DSN_NAME>`, where `<SALESFORCE_DSN_NAME>` is the salesforce.com data source name.
4. Right-click the data source name and select `New > String Value`.
5. Enter `CheckJVMChanged`.
6. Double-click the property and enter `0`.
7. Close the Registry Editor.

You must then follow the steps below to complete the configuration.

### Related Information

[To Make salesforce.com Connections Work in the Information Design Tool \[page 144\]](#)

[To Make salesforce.com Connections Work in the Universe Design Tool \[page 145\]](#)

### 7.25.2 To Make salesforce.com Connections Work in the Information Design Tool

1. Exit the information design tool.
2. Copy the `sforce.jar` driver file to the `<bip-install-dir>\win32_x86\jdk\jre6\lib\ext` directory.
3. Go to the `<bip-install-dir>\win32_x86` directory.
4. Open the `InformationDesignTool.ini` for editing.
5. Add the following line at the end of the file:

```
-Dosgi.parentClassLoader=ext
```

6. Save the file.



7. Restart the application.

When you complete this task, connections to salesforce.com are properly configured.

## 7.25.3 To Make salesforce.com Connections Work in the Universe Design Tool

1. Exit the universe design tool.
2. Open the `cs.cfg` file for editing.
3. In the `JavaVM` section, add the following path:

```
<ClassPath>
  <Path>C:\Program Files
(x86)\Progress\DataDirect\Connect_for_ODBC_61\java\lib\sforce.jar</Path>
</ClassPath>
```

4. Save the file.
5. Open the `openaccess.sbo` file for editing.  
It is located in the `<connectionserver-install-dir>\connectionServer\odbc` directory.
6. Add the following line under the Database section:

```
<Parameter Name="Transactional Available">No</Parameter>
```

7. Save the file.
8. Restart the service and application.

When you complete this task, connections to salesforce.com are properly configured.

## Related Information

[Transactional Available \[page 207\]](#)

## 7.25.4 To Create Simba JDBC Connection

The Data Access layer allows BI platform to connect to the Salesforce.com databases through JDBC on all platforms.

1. While installing BI Platform, the salesforce jar get saved at `<connectionserver-install-dir>\connectionServer\jdbc\drivers\salesforce` directory.

Database	JAR Files
Salesforce	partner30.jar

Database	JAR Files
	simbaSFJDBC4-1.0.0.1000.jar
	wsc-22-jdk-1-5.jar

2. In the connection wizard, enter the following details: **User Name** in *User Name* field, **Password** in *Password* field, **Proxy Address** in *Proxy Address* field, **Proxy User Name** in *Proxy User Name* field and **Proxy Password** in *Proxy Password* field.

You have created a connection to the Salesforce.com database.

## 7.25.5 To Create Simba ODBC Connection

The Data Access layer allows BI platform to connect to the Salesforce.com databases through ODBC using SAP Salesforce ODBC Driver on all supported platforms.

### Windows System 64 Bit

Sample SAP Salesforce DSN is the Sample DSN found in the *ODBC Data Source Administrator*, refer to this for further configuration assistance.

### UNIX System

For Salesforce.com ODBC configuration on UNIX System, see *Simba ODBC Driver for Salesforce Install Guide.pdf* and *Simba-Salesforce-ODBC-Driver-Quickstart.pdf*.

#### Note

*Simba ODBC Driver for Salesforce Install Guide.pdf* and *Simba-Salesforce-ODBC-Driver-Quickstart.pdf* are shipped along with the product.

## 7.26 SAP BW Connections

Relational connections to SAP BW do not use Connection Server. These connections go through a dedicated connector and use a specific facade in SAP BW.

For details on how to configure and tune connections to SAP BW, see the *Data Federator Administration Tool Guide*.

### 7.26.1 Requirements for Connecting Data Federator to SAP BW

To connect to SAP BW, you must have a compatible release of SAP BW, as well as the appropriate SAP notes:

- The minimum required release is SAP BI 7.01 SP06.

#### Note

The official name SAP BW changed between releases. Before release 7.3, it was called SAP BI.

- The required SAP note is: <https://launchpad.support.sap.com/#/notes/1460273> .

For details on supported versions of SAP BW, see the *Product Availability Matrix*.

## 7.26.2 Requirements for Making SAP BW Connections Work in the Information Design Tool

An external application such as the information design tool can connect to SAP BW if SAP Gateway permits.

To make connections work in the information design tool, ensure the SAP Gateway security settings for external programs are configured properly. For more information, see the SAP Gateway online documentation.

### Related Information

[Security Parameters - Connectivity - SAP Library](#)

## 7.26.3 Requirements for Accessing Multisource-Enabled Universes on SAP BW

Application users require authorizations to access multisource universes based on the SAP BW database.

For information on the authorizations necessary for users of query and reporting applications to access multisource universes on SAP BW, see the SAP Note #1465871.

### Related Information

[SAP Note #1465871](#) 

## 7.26.4 BW Connections for .unv universes

The Data Access layer allows the BI platform to access SAP BW data sources.

Connections to SAP BW through BAPI are OLAP connections. SAP BW connections can work with 64-bit Connection Server for 64-bit operating systems. You can create .unv universes based on SAP BW on 64-bit Microsoft Windows, and 64-bit UNIX flavors.

### 7.26.4.1 To Enable BW 64-bit Connections for .unv Universes

You can use SAP BW connections with a 64-bit Connection Server to build .unv universes.

You can install the SAP BW 64-bit driver on an SAP BusinessObjects BI platform on 64-bit Microsoft Windows.

Follow the steps below according to the type of installation you perform:

- If you perform a full installation of this release, SAP BW connections will use the 64-bit Connection Server.
- If you perform a patch installation over an existing platform, SAP BW connections will continue to use the 32-bit Connection Server. To use the 64-bit Connection Server, modify the installation of the platform:
  - a. In the Control Panel, locate the latest full installation program of the BI platform.

#### → Remember

You cannot perform the next step on a program update of the platform.

- b. Right-click and select *Uninstall/Change*.
- c. In the *Application Maintenance* screen of the *SAP BusinessObjects BI platform setup* dialog box, select *Modify* and click *Next*.
- d. In the *Select Features* screen, select the *SAPBW64* option under *Database Access*.
- e. Click *Next* and complete the installation.

You have installed the SAP BW 64-bit driver on the platform. You can now create SAP BW connections that use the 64-bit Connection Server on 64-bit Microsoft Windows.

## 7.27 SAP Datasphere

On March 8 2023, SAP Data Warehouse Cloud 1.0 was rebranded as SAP Datasphere.

The connector for SAP Datasphere is based on HANA 2.0 SP5 drivers. SAP Datasphere supports SQL query language with the same query capabilities. Running a query consists in creating a job with the desired SQL sentence, and executing it.

The driver currently uses the original entry in Connection Server driver list: ► [SAP](#) ► [SAP Data Warehouse Cloud 1.0](#) 🗑️:

- Driver Version: 02.05.0109(2020-08-28)

- Database Version: 04.00.0000 00-1595263150
- Connection using SSO is supported.
- JDBC connections are supported
- ODBC connections on Windows are supported
- ODBC connections on UNIX are supported

#### ⓘ Note

Stored procedures are not supported.

## 7.28 SAP ERP Connections - Driver Failed to Load

The following error message may appear in SAP BusinessObjects Web Intelligence:

```
Database error: (CS) "Java Exception : java.lang.NoClassDefFoundError:
com/sap/bip/jco/JCoManager : cannot initialize class because prior
initialization attempt failed"
```

It means the SAP ERP driver fails to load, because the Web Intelligence Processing Server cannot find the `sapjco3.dll` file.

To make SAP ERP connections work, you must copy the file from the BI platform server directory (`<bip-install-dir>\win64_x64`) to the Microsoft Windows directory (`C:\WINDOWS\system32`). You then restart the Web Intelligence Processing Server.

## 7.29 SAP HANA Connections

The Data Access layer allows the BI platform to connect SAP HANA database 1.0 SPS 08, or higher, using ODBC and JDBC on all platforms. The present release supports HANA 2.0 SPS04 and also supports OLAP connections to the SAP HANA database on Microsoft Windows, Linux and AIX.

#### ⓘ Note

For HANA2 SSO connections, when your connection is based on SAML, you cannot use the [Connect to tenant](#) option, you must use the [Connect to port or failover](#) option, as it is not possible to connect to the tenant using the tenant name.

## Array Fetch Size

The `Array Fetch Size` default value is 1000 for SAP HANA connections.

### ⚠ Caution

Because a high number for `Array Fetch Size` requires more memory, this configuration may affect your system performance.

## Failover

Connections to clusters of SAP HANA servers that work in failover mode are supported through ODBC and JDBC. The driver chooses one of these servers, and if it is not available, the next server is used. A connection error occurs if all servers are unavailable.

## Preferred Viewing Locale

SAP HANA connectivities support Preferred Viewing Locale (PVL) for all authentication modes through JDBC and ODBC. The PVL allows the user to retrieve localized data if the database stores data in different languages.

## Single sign-on to database

The BI platform provides single sign-on (SSO) to database using either Windows AD with Kerberos or the SAML protocol on Microsoft Windows and Linux platforms. SSO with Kerberos is available for JDBC and ODBC connections. SSO with SAML is available in JDBC, but not in ODBC.

If both Kerberos and SAML implementations are available in your environment, the platform uses SAML in priority. If any problem occurs using SAML, the platform uses Kerberos instead. This logic is transparent to the application user. To deactivate the use of SAML, set the `skip_saml_sso` parameter to `True` in the appropriate `newdb.sbo` configuration file.

The BI platform also provides SSO to database using either Windows AD with Kerberos or the SAML protocol in OLAP connections.

Once users are logged on to the BI platform from an SAP BusinessObjects application, they can perform actions that require database access, such as refreshing Web Intelligence documents, without providing their database credentials.

## UNIX support

Starting from the 4.1 release, the Data Access layer allows the BI platform to connect to the SAP HANA database through ODBC on 64-bit UNIX platforms. This requires the use of an ODBC driver manager, for instance, `unixODBC`.

## Use of SSL

Relational and OLAP connections to SAP HANA can use the SSL protocol.

## Related Information

[Skip SAML SSO \[page 204\]](#)

## 7.29.1 Creating an SAP HANA Connection

### Creating a JDBC Connection

The SAP HANA 1.0 SPS 08 JDBC drivers are installed as part of the BI platform in the `<connectionserver-install-dir>\connectionServer\jdbc\drivers\newdb` directory. Consequently, you do not need to perform any additional configuration to create a connection to the SAP HANA database.

Select one of the following options in the connection wizard to create a JDBC connection:

- *Single Server*  
Enter the HANA host name and instance number in the *Host Name* and *Instance Number* fields.
- *Multiple Servers (Failover)*  
Enter the server host and port separated by a semi-colon in *Server (host:port{;host:port})*. Enter information for either one server or multiple servers if you want to take advantage of the failover mechanism.

The convention for port number is as follows:

```
3##15
```

where `##` is the HANA instance number.

### Example

If you are connecting to instance 0, type either the instance number 00 or the port number 30015 in the wizard. If you are connecting to instance 1, type either the instance number 01 or the port number 30115.

## Using SSL

Select *Use SSL* in the connection wizard to create an OLAP or JDBC connection that is using the SSL protocol to connect to the SAP HANA server.

#### Note

To use SSL in ODBC on Microsoft Windows, open the ODBC Data Source Administrator and select [SSL](#) when you configure the DSN.

## Single- and Multi- Tenant HANA Connections

We assume that HANA 1 operates mostly in single tenant mode, and HANA 2 mostly operates in multi tenant mode. This means:

- For a connection to a single tenant HANA 1 instance, you should use our HANA 1 connector
- For a connection to a multi tenant HANA 2 instance, you should use our HANA 2 connector

Although it is possible to have multitenant HANA 1 setups, or single-tenant HANA 2 setups, you should proceed as follows:

- To configure a connection to a single tenant HANA 2 instance, you should use our HANA 1 connector
- To configure a connection to a multi tenant HANA 1 instance, you should use our HANA 2 connector

## Related Information

[Creating JDBC Connections \[page 47\]](#)

## 7.29.2 Editing an SAP HANA Connection

An SAP HANA connection opened for editing can show up under [Single Server](#) or [Multiple Servers \(Failover\)](#) in the connection wizard. To edit the connection, do one of the following:

- If it shows up in [Single Server](#), modify the host name and instance number of the data source.
- If it shows up in [Multiple Servers \(Failover\)](#), modify the server host and port.

## 7.29.3 Before Configuring Single Sign-On for SAP HANA Connections

#### → Remember

This section is about configuring single sign-on through Windows AD with Kerberos for SAP HANA connections.



Before setting up the necessary Java VM options, you must create the JAAS `bscLogin.conf` and Kerberos `krb5.ini` configuration files to prepare your application for Windows AD authentication. See the *SAP BusinessObjects Business Intelligence platform Administrator Guide* for more information.

## Related Information

[To Configure Single Sign-On to SAP HANA for the Information Design Tool \[page 153\]](#)

[To Configure Single Sign-On to SAP HANA for Web Intelligence \[page 154\]](#)

[To Configure Single Sign-On to SAP HANA for Web Intelligence Rich Client \[page 155\]](#)

[Before Configuring Single Sign-On for SAP HANA Connections \[page 152\]](#)

## 7.29.4 To Configure Single Sign-On to SAP HANA for the Information Design Tool

The following steps enable single sign-on to the SAP HANA database through JDBC from the information design tool.

Do one of the following:

Option	Description
<b>To configure SSO for local connections through JDBC</b>	<ol style="list-style-type: none"> <li>Exit the information design tool.</li> <li>Open the <code>InformationDesignTool.ini</code> file for editing. It is located at the <code>&lt;bip-install-dir&gt;\win32_x86</code> directory.</li> <li>Add the following lines: <div data-bbox="403 1332 1292 1384" data-label="Text"> <pre>-Djava.security.auth.login.config=C:\&lt;location&gt;\bscLogin.conf -Djava.security.krb5.conf=C:\&lt;location&gt;\Krb5.ini</pre> </div> <p>where <code>&lt;location&gt;</code> is the configuration file directory on the machine where the Connection Server is running.</p> </li> <li>Save the file.</li> <li>Restart the information design tool.</li> </ol>
<b>To configure SSO for connections located on the CMS through JDBC</b>	<p>The objective is to configure the Adaptive Connectivity Service.</p> <ol style="list-style-type: none"> <li>Open the CMC.</li> <li>Under <i>Connectivity Services</i>, stop the Adaptive Connectivity Service hosted by the Adaptive Processing Server.</li> <li>Go to the <i>Properties</i> page.</li> <li>Add the following options to the <i>Command Line Parameters</i> property: <div data-bbox="403 1785 1292 1836" data-label="Text"> <pre>-Djava.security.auth.login.config=C:\&lt;location&gt;\bscLogin.conf -Djava.security.krb5.conf=C:\&lt;location&gt;\Krb5.ini</pre> </div> <p>where <code>&lt;location&gt;</code> is the configuration file directory on the machine where the Connection Server is running.</p> </li> <li>Click <i>Save</i>.</li> <li>Restart the service from the CMC.</li> </ol>

Option	Description
	<p>→ Remember</p> <p>You also need to configure the Adaptive Connectivity Service to enable SSO with Web Intelligence Rich Client in Connected mode. These steps also allow you to configure SSO for all other Java services, such as the Data Federation services. You use Data Federation services when querying on a multisource-enabled universe built on an SAP HANA connection.</p>

## 7.29.5 To Configure Single Sign-On to SAP HANA for Web Intelligence

The following steps enable single sign-on to the SAP HANA database through JDBC for SAP BusinessObjects Web Intelligence.

### ❗ Note

This procedure applies to the Java or HTML interface of SAP BusinessObjects Web Intelligence that the application user launches from the BI launch pad.

### → Remember

This configuration only addresses Web Intelligence reporting services hosted by the Web Intelligence Processing Server.

1. Open the CMC.
2. Under *Web Intelligence Services*, stop the reporting service hosted by the Web Intelligence Processing Server.
3. Open the `cs.cfg` file for editing.
4. In the `JavaVM` section, add the following Java VM options:

```
<Options>
  <Option>-Djava.security.auth.login.config=C:\<location>\bscLogin.conf</Option>
  <Option>-Djava.security.krb5.conf=C:\<location>\Krb5.ini</Option>
</Options>
```

where `<location>` is the configuration file directory on the machine where the Connection Server is running.

5. Save the file.
6. Restart the service from the CMC.

## Related Information

[JVM Settings \[page 170\]](#)

## 7.29.6 To Configure Single Sign-On to SAP HANA for Web Intelligence Rich Client

The following steps enable single sign-on to the SAP HANA database through JDBC from the Web Intelligence Rich Client application.

Follow one of the procedures below:

- If you connect to Web Intelligence Rich Client from a WID document or from the Windows Start menu:
  1. Close your document and exit from Web Intelligence Rich Client.
  2. Create the following environment variables:
    - `java.security.auth.login.config=C:\<location>\bscLogin.conf`
    - `java.security.krb5.conf=C:\<location>\Krb5.ini`where `<location>` is the configuration file directory on the machine where Connection Server is running.
  3. Restart Web Intelligence Rich Client.
- If you use Web Intelligence Rich Client in Connected mode from the BI launch pad (also known as HTTP mode), you must configure the Adaptive Connectivity Service. Follow the steps described to configure single sign-on for the information design tool.

### Related Information

[To Configure Single Sign-On to SAP HANA for the Information Design Tool \[page 153\]](#)

## 7.29.7 To Configure the Java Virtual Machine for Instrumentation with SAP HANA Connections

You can monitor the activity of SAP HANA drivers if you install CA Wily Introscope with the BI platform. This instrumentation provides end-to-end tracing support for SAP HANA connections through ODBC and JDBC.

SAP HANA tracing is enabled by default in the platform. However, you also have to configure the Java Virtual Machine to use the JNI bridge.

1. Open the `cs.cfg` file for editing.
2. Add the following JAR file paths to the `JavaVM` section in order to load the necessary classes:

```
<ClassPath>
  <Path> "<bip-install-dir>\java\lib\TraceLog.jar;<bip-install-dir>\java\lib\external\com.sap.js.passport.api.jar"
</Path>
</ClassPath>
```

3. Add the following options to the `JavaVM` section:

```
<Options>
  <Option>-javaagent:<bip-install-dir>\java\wily\Agent.jar</Option>
  <Option>-Dcom.wily.introscope.agentProfile=<bip-install-dir>\java\wily\IntroscopeAgent_CSJNI.profile</Option>
```

```
<Option>-Dcom.wily.introscope.agent.agentName=CSJNIEngine</Option>
</Options>
```

4. Save the file.
5. Open the `IntroscopeAgent_CSJNI.profile` for editing.  
It is located in the `<bip_install_dir>\java\wily` directory.
6. Replace `localhost` with the host name of the Introscope Agent in the following line:

```
introscope.agent.enterprisemanager.transport.tcp.host.DEFAULT=localhost
```

7. Save the file.

## Related Information

[JVM Settings \[page 170\]](#)

## 7.30 SAP HANA Cloud 1.0

SAP HANA Cloud 1.0 is a new data source for the Connection Server.

The connector for SAP HANA Cloud 1.0 is based on HANA 2.0 drivers. The driver is added as a new entry in Connection Server driver list: ► [SAP](#) ► [SAP HANA Cloud 1.0](#) ►.

- Driver Version: 02.05.0109(2020-08-28)
- Database Version: 04.00.0000 00-1594901487
- Connection using SSO is supported.
- JDBC connections are supported
- ODBC connections on Windows are supported
- ODBC connections on UNIX are supported

### ⓘ Note

Stored procedures are not supported

### ⓘ Note

Multi-source universes are not supported.

## 7.31 SAP HANA Vora Connections

The Data Access layer allows the BI platform to connect SAP HANA Vora database using ODBC and JDBC on all platforms.

### 7.31.1 To Create JDBC Connection to SAP HANA Vora Platform

The Data Access layer allows the BI platform to connect to SAP HANA Vora through JDBC

For details on how to create JDBC connection refer: [To Create JDBC Connection to Apache Spark \[page 129\]](#)

### 7.31.2 To Create ODBC Connection to SAP HANA Vora Platform

The Data Access layer allows BI platform to connect to SAP HANA Vora Platform through ODBC using Spark ODBC Driver on all supported platforms. After BOE client or server installation, you need to update the host and port number details.

For details on how to create ODBC connection, refer: [To Create ODBC Connection to Apache Spark \[page 130\]](#)

## 7.32 SAP MaxDB Connections

On ODBC, make sure to use the SAP MaxDB ODBC driver version 7.7.07 (build number 07 or higher). SAP MaxDB provides ASCII and Unicode drivers for both Microsoft Windows and UNIX. The ASCII version of the ODBC driver always connects to the database kernel with ASCII. The Unicode version of the ODBC driver connects to ASCII database kernels via ASCII and to Unicode database kernels with UCS2.

SAP MaxDB does not require a specific driver manager on UNIX. However, it can be configured to work with the following driver managers if needed:

- unixODBC 2.0.9 or higher
- iODBC 3.0.5 or higher

On JDBC, make sure to use the latest version of the `sapdbc.jar` driver. For more information about SAP MaxDB JDBC driver, refer to `maxdb.sbo` configuration file.

## 7.33 SAS Connections

Connections to SAS do not use Connection Server. They use an adapted JDBC connector to SAS/SHARE data sets.

To configure these connections, you need to install the compatible JDBC driver.

For more information about configuring SAS connectors, refer to the *Data Federator Administration Tool Guide*.

### 7.33.1 Installing Drivers for SAS Connections

In order to use a SAS connector, you must install a driver that lets the data federation query engine connect to a SAS/SHARE server.

A SAS/SHARE server is a server that allows you to connect to SAS data sets. For more information about SAS/SHARE, see the SAS website.

The directory where you should copy the SAS JDBC driver jars on the machine where you installed the BI platform is `<boe-install-dir>/java/pjs/services/DataFederatorService/resources/drivers/sas`.

You must create the `drivers/sas` directories under the `resources` directory.

For details on supported versions of SAS, see the *Product Availability Matrix*.

### Related Information

<http://www.sas.com/products/share/index.html> ➡

## 7.34 Snowflake Connections

Snowflake is supported through the ODBC and JDBC drivers and uses the warehouse concept. The snowflake instance can host multiple warehouses depending on your requirements. You define the warehouse size depending on your performance requirements. These warehouses can be started and stopped automatically by Snowflake. Refer to the *snowflake.net* web site for specific information concerning driver configuration.

#### ❗ Note

Stored procedures are not supported.

## ODBC Connections

The ODBC driver allows you to choose the default warehouse for connection. For ODBC connections, configure the warehouse(s) in the ODBC DSN.

## DNS-less ODBC Connections

The Snowflake ODBC driver supports the `SQLDriverConnect` API. Snowflake-specific connection parameters for DNS-less connection are:

- Server: This contains the full Snowflake server name.
- Warehouse: The default warehouse for the connection.
- Database: the default database for the connection.

## JDBC Connections

For JDBC, provide the following information:

- Server: provide the full server address including `.snowflakecomputing.com`.
- Warehouse: the name of the warehouse to use.
- Database: the default database for the connection. The database must be present in the warehouse definition.
- User and password: For authentication.

## 7.35 SQLite

The native SQLite driver directly based on SQLite C/C++ API and is available on all platforms supported by Web Intelligence:

- Windows
- Unix Linux
- Unix AIX/Solaris

In order to connect to a SQLite database, all that is needed is a path to the database file. SQLite does not run on a server, nor requires authentication, all that is needed is the file to open.

So the connection wizard is the simplest: it has only one parameter, the file path.

This means that your SQLite connections must accept database paths:

- That are relative to the `dataAccess/connectionServer` folder
- Written using Unix-style separators (ie use `/` on all platforms to separate folders)

Paths must also support two templates to allow for easy folder access:

- %CS%, which points to the ConnectionServer root (dataAccess/connectionServer)
- %WebiSamples%, which points to the Web Intelligence samples directory (samples/webi)

## Supported Datatypes

- INTEGER as signed integer
- REAL as floating point value
- TEXT as text string
- BLOB as blob of data

Date and Time datatypes are not stored in SQLite as native dates and/or times. They can be stored as:

- TEXT as ISO8601 strings ("YYYY-MM-DD HH:MM:SS.SSS").
- REAL as Julian day numbers, the number of days since noon in Greenwich on November 24, 4714 B.C. according to the proleptic Gregorian calendar.
- INTEGER as Unix Time, the number of seconds since 1970-01-01 00:00:00 UTC

## 7.36 Sybase SQL Anywhere Connections

The Data Access layer allows the BI platform to connect to the Sybase SQL Anywhere 16 databases through JDBC and ODBC on all platforms.

### 7.36.1 To Create JDBC Connection to Sybase SQL Anywhere 16

The Data Access layer allows the BI platform to connect to Sybase SQL Anywhere 16 through JDBC on all platforms. This is shipped for both the server and client.

1. You can find the JAR files in the <connectionserver-install-dir>\connectionServer\jdbc\drivers\ssa16

Sybase SQL Anywhere	JAR File
16	jconn4.jar

2. Run the connection wizard.
3. Select Sybase SQL Anywhere 16.
4. Use the wizard to configure the connection.



#### Note

You need not perform any additional configuration to create a connection to Sybase SQL Anywhere 16 as the drivers are installed as a part of the BI platform in the <connectionserver-install-dir>\connectionServer\jdbc\drivers\ssa16 directory.

## Related Information

[JAR File Location Reference \[page 49\]](#)

## 7.36.2 To Create ODBC Connection to Sybase SQL Anywhere 16

The Data Access layer allows BI platform to connect to Sybase SQL Anywhere 16 through ODBC on all supported platforms. After BOE client or server installation, you need to update the host and port number details. This is shipped for both the server and client.

#### Note

Previously, In the Central Management Console (CMC), when the data base was not configured with Sybase SQL Anywhere, SQL Anywhere ODBC driver was not shipped with BOE server installation. However, Sybase SQL Anywhere 16 driver is now shipped with the installation.

### Windows System

#### Note

- SQL Anywhere 16 Driver must be used to create DSN
- Sample SAP SQL Anywhere DSN is the Sample DSN found in the [ODBC Data Source Administrator](#), refer this for further configuration assistance. In the BOE Server, when CMS Database is configured with SQL Anywhere, the sample DSN will not be found. In this case, the CMS and Audit DSN are used for reference.
- If you select Sample SAP Sybase SQL Anywhere DSN for ODBC connectivity, possible values for <Platform> is win32\_x86(BOE Client) or win64\_x64(BOE server)
- The driver specific libraries are present in the path: <install\_directory>\sqlanywhere

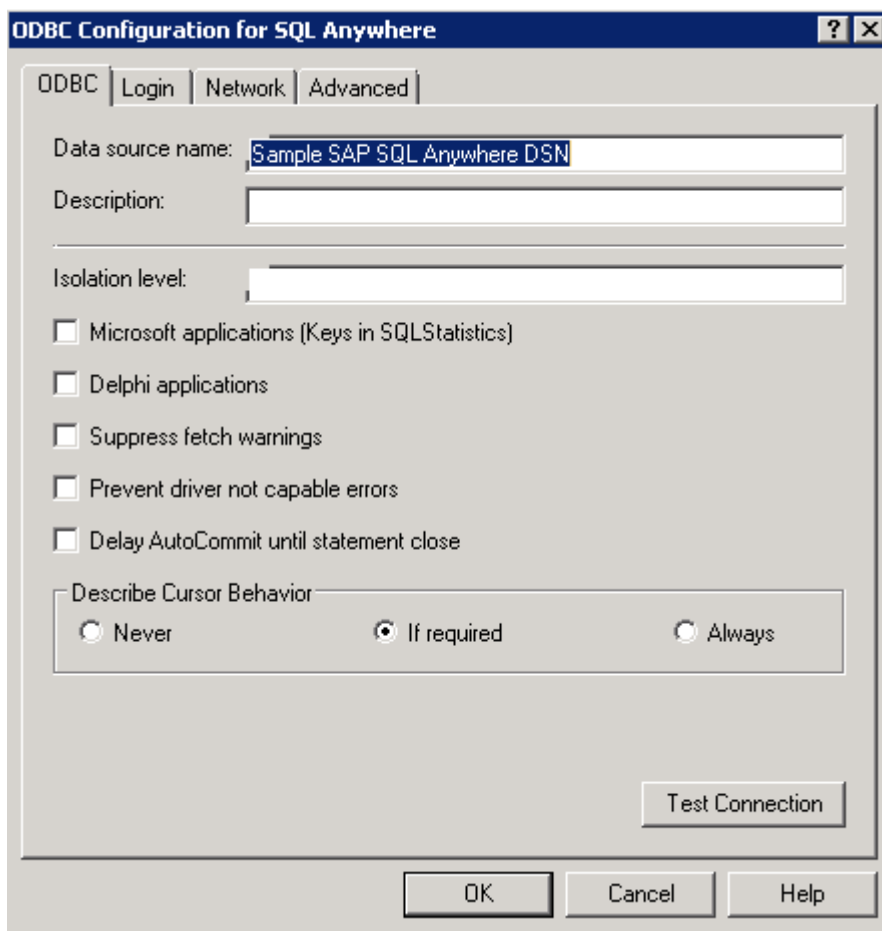
### UNIX System

After installation, you can find SAP Sybase SQL Anywhere ODBC driver specific libraries in the path: <install\_directory>\sqlanywhere

#### SQL Anywhere ODBC configuration on UNIX System

After installation, you can configure the ODBC Driver for UNIX Platform by referring to the ini file sample present in: <install\_directory>\sqlanywhere\conf

- You can set the environment variables ODBCINI to the path where odbc.ini file (inclusive of filename)
- Driver libraries path: [INSTALLDIR]/sqlanywhere/lib64, must be set to the environment variables LD\_LIBRARY\_PATH (LINUX,SOLARIS), LIBPATH (AIX).
- Create DSN entry in the odbc.ini file as below:  
[ODBC Data Sources]  
*Sample SAP SQL Anywhere DSN*=SQLAnywhere 16.0  
[Sample SAP SQL Anywhere DSN]  
*UID*=[your\_user\_name]  
*Password*=[password]  
*DatabaseName*=[your\_database\_name]  
*ServerName*=[your\_server\_name]  
*Host*=[HOST]  
*Driver*=[INSTALLDIR]/sqlanywhere/lib64/libdbodbc16.so



## 7.37 Teradata Connections - Mapping Teradata Database to Current Owner

The following section provides configuration information for Teradata connections.

A Teradata database supports table owners, but not qualifiers. The Connection Server returns the current user as current owner for Teradata data sources. However, the data source may be configured to map a user to the database of another user. In this case, you can configure the Teradata driver to map the current owner to the database with the `Replace Current Owner With Database` parameter. You can only use this parameter with ODBC connections.

### Related Information

[Replace Current Owner With Database \[page 221\]](#)

## 7.38 Trino Connections

This software supports Trino datasources as JDBC connections.

The Trino connector is an ANSI SQL compliant query engine. Running a query consists in creating a job with the desired SQL sentence, and executing it.

For SQL query generation, the PRM parameters wiki page lists the PRM parameters that control SQL generation. For details about parameter values, refer to the Trino PRM file. For more details, see the section *Trino SQL Language* in the Trino website.

#### Note

For Date filters in SQL, the `USER_INPUT_DATE_FORMAT` PRM parameter should be defined as following in PRM files:

```
<Parameter Name="USER_INPUT_DATE_FORMAT">\C\A\S\T('yyyy-MM-dd HH:mm:ss' \A\S
\t\i\m\e\s\t\a\m\p)</Parameter>
```

#### Note

Trino is not supported for multi-source universes.

Stored procedures provided by Trino connectors are supported.

You'll find the Trino driver in the following location in the driver list::

► [Trino](#) ► [Trino](#) ►

## Connection

To connect to a Trino Server, the following connection properties must be set:

Connection properties

Connection property	Notes
Authentication Mode	Mandatory. Possible values: <ul style="list-style-type: none"><li>• User/Pass</li><li>• BO Credential Mapping</li><li>• SSO (for Kerberos support)</li></ul>
Username	Enabled if Authentication mode = User/pass
Password	Enabled if Authentication mode = User/pass
Server (host:port)	Mandatory host:port
Catalog	Optional catalog
Schema	Optional schema
Use SSL	Optional to enable SSL

You may be able to set additional connection properties from JDBC Driver Properties field in the connection wizard. For more details, see *Trino JDBC Driver* documentation.

The driver class is `io.trino.jdbc.TrinoDriver`.

## Supported datatypes

Supported data types

Data type	Notes
Boolean <ul style="list-style-type: none"><li>• BOOLEAN</li></ul>	Supported as 0 (false) or 1 (true)
Integer <ul style="list-style-type: none"><li>• TINYINT</li><li>• SMALLINT</li><li>• INTEGER</li><li>• BIGINT</li></ul>	Supported as Number
Floating-Point <ul style="list-style-type: none"><li>• REAL</li><li>• DOUBLE</li></ul>	Supported as Number
Fixed-Precision <ul style="list-style-type: none"><li>• DECIMAL</li></ul>	Supported as BigDecimal

Data type	Notes
String <ul style="list-style-type: none"> <li>VARCHAR</li> <li>CHAR</li> <li>JSON</li> <li>VARBINARY</li> </ul>	Supported as String
Date and Time <ul style="list-style-type: none"> <li>DATE</li> <li>TIME</li> <li>TIMESTAMP</li> </ul>	Supported
Date and Time with Time Zone <ul style="list-style-type: none"> <li>TIME WITH TIME ZONE</li> <li>TIMESTAMP WITH TIME ZONE</li> </ul>	Not supported
Structural <ul style="list-style-type: none"> <li>ARRAY</li> <li>MAP</li> <li>ROW*</li> </ul>	Not supported. * Except for ROW

# 8 Configuring Data Access Global Parameters

## 8.1 About Global Parameters

You can configure the global parameter values that apply to all connections. You can do this to improve performance, or to resolve issues with the connection that arise.

Data access global parameters are maintained in the `cs.cfg` file. This is an XML file that contains Connection Server configuration parameters, and default configuration parameters that apply to all data access drivers.

To override these global settings, you can edit settings in the SBO configuration file of each driver.

### Related Information

[Configuring Driver Parameters \[page 182\]](#)

## 8.2 About the `cs.cfg` Configuration File

On Microsoft Windows, the `cs.cfg` file is stored in the following location:

- `<connectionserver-install-dir>\connectionServer`

In the `cs.cfg` file, you can configure parameters in the following sections only:

- **Capabilities**  
This section defines parameters that allow you to specify the use of local or remote Connection Server.
- **Settings**  
This section defines Connection Server global configuration parameters, including which drivers to load at startup in library mode.
- **JavaVM**  
This section defines the default library of the Java Virtual Machine (JVM) used by the data access layer.
- **DriverDefaults**  
This section defines parameters that apply to all data access drivers. They can be overridden for a specific driver by corresponding settings in the `<driver>.sbo` configuration files, where `<driver>` is the name of the data access driver to which the SBO file relates.
- **Traces**  
This section defines parameters that allow the recording of connection activity through Connection Server in log files.

The remaining `Locales` section defines the operating system charset for each available language. You must not modify the parameters in this section.

## 8.3 To View and Edit the `cs.cfg` File

1. Browse to the directory that stores the `cs.cfg` file. For example, on a Microsoft Windows system:

`<connectionserver-install-dir>\connectionServer\cs.cfg` where `<connectionserver-install-dir>` is the path where your Connection Server software is installed.

2. Open `cs.cfg` in an XML editor.
3. Expand sections as required.
4. Set parameters by either adding new parameters and values, or modifying existing parameter values.
5. Check that the document is valid against the DTD, then save and close the file.

### → Remember

You must restart Connection Server after editing the `cs.cfg` file.

## 8.4 Configuring the Global Settings Parameters

The `Settings` section of `cs.cfg` defines settings that apply to all drivers, and cannot be customized for individual data access drivers.

To view or edit parameters, open `cs.cfg` in an XML editor and go to the `Settings` section. In the file, each parameter is defined in the following tag:

```
<Parameter Name="<parameter>"><value> </Parameter>
```

where `<parameter>` is the name of the parameter, and `<value>` is the value to which the parameter is set.

Each parameter is shown with the following information:

- Example of how the parameter appears in the XML file
- Description of the parameter
- Possible values that can be set for the parameter (where applicable)
- Default value for the parameter

### 📌 Note

Some settings can only be modified from the Central Management Console (CMC). For more information about it, refer to the *SAP BusinessObjects Business Intelligence platform Administrator Guide*.

## 8.4.1 Ignore Driver Load Failure

```
<Parameter Name="Ignore Driver Load Failure">Yes</Parameter>
```

Description	Determines action taken when a driver fails to load. The parameter lets you choose whether you want a usable connection possibly without all drivers operating, or a fatal error and no functionality when a driver fails to load. <div><b>Note</b> This parameter is ignored in server deployment mode.</div>
Values	<p>Yes: Connection Server generates a warning message when a driver fails to load.</p> <p>No: Connection Server generates a fatal error when a driver fails to load.</p>
Default	Yes

## Related Information

[Load Drivers On Startup \[page 168\]](#)

## 8.4.2 Load Drivers On Startup

```
<Parameter Name="Load Drivers on Startup">No</Parameter>
```

### ⚠ Caution

Load Drivers On Startup only applies to library mode.

Description	Determines how driver libraries are loaded.
Values	<ul style="list-style-type: none"><li>Yes: all installed drivers are loaded during the initialization phase.</li><li>No: drivers are loaded on demand.</li></ul>
Default	No



# 8.4.3 Max Pool Time

<Parameter Name="Max Pool Time">-1</Parameter>

## ⚠ Caution

Max Pool Time is available for library mode only.

You can change connection pool timeout for server mode on the [Properties](#) page of the server in the CMC. See the *SAP BusinessObjects Business Intelligence platform Administrator Guide*. Value applies to Connection Server stand alone server installations. For information on deploying Connection Server on a dedicated node, see the *SAP BusinessObjects Business Intelligence platform Planning Guide*.


Description	Determines the maximum length of time that an unused connection can remain idle in the connection pool. This represents an upper bound for connection lifetimes. A connection pool is a mechanism used by data access drivers to re-use database connections, to make the best use of system resources.  You can set Max Pool Time for the library deployment mode only. Value applies to nodes that have Connection Server installed with server products.
Values	-1: No timeout, keep alive for the whole session.  0: Connection not managed by the pool.  > 0: Idle lifetime (in minutes).
Default	-1

## Related Information

[Connection Pools \[page 29\]](#)


# 8.4.4 Validate Configuration Files

<Parameter Name="Validate Configuration Files">No</Parameter>

Description	Triggers the validation of the configuration files (SBO, COD, and PRM) against the XML schema.
<div>  <b>Note</b>            You can only validate configuration files when using Java-based connectivities.         </div>	
Default	No

## 8.4.5 Validate XML Streams

```
<Parameter Name="Validate XML Streams">No</Parameter>
```

Description	Triggers the validation of the XML streams parsed within Connection Server implementation against the XML schema (for example: connection definition).
<div>  <b>Note</b>            You can only validate XML streams when using Java-based connectivities.         </div>	
Default	No

## 8.4.6 JVM Settings

The following table explains you the JVM's Option parameter along with relevant examples:

Attribute Setting	Example	Attribute Description
Default	<pre>&lt;JavaVM&gt; &lt;Options&gt; &lt;Option&gt;-Xrs&lt;/Option&gt; &lt;/Options&gt; &lt;/JavaVM&gt;</pre>	In this example, as, there is no Processor attribute mentioned, by default both the Client Tools and Server use this Option.
Processor="64"	<pre>&lt;JavaVM&gt; &lt;Options&gt; &lt;Option Processor="64"&gt; -Xmx2048m&lt;/Option&gt; &lt;/Options&gt; &lt;/JavaVM&gt;</pre>	In this example, the Processor attribute is set to "64". So, the Server uses this Option.

## 8.5 Setting the Deployment Mode

The `Capabilities` section helps you specify the deployment mode of Connection Server to be used at runtime.

Beneath `Capabilities` section, `Local` name means connectivity service is locally provided, as an in-proc library embedded in the client process. `Remote` name means Connection Server is provided on a remote server.

You can enable these deployment modes independently by setting the `Active` attribute. Specific to `Local` capability, the `EnableJNI` attribute enables the use of Java Native Interface (JNI).

### Note

A two-way JNI embedded in Connection Server allows APIs to work with Connection Server core developed in a different language. This means you can use the Java API to work with the native core and vice-versa.

### Example: Default Values

The following configuration allows the library deployment mode with JNI and the server deployment mode.

```
<Capabilities>
  <Capability Name="Local" EnableJNI="Yes" Active="Yes"/>
  <Capability Name="Remote" Active="Yes"/>
</Capabilities>
```

### Example: Connection Server in Server Mode

The following configuration allows you to use the Connection Server in server mode only.

```
<Capabilities>
  <Capability Name="Local" EnableJNI="Yes" Active="No"/>
  <Capability Name="Remote" Active="Yes"/>
</Capabilities>
```

In this mode, only the drivers installed on the back-end system of the BI platform can be used to create connections.

If a server instance is running, you can create a local connection based on a driver installed on the back-end system of the platform. If you stop the server instance, you cannot create any connections, because this setting does not allow you to use a driver installed on the client machine.

## Related Information

[Connectivity Services \[page 20\]](#)

## 8.6 Configuring the Deployment Mode

Parameters defined in the `Settings` section of the `cs.cfg` file control the deployment mode.

### Library mode

Parameters in the `Library` section control library mode.

### Server mode

You manage this mode from the CMC of your SAP BusinessObjects Enterprise installation. Parameters displayed on the [Properties](#) page of the server control the CORBA access. See the *SAP BusinessObjects Business Intelligence platform Administrator Guide* for more information.

## 8.7 Configuring the Drivers to Load

The default behavior of Connection Server is to load all available drivers. However, you can select the data sources to be exposed by Connection Server.

### Library mode

Uncomment the `ActiveDataSources` section beneath `Library` in the `cs.cfg` file and specify the network layers and databases you want to load. For example:

```
<Library>
  <ActiveDataSources>
    <NetworkLayer Name="ODBC">
      <DataBase Name="MS SQL Server.*$"/>
    </NetworkLayer>
    <NetworkLayer Name="Oracle OCI">
      <DataBase Name="Oracle 11"/>
    </NetworkLayer>
  </ActiveDataSources>
</Library>
```

#### Note

Database names can be regular expressions if they are pure ASCII. Patterns use GNU regexp syntax. Use the `.*` pattern to match any character. For more information about regular expressions, refer to the PERL website at [http://www.perl.com/doc/manual/html/pod/perlre.html#Regular\\_Expressions](http://www.perl.com/doc/manual/html/pod/perlre.html#Regular_Expressions).

## Server mode

Select the data sources in the [Active Data Sources](#) section of the server properties in the CMC.

### ⚠ Caution

To avoid connection failures, you must make sure your environment provides all the necessary middleware, otherwise you must set the network layers and databases you only need in the [Active Data Sources](#) section.

By allowing server specialization, this setting also addresses complex deployment scenarios involving multiple Connection Servers in server mode. For more information about complex deployment scenarios, see the *SAP BusinessObjects Business Intelligence platform Administrator Guide*.

## 8.7.1 Setting One Connectivity per Machine

In complex deployment scenarios, you may want to set up one connectivity per type of machine, for example you want to connect applications that come with the BI platform to an Microsoft SQL Server database installed on Microsoft Windows and to an Oracle database installed on a UNIX machine.

To avoid connection failures, you need to do one of the following:

- When doing a custom installation of the BI platform, specify the connectivities you want to deploy for each type of database you require. You do this when selecting features you would like to install.
- When configuring Connection Server in the `cs.cfg` file, set the `ActiveDataSources` section for the library mode (`Library` parent element) as you do for the server mode in the CMC. Because applications first try to establish connections through drivers installed locally, you should configure the driver filter for both modes in the same way.

## 8.8 Configuring the CORBA Access Protocols

You set the CORBA access protocols in the CMC of your BI platform installation. Protocols define values that Connection Server uses to process requests coming from CORBA clients or HTTP clients.

For more information about the CMC, see the *SAP BusinessObjects Business Intelligence platform Administrator Guide*.

## 8.9 Activating Logs and Traces of Connection Server and Drivers

SAP differentiates between two types of messages:

- A trace message analyzes the system in detail from a developer's point of view as an exceptional procedure.

- A log message is a permanent record of the events and status of a system.

Log messages are intended for system administrators, while traces are for developers. You can enable logs and traces for all connectivities supported by the Data Access layer (for example, ODBC, JDBC, Javabeans, OLE DB, OCI, and JCo).

The Connection Server logging and tracing process relies on the SAP BusinessObjects TraceLog logging and tracing facility. It helps to log and trace the following processes:

Logs	<ul style="list-style-type: none"> <li>• Startup and stop of Connection Server server instances</li> <li>• Single sign-on initialization</li> <li>• Driver loading</li> </ul>
Traces	<ul style="list-style-type: none"> <li>• Connection Server initialization and configuration</li> <li>• Job and dictionary creation and execution</li> <li>• Driver loading and activity</li> <li>• Startup and stop of Connection Server server instances</li> <li>• Initialization and activity of services of Connection Server server instances</li> <li>• Single sign-on initialization</li> </ul>

## 8.9.1 About the \_trace.ini Configuration File

You set the logging and tracing levels in the `_trace.ini` configuration file. For example, you can set the following information in the `BO_trace.ini` file:

```
sap_log_level = log_info;
sap_trace_level = trace_debug;
if
(process == "cms")
{
    log_level = error; // but only log errors for the CMS
}
```

### File content

In the example above, the tags defined are the following:

- `sap_log_level`, which defines the logging level
- `sap_trace_level`, which defines the tracing level
- A piece of code to specify the logging or tracing level for a process. The code is C-based or Java-based and can contain expressions, simple statements, and if-else statements.

The following tables describe the configuration values accepted by the `sap_log_level` and `sap_trace_level` tags.

SAP log level

Severity	Configuration Values
INFO	log_info or log_information
WARNING	log_warn or log_warning
ERROR	log_error
FATAL	log_fatal
NONE	log_none

All messages of the set severity level and higher appear in the log file. For example, if you set log severity to WARNING, all messages of severity WARNING, ERROR and FATAL are logged. The default log severity is ERROR.

SAP trace level


Severity	Configuration Values
DEBUG	trace_debug
PATH	trace_path
INFO	trace_info or trace_information
ERROR	trace_error
NONE	trace_none

All messages of the set severity level and higher appear in the log file. For example, if you set trace severity to INFO, all messages of severity INFO and ERROR are logged. The default trace severity is ERROR.

## Configuration options

You can also add the following options to the file:

Option	Values	Description
always_close	true or false	Closes the log file after each write. Default value is false.
append	true or false	Adds the log information to the existing log files. Changes the naming pattern to exclude the PID and timestamp, and instead uses a rolling log file number. Default value is false.
keep_num	an integer	Specifies the number of log files to keep. Default value is 0. A negative integer means all log files are kept.

Option	Values	Description
log_dir	a string	Specifies the log file directory. Default value is the value of the <code>BO_TRACE_LOGDIR</code> environment variable. A hyphen (-) means the log information is directed to <code>stdout</code> .
log_level	none, low, medium or high	Defines a shortcut to specify both <code>sap_log_level</code> and <code>sap_trace_level</code> values. See the table below.
scope_only	true or false	Specifies if only messages associated with scopes appear in log files. The default value is <code>false</code> .
<div>  <b>Note</b>  A scope marks the entry and exit out of a code block. </div>		
size	a number in KB	Maximal size of a log file. Default value is 10000.

## log\_level option values

The following table provides the `sap_log_level` and `sap_trace_level` values set when the corresponding `log_level` value is specified in the configuration file.

log_level Value	sap_log_level Value	sap_trace_level Value
none	log_error	trace_error
low	log_error	trace_info
medium	log_warn	trace_path
high	log_info	trace_debug

## Parsing errors

Errors and warnings that may occur when parsing the `_trace.ini` file are written to an `ERR` file in the same directory as the `INI` file. The error file name is made of the `INI` file name.

If the same `INI` file is shared by several processes, then you do not know which process generates the error. To generate more informative error file names, add the following lines at the top of the `_trace.ini` file:

```
error_file = config_file + "_" + process + ".err";
output_file = config_file + "_" + process + ".out";
```



## 8.9.2 Activating Logs and Traces in the cs.cfg File

You can find Connection Server logs and traces with those of SAP BusinessObjects applications, such as SAP BusinessObjects Web Intelligence. You can also log and trace Connection Server separately by configuring the `cs.cfg` file.

The `Traces` section of the file helps you activate traces for Connection Server jobs and drivers. You activate job traces by setting the `Active` attribute of `Job` and `JobLevel` to `Yes`. You activate driver traces by setting the `Active` attribute of the `MiddleWare` to `Yes`. You can activate traces for a specific driver by setting the `Active` attribute of the driver to `Yes`.

### Example: Default values

```
<Traces Active="Yes">
  <Logger Implementation="C" ClassID="csTRACELOG">
  <Logger Implementation="Java"
ClassID="com.sap.connectivity.cs.logging.TraceLogLogger" />
  <Trace Name="JobLevel" Active="Yes">
    <Trace Name="Job" Active="Yes" />
  </Trace>
  <Trace Name="MiddleWare" Active="Yes">
    <Trace Name="Oracle" Active="Yes" />
    <Trace Name="Sybase" Active="Yes" />
    <Trace Name="DB2" Active="Yes" />
    ...
    <Trace Name="JCO" Active="Yes" />
    <Trace Name="BO OC" Active="Yes" />
  </Trace>
</Traces>
```

This configuration allows by default the logging and tracing of Connection Server and drivers.

## 8.9.3 To activate Logs and Traces in Library Mode

1. Stop the Connection Server.
2. Create and set values to the following environment variables:
  - `BO_TRACE_CONFIGDIR`, to set the folder name of configuration files for logs, for example:  
`C:\BOTraces\config`
  - `BO_TRACE_CONFIGFILE`, to set the name of the configuration file, for example `BO_trace.ini`
  - `BO_TRACE_LOGDIR`, to set the folder name for logs, for example: `C:\BOTraces`

#### Note

These environment variables are commonly used to configure tracing of all BI platform activity.

3. Create the `BO_trace.ini` configuration file as follows:

```
sap_log_level = log_info;
sap_trace_level = trace_debug;
```

#### Note

The `INI` file name is case-sensitive.

4. Add the `logging.jar` and `tracelog.jar` directory paths to the `CLASSPATH` environment variable. For example: `C:\BOTraces\lib\logging.jar` and `C:\BOTraces\lib\tracelog.jar`.
5. Restart the Connection Server.

The logs and traces are written into a file whose default name is `TraceLog_<pid>_<timestamp>_trace.log`. If you want to set another name to the log file, update the `BO_TRACE_PROCESS` environment variable with the new name.

## 8.9.4 To activate Logs and Traces in Server Mode

You enable traces for jobs and drivers from the CMC. This allows you to let the server run while enabling traces.

1. Start the CMC.
2. Go to the [Properties](#) page of either ConnectionServer server (for Native Connectivity Service) or Adaptive Processing Server (for Adaptive Connectivity Service).
3. In the [Low Level Tracing](#) section, select:
  - [Enable Job Tracing](#) to enable job traces
  - [Enable Middleware Tracing](#) to enable middleware traces

#### Note

The [TraceLog](#) level must be set to `High` in the [TraceLog Service](#) section. This level is different from the SAP log level defined through the `BO_Trace.ini` file.

#### → Remember

The [Enable Middleware Tracing](#) setting allows you to trace all middleware. If you want to trace only specific middleware, you then need to configure the `cs.cfg` file and restart the server.

## 8.9.5 Reading Logs and Traces

Connection Server traces and logs are tagged with `|CS|` in trace files. Connection Server logs are also identified by the `THIS IS A LOG` mention. Each function has its own trace. Traces contain the following information:

- `ENTER` traces, which identify the middleware API call. `EXIT` traces identify the returned call. The middleware API does not return any call if there is no `EXIT` after `ENTER`.
- Call exceptions, if `|E|` is displayed
- API errors, if the return code `-1` is displayed
- Error or log severity (For example, `Debug`, `Path`, or `Information`)
- Traced network layer and database in the `[Network Layer | Database | ID]` section of the trace

- The log and error messages

## Example: Trace

The following is an excerpt of a trace with DEBUG and PATH severities obtained when the Connection Server was used in library mode:

```
|BE42CC9D40484416BADEF01039652F620|2012 04 12 11:41:27.422|+0200|Debug| |<<| |  
|TraceLog| 5256| 1|main| |||||CS||[unknown|unknown|  
ID:0]CS Internal Configuration:  
|BE42CC9D40484416BADEF01039652F621|2012 04 12 11:41:27.534|+0200|Debug| |<<| |  
|TraceLog| 5256| 1|main| |||||CS||[unknown|unknown|  
ID:0]  
...  
|BE42CC9D40484416BADEF01039652F628|2012 04 12 11:41:27.920|+0200|Path| | | | |  
TraceLog| 5256| 1|main| |||||CS||ENTER [JDBC|Oracle  
11|  
ID:0]com.sap.connectivity.cs.java.ConnectionManager{com.businessobjects.connectionserver.ConnectionManager}.close  
|BE42CC9D40484416BADEF01039652F629|2012 04 12 11:41:27.920|+0200|Path| | | | |  
TraceLog| 5256| 1|main| |||||CS||EXIT [JDBC|Oracle  
11|  
ID:0]com.sap.connectivity.cs.java.ConnectionManager{com.businessobjects.connectionserver.ConnectionManager}.close
```

## Example: Trace

The following is an excerpt of a trace with INFO severity obtained when the Connection Server was used in server mode:

```
|6E060102224D9849A2C17D8691FAC785011|2012 04 26 19:02:43.075|+0200|Information|  
|=||aps_MySIA.csjava| 7088| 53|service builder-4| ||||| ||||| |||||CS||  
[unknown|unknown|ID:0]Starting CORBA NetworkLayer service...
```

### Example: Log

The following is an excerpt of a log obtained when the Connection Server was used in server mode:

```
|6E606102224D49849A2C17D8691FAC7B5114|2012 04 26 19:02:43.805|+0200| |
Information| | |aps_MySIA.csjava| 7088| 61|service builder-1|
|||||||||||||||||CS|THIS IS A LOG [unknown|unknown|ID:0]Loaded driver:
NetworkLayer=JDBC, Database=Generic JDBC datasource
|6E606102224D49849A2C17D8691FAC7B5116|2012 04 26 19:02:43.817|+0200| |
Information| | |aps_MySIA.csjava| 7088| 61|service builder-1|
|||||||||||||||||CS|THIS IS A LOG [unknown|unknown|ID:0]Loaded driver:
NetworkLayer=JDBC, Database=SAP HANA database 1.0
...
|43eabdad-d3e4-ec14-89aa-0c9a9fba3101|2012 04 26 19:02:20.883|+0200| |
Information| | |connectionserver_MySIA.ConnectionServer|1576|7816| | |0|94|0|
2|-|-|-|-|-|-|-|-|-|CS|THIS IS A LOG [unknown|unknown|ID:0]ConnectionServer
is now started
```

## 8.10 Activating Logs and Traces for the OLAP Client

You can find OLAP Client logs and traces with those of SAP BusinessObjects applications, such as SAP BusinessObjects Web Intelligence. For example, you can find them with traces of the Web Intelligence Processing Server. You can also log and trace OLAP Client separately by configuring the `OlapClient.cfg` file.

You activate logs by setting the `UseLog` attribute to `yes` in the `OlapClient` section of the file. You specify the log file path in the `LogFileName` attribute. You must not change the `UseProcessName` value.

You do not need to stop the Web Intelligence Processing Server to change these settings. You can activate the logs and traces while it is running.

### Example

```
[OlapClient]
UseLog =yes
UseProcessName=false
LogFileName =c:\OlapClient.log
; Factory Mode can be: Lib (inproc) or Proxy (Remoting)
FactoryMode=Lib
...
```

This configuration allows the logging and tracing for the OLAP Client.

### Related Information

[About the OlapClient.cfg Configuration File \[page 19\]](#)

### 8.10.1 Example of Log

The following example is an excerpt of a log file for the OLAP Client obtained for an MSAS connection.

```
...
[2019/11/05 - 12:04:54:025][0] XmlaConnectionWinhttp::XmlaConnectionWinhttp() ->
Using Windows HTTP Services version 6.1.7600.16385
[2019/11/05 - 12:04:54:025][0] HTTPClient::connect() -> Using direct access
[2019/11/05 - 12:04:54:040][0] HTTPClient::connect() -> Using Windows Proxy
Automatic Discovery (WPAD)
[2019/11/05 - 12:04:54:040][0] HTTPClient::connect() -> Using proxy settings:
WPAD url=http://proxy:8083, Proxy= ProxyBypass=
[2019/11/05 - 12:04:54:040][0] HTTPClient::connect() -> Connecting using
WinHttpConnect(): Hostname='olap-wxp' Port=80
[2019/11/05 - 12:04:54:040][0] XmlaConnectionWinhttp::Open() -> Connected.
[2019/11/05 - 12:04:54:040][0] XmlaClient::discover() Call
'DISCOVER_DATASOURCES'...
[2019/11/05 - 12:04:54:040][0] SoapEnvelope::updateProperties() BeginRange=-1
EndRange=-1
```

```

[2019/11/05 - 12:04:54:040][0] XmlaConnectionWinhttp::SendRequest()
Authentication Mode = Credentials.
[2019/11/05 - 12:04:54:040][0] XmlaConnectionWinhttp::SendRequest() Setting
basic credential to HttpRequest.
[2019/11/05 - 12:04:54:040][0] XmlaConnection::getTimeout() No timeout was
specified in ConnectionSpecification, defaulting to 100(s).
[2019/11/05 - 12:04:54:056][0] XmlTextReader::XmlTextReader() Using libXML
version 2.06.32
[2019/11/05 - 12:04:54:056][0] XmlaClient::discover() Rowset contains 1 rows
[2019/11/05 - 12:04:54:056][0] XmlaClient::discover() Call
'DISCOVER_DATASOURCES' ElapseTime=15ms
[2019/11/05 - 12:04:54:056][0] XmlaClient::createOlapEntities() ->
Rowset=[DISCOVER_DATASOURCES], 1 entities retrieved Elapse=15ms
[2019/11/05 - 12:04:54:056][0] XmlaClient::discover() Call
'DISCOVER_SCHEMA_ROWSETS'...
[2019/11/05 - 12:04:54:072][0] SoapEnvelope::updateProperties() BeginRange=-1
EndRange=-1
[2019/11/05 - 12:04:54:072][0] XmlaConnectionWinhttp::SendRequest()
Authentication Mode = Credentials.
[2019/11/05 - 12:04:54:072][0] XmlaConnectionWinhttp::SendRequest() Setting
basic credential to HttpRequest.
[2019/11/05 - 12:04:54:072][0] XmlaConnection::getTimeout() No timeout was
specified in ConnectionSpecification, defaulting to 100(s).
[2019/11/05 - 12:04:54:072][0] XmlTextReader::XmlTextReader() Using libXML
version 2.06.32
[2019/11/05 - 12:04:54:072][0] XmlaClient::discover() Rowset contains 54 rows
...

```

# 9 Configuring Data Access Driver Parameters

## 9.1 Configuring Driver Parameters

To configure data access for a particular data access driver, you can either edit the driver configuration files to adjust the parameter settings, or create your own database entries if you need connections for specific databases of your environment.

### Note

For each SAP BusinessObjects application that uses Connection Server, the associated Readme file contains information on command line utilities that you can use to check your RDBMS and data access driver configuration. These utilities can create log files that trace interactive analysis server activity. Refer to the readme file for the release for instructions on the use of these utilities.

### Related Information

[About Global Parameters \[page 166\]](#)

### 9.1.1 Data Access Configuration Files

The following configuration files control data access driver configurations for each defined connection:

- `cs.cfg`  
This file defines global parameters that apply to all connections. It is located in the `<connectionserver-install-dir>\connectionServer` directory.
- `<driver>.sbo`  
This file is specific to each data access driver. The `<driver>` placeholder stands for the data source to which the configuration file applies. Each SBO file is in a subdirectory of the `connectionServer` directory, where the subdirectory is named after the database network layer or middleware, for example `<connectionserver-install-dir>\connectionServer\oracle` for Oracle databases.

### Note

The parameters set in the `DriverDefaults` section of `cs.cfg` are overridden by corresponding settings in the SBO files.

- `<driver>.setup`

This file defines the SBO file name, directory and the database network layer or middleware that relates to the driver. This file is required to make the driver usable. A driver without any setup file cannot be used. All the files are in the

`<connectionserver-install-dir>\connectionServer\setup` directory.

As an example, the following `oracle_jdbc.setup` file defines the `oracle.sbo` configuration file for Oracle data access drivers that are used to establish JDBC connections:

```
...
<Driver>
  <NetworkLayer Name="JDBC"></NetworkLayer>
  <Directory>jdbc</Directory>
  <DataFileName>oracle</DataFileName>
</Driver>
...
```

## Related Information

[About Global Parameters \[page 166\]](#)

[Installed SBO Files \[page 183\]](#)

## 9.1.2 Installed SBO Files

The following `<driver>.sbo` files are installed by default on Microsoft Windows.

For an up-to-date list of supported drivers, check the SAP Service Marketplace website at <https://support.sap.com/home.html>, or contact your SAP representative.

Subdirectory	Database Technology	SBO File
bigquery	Google BigQuery	bigquery.sbo
cms	SAP BI platform CMS system database	cms.sbo
db2	IBM DB2	db2.sbo
javabean	JavaBean	javabean.sbo
jco	SAP ERP	jco.sbo
jdbc	Amazon EMR Hive	simbaEmr.sbo
	Amazon Redshift	amazon.sbo
	Data Federator Server	datafederator.sbo
	Denodo	denodo.sbo

Subdirectory	Database Technology	SBO File
	Generic JDBC datasource	jdbc.sbo
	Greenplum	greenplum.sbo
	Hive	simbahive.sbo
	IBM DB2	db2.sbo
	IBM Informix	informix.sbo
	IBM Netezza	netezza.sbo
	Impala	simbaImpala.sbo
	Microsoft SQL Server	sqlsrv.sbo
	Oracle Database	oracle.sbo
	Oracle MySQL	mysql.sbo
	PostgreSQL	postgresql.sbo
	Progress OpenEdge	progress.sbo
	Salesforce.com	simbasalesforce.sbo
	SAP HANA	newdb.sbo
	SAP MaxDB	maxdb.sbo
	SAP Sybase	sybase.sbo
	SAP VORA	simbavora.sbo
	Spark	simbaspark.sbo
	Snowflake	snowflake.sbo
	Teradata	teradata.sbo
	Vertica	vertica.sbo
odata	OData 2.0	odata.sbo
odbc	Amazon EMR HIVE	simbaEmr.sbo
	Amazon Redshift	amazon.sbo
	Generic ODBC datasource	odbc.sbo



Subdirectory	Database Technology	SBO File
	Greenplum	greenplum.sbo
	Hive	bigdata.sbo
	IBM db2 for i	db2iseries.sbo
	IBM Informix	informix.sbo
	IBM Netezza	netezza.sbo
	Impala	simbaImpala.sbo
	Microsoft Access	access2010.sbo
	Microsoft Excel	personalfiles.sbo
	Microsoft SQL Server	sqlsrv.sbo
	Oracle Database	oracle.sbo
	Oracle MySQL	mysql.sbo
	PostgreSQL	postgresql9.sbo
	Progress OpenAccess for Salesforce	openaccess.sbo
	Progress OpenEdge	progress.sbo
	Salesforce.com	simbasalesforce.sbo
	SAP HANA	newdb.sbo
	SAP MaxDB	maxdb.sbo
	SAP Sybase (IQ and SQLAnywhere)	sybase.sbo
	SAP VORA	simbavora.sbo
	Snowflake	snowflake.sbo
	Spark	simbaspark.sbo
	Teradata	teradata.sbo
	Vertica	vertica.sbo
oledb	Generic OLEDB datasource	oledb.sbo
	Microsoft SQL Server	sqlsrv.sbo

Subdirectory	Database Technology	SBO File
open	Text files	open.sbo
oracle	Oracle Database	oracle.sbo
sap	SAP Business Warehouse	sap.sbo
sybase	Sybase Adaptive Server Enterprise	sybase.sbo
xml	XML Files	xml.sbo
	Web services	webservices.sbo

The `jdbc` subdirectory contains configuration files for managing connections to databases through JDBC network layer. Check the SAP Service Marketplace website or the series of SBO files for details on the databases supported for JDBC connections.

The `odbc` subdirectory contains configuration files for managing connections to databases through ODBC network layer. Check the SAP Service Marketplace website or the series of SBO files for details on the databases supported for ODBC connections.

The `open` subdirectory contains the `open.sbo` configuration file for managing connections to CSV files through the CSV OpenDriver. When developing a CSV driver based on the CSV Open driver sample using the Java Driver Development Kit, you must locate all your configuration files in this directory. For more information about this driver, refer to the *Data Access Driver Java SDK Developer Guide*.

## 9.1.3 To View and Edit SBO Files

### ⚠ Caution

Before opening an SBO file, make a backup copy of the file. Some configuration parameters must not be edited. If you change or delete them it could affect the operation of your SAP BusinessObjects applications.

1. Browse to the directory that stores the SBO file for your target data access driver.
2. Open the SBO file in an XML editor.
3. Expand sections as required.
4. Locate the appropriate tag for the value to change, and change the value.

Parameters appear in the format: `<Parameter Name="<parameter>"><value></Parameter>`

where `<parameter>` is the name of the parameter, and `<value>` is the value attributed to the parameter.

5. Check that the file is valid against the DTD, save and close the file.

## 9.1.4 To Customize SBO Files

### ⚠ Caution

When installing a new driver, you may want to customize SBO files with your own database entries and drivers. In order to avoid possible errors when editing SBO files, SAP BusinessObjects recommends you to create a separate SBO file that specifies the databases targeted by your customization and the libraries used by the driver. Beforehand you also need to create a setup file for the SBO file definition. You do not need to modify registries.

1. Create a setup file in the `<connectionserver-install-dir>\connectionServer\setup` directory by using an XML editor.  
You specify the SBO file name, its directory and the database network layer that is used for the connection.
2. Check that the file is valid against the DTD, save and close the file.
3. Either browse to the subdirectory where you want to store the SBO file or create your own subdirectory as specified in the setup file.
4. Create the SBO file with your target database and driver libraries by using an XML editor.
5. Check that the file is valid against the DTD, save and close the file.

Apart from customizing the SBO file, you also need to create the COD, PRM and RSS files for each driver newly installed.

## 9.1.5 To Check Connections Dynamically

You can customize your driver to make it validate at runtime that a connection of the connection pool can be used. This validation process consists of executing an SQL query without side effect when the connection is retrieved from the pool. It means that the connection can be used if the SQL query is executed without error. If it is not, the connection is discarded.

### → Remember

This functionality is available for Generic ODBC, Generic OLE DB and Generic JDBC connections. All other supported connectivities handle this connection check already, then no customization is required.

1. Stop Connection Server.
2. Open the SBO file of your driver.
3. Locate the `DataBase` section that is appropriate to your connection.  
For example, for a Generic ODBC connection:

```
<DataBases>
  <DataBase Active="Yes" Name="Generic ODBC datasource">
    <Libraries>
      ...
    </Libraries>
    <Parameter Name="CharSet Table" Platform="Unix">datadirect</Parameter>
  </DataBase>
  ...
```

4. Add the following row in the DataBase section:

```
<Parameter Name="Connection Check"><SQL query></Parameter>
```

where `<SQL query>` is the query you use to check the validity.

5. Save the SBO file.
6. Restart Connection Server.

Connection Server validates that the connection can be used before executing the data request.

## 9.1.6 JDBC Driver Properties

You can add JDBC driver properties by doing one of the following:

- In the connection wizard of your application, at connection creation, set the *JDBC Driver Properties* (*key=value,key=value*): parameter. It is optional.
- Set driver properties in the appropriate SBO file after you stop Connection Server.

If the property is both set in the SBO file and through the wizard, only the value set through the wizard is taken into account by the application.

### Example

This shows the section of an `oracle.sbo` file modified with two driver properties.

```
<DataBase Active="Yes" Name="Oracle 11">
  <Class JARFile="dbd_jdbc,dbd_oracle">
    com.businessobjects.connectionserver.java.drivers.jdbc.oracle.OracleDriver</
  Class>
  <JDBCdriver>
    <Parameter Name="JDBC Class">oracle.jdbc.OracleDriver</Parameter>
    <Parameter Name="URL Format">jdbc:oracle:thin:@$DATASOURCE:$DATABASE$</
  Parameter>
    <Properties>
      <Property Name="oracle.jdbc.defaultNChar">true</Property>
      <Property Name="defaultNChar">true</Property>
    </Properties>
    ...
  </JDBCdriver>
  ...
</DataBase>
```

### Related Information

## 9.2 About DataDirect ODBC Drivers

The Data Access layer allows the use of DataDirect ODBC 7.0 drivers for Microsoft SQL Server databases on all UNIX platforms. These drivers can be either non-branded or branded drivers.

DataDirect branded drivers are provided as part of the BI platform and can only be used with SAP BusinessObjects applications such as SAP BusinessObjects Web Intelligence. You can find them in `<boe-install-dir>/enterprise_xi40/<platform-name>/odbc/lib` directory, where `<boe-install-dir>` stands for the BI platform installation directory and `<platform-name>` for the UNIX platform name.

The Microsoft SQL Server databases can work with either a DataDirect ODBC 7.1 driver or a DataDirect ODBC 7.1 branded driver.

The Connection Server default settings allow the non-branded ODBC driver to work seamlessly with your current configuration settings. If you have already deployed a driver in your environment, you will be able to install the non-branded driver without any configuration change.

### 9.2.1 To Enable the Use of DataDirect Branded Drivers

To use the branded driver, you must make sure the data access is configured correctly.

1. Navigate to the directory that contains the `sqlsrv.sbo` file.

On UNIX, this configuration file is located in the `<connectionserver-install-dir>/connectionServer/odbc` directory.

2. Use an XML editor to open the `sqlsrv.sbo` file for editing.
3. Locate the Defaults section.

The `Use DataDirect OEM Driver` parameter is set to `No` by default. This means the data access is configured by default to work for non-branded drivers.

4. Set the `Use DataDirect OEM Driver` parameter to `Yes` and save the file.
5. Add the following path to `LD_LIBRARY_PATH` environment variable:  
`<boe-install-dir>/enterprise_xi40/<platform-name>/odbc/7.1.5/lib`
6. Configure the environment by editing the `env.sh` file in the `<boe-install-dir>/setup` directory and source it.

For example:

```
DEFAULT_ODBCFILE="{BOBJEDIR}enterprise_xi40/"odbc.ini
Export DEFAULT_ODBCFILE
ODBC_HOME="{BINDIR}odbc"
Export ODBC_HOME
ODBCINI="{BOBJEDIR}enterprise_xi40/"odbc.ini
export ODBCINI
```

#### Note

`DEFAULT_ODBCFILE` can point to any file which holds the connection details for the branded drivers.

7. Configure the data source by editing the `odbc.ini` file.

For example:

```
[ODBC Data Sources]
sql2014=sql=DataDirect 7.1 SQL Server Native Wire Protocol
Driver=../../enterprise_xi40/linux_x64/odbc/7.1.5/lib/CRsqls26.so
Description=DataDirect 7.1 SQLServer Wire Protocol Driver
Address=10.180.0.197,1433
Database=bodb01
```

8. Start Connection Server from the CMC.

Connection Server is able to create a connection to Microsoft SQL Server databases with DataDirect ODBC branded drivers.

## Example

The following is an excerpt of the default `sqlsrv.sbo` file.

```
<Defaults>
  <Parameter Name="Family">Microsoft</Parameter>
  <Parameter Name="SQL External File">sqlsrv</Parameter>
  <Parameter Name="SQL Parameter File">sqlsrv</Parameter>
  <Parameter Name="Description File">sqlsrv</Parameter>
  <Parameter Name="Strategies File">sqlsrv</Parameter>
  ...
  <Parameter Name="Use DataDirect OEM Driver" Platform="Unix">No</Parameter>
</Defaults>
...
```

# 10 SBO Parameter Reference

## 10.1 SBO File Structure

There is a `<driver>.sbo` file for each supported data access driver. Each `<driver>.sbo` file is divided into the following sections:

File Section	Description
Defaults	This section contains the default configuration parameters that apply to all database middleware that uses the data access driver. These parameters override any corresponding values set in the database middleware.
Databases	<p>This section contains a <code>DataBase</code> child element for each database middleware that is supported by the data access driver.</p> <p>Each <code>DataBase</code> element can contain the following elements or attributes:</p> <ul style="list-style-type: none"><li>• <b>Active</b>: this attribute specifies if middleware support is activated or not. Its value is YES or NO.</li><li>• <b>Name</b>: this attribute specifies the name of the middleware supported by the data access driver. The middleware name values set here appear in the Database Middleware page of the connection wizard.</li><li>• <b>Alias</b>: this element specifies the name of the older middleware versions no longer officially supported by the data access driver, but that are still in use. You can add an alias element for an older middleware version so that existing connections use the current data access driver instead. You can set configuration parameters specific to the old middleware as parameters of the new alias. You can create new connections using the alias.</li><li>• <b>Parameter</b>: this element has a <b>Name</b> attribute and a value that applies specifically to a middleware. Values set for parameters listed here override the values set for the same parameters in the <b>Defaults</b> section.</li></ul> <div><p><b>Note</b></p><p>Boolean parameters accept both <code>true/false</code> and <code>yes/no</code> as values. Values do not depend on case.</p></div>

## 10.2 SBO Parameter Description

The configuration parameters are listed according to the following:

- **Common**  
This section describes SBO file parameters shared by different database technologies. The other categories describe parameters that are specific to the database technology or network layer they represent.
- **JavaBean**
- **JCO**
- **JDBC**
- **OData**
- **ODBC**
- **OLE DB**
- **OLE DB for OLAP**
- **Sybase ASE/CTL**
- **Teradata**

Each parameter is shown with the following information:

- Example of how the parameter appears in the XML file
- Description of the parameter
- Possible values that can be set for the parameter
- Default value of the parameter

## Related Information

[Common SBO Parameters \[page 192\]](#)

[JCO SBO Parameters \[page 210\]](#)

[JDBC SBO Parameters \[page 210\]](#)

[OData SBO Parameters \[page 214\]](#)

[ODBC SBO Parameters \[page 214\]](#)

[OLE DB SBO Parameters \[page 218\]](#)

[Sybase SBO Parameters \[page 219\]](#)

[Teradata SBO Parameters \[page 221\]](#)

## 10.3 Common SBO Parameters

These SBO parameters are mostly common to all data access drivers. They are defined in the `Defaults` section of the files. Some of these SBO parameters are also defined in the `cs.cfg` file. Values set in the `Defaults` section override values set in the `cs.cfg` file.



### 10.3.1 Array Bind Available

```
<Parameter Name="Array Bind Available">No</Parameter>
```

Description	Specifies whether the database supports array binding.  Array binding helps you optimize performance of SQL update queries.
Values	Yes: the database supports array binding.  No: the database does not support array binding.
Default	The value set in the <code>cs.cfg</code> file.

### 10.3.2 Array Fetch Available

```
<Parameter Name="Array Fetch Available">No</Parameter>
```

Description	Specifies whether Connection Server enables array fetching.  Array fetching helps you optimize performance by retrieving SQL results per slice.
Values	Yes: array fetching is supported.  No: array fetching is not supported.
Default	The value set in the <code>cs.cfg</code> file.

### 10.3.3 Array Fetch Size

```
<Parameter Name="Array Fetch Size">10</Parameter>
```

Description Specifies the number of rows of data retrieved per slice. Connection Server provides array fetch capability in any deployment mode.

#### → Remember

The `Array Fetch Size` value is propagated to the database middleware if it supports array fetch.

The optimal number depends on the performance of your system:

- If the number is low, the system retrieves small amounts of data many times. This can affect performance.
- If the number is high, the system performs fewer retrieval operations, but it requires more memory for each one.

#### ⚠ Caution

Make sure the `Array Fetch Size` value is appropriate because it can affect the performance of your system, especially in remote access, for example when connections to SAP ERP system are established in a web tier deployment mode. For OLAP connections in remote access (Microsoft Analysis Services, SAP BW, and Essbase data sources through 32-bit Connection Server), set the array fetch size to an optimal value depending on the number of columns in reports to be created (for example 100 if the number of columns is high, and 250 if the number is low).

In a web tier deployment mode, the [HTTP Chunk Size](#) parameter can also help you to fine-tune the performance by reducing the number of data calls between the client and the server. See the *SAP BusinessObjects Business Intelligence platform Administrator Guide* for more information about HTTP chunking.

Values	<p>The number of rows retrieved per slice (integer).</p> <p>1 specifies that array fetching is disabled.</p> <p>0 specifies that the driver decides which array fetch size to use. This value is only valid for JDBC drivers.</p>
Default	<p>The value set in the <code>cs.cfg</code> file.</p>

## Related Information

[SAP ERP Driver Restrictions \[page 85\]](#)

### 10.3.4 `BigDecimal Max Display Size`

```
<Parameter Name="BigDecimal Max Display Size">128</Parameter>
```

Description	Specifies the maximum display size of data retrieved with BigDecimal character type.
Values	The display size (integer in bytes).
Default	No default value.

### 10.3.5 Binary Max Length

```
<Parameter Name="Binary Max Length">32768</Parameter>
```

Description	<p>Specifies the maximum length of table columns whose type is:</p> <ul style="list-style-type: none"> <li>binary and MaxLength value is Max or no fixed length is provided for OData data sources</li> <li>base64Binary and hexBinary for XML data sources</li> </ul> <p>Data returned is truncated if larger than specified.</p>
Default	32768

## Related Information

[OData Driver \[page 65\]](#)

[XML Driver \[page 85\]](#)

[Web Service Driver \[page 98\]](#)

### 10.3.6 Bucket Split Size

```
<Parameter Name="Bucket Split Size">25000</Parameter>
```

Description	<p>Specifies the number of records which are sorted in memory before they are written to the local disk. The following data access drivers use <code>Bucket Split Size</code> when they perform the ORDER BY, GROUP BY or DISTINCT operations:</p> <ul style="list-style-type: none"> <li>• CSV OpenDriver</li> <li>• OData driver</li> <li>• SAP ERP driver</li> <li>• XML and Web Service drivers</li> </ul> <div style="border: 1px solid #ccc; background-color: #f9f9f9; padding: 10px; margin-top: 10px;"> <p><b>Note</b></p> <p>You can configure the directory path in the <code>cs.cfg</code> file using the <code>Temp Data Dir</code> parameter when the operating system does not specify a temporary folder. This can happen with Linux operating systems.</p> </div> <p><code>Bucket Split Size</code> affects the memory consumption. If the main memory size is too small, the parameter value is ignored.</p>
Default	25000

## Related Information

[Local Disk Used as a Cache for Sorting Operations \[page 106\]](#)  
[Temp Data Dir \[page 207\]](#)

### 10.3.7 Catalog Separator

```
<Parameter Name="Catalog Separator">.</Parameter>
```

Description	<p>Specifies the separator character that is used between elements of database identifiers (qualifiers, owners, tables and columns). For example,</p> <p><code>&lt;database_name&gt;.&lt;table_name&gt;.&lt;column_name&gt;.</code></p>
Values	The separator character to use. Usually a period.
Default	If not specified, Connection Server uses the separator specified in the database middleware.

## 10.3.8 CharSet Table

```
<Parameter Name="CharSet Table">sybase</Parameter>
```

Description	Specifies the name of the table used for character set mapping between the operating system and the middleware.
Values	The name of the CRS file.
Default	No default.

## 10.3.9 Description File

```
<Parameter Name="Description File">oracle</Parameter>
```

Description

### Note

Do not edit this parameter.

Specifies the name of the COD file, which holds the connection wizard input field labels.

## 10.3.10 Dictionary Transaction Mode

```
<Parameter Name="Dictionary Transaction Mode">Transactional</Parameter>
```

Description

Specifies that the data access driver queries metadata in transaction mode.

### Note

The data access drivers query metadata in AutoCommit mode by default. To change the configuration of a driver to transactional, add the parameter to the appropriate section of the SBO configuration file (either Defaults or any Database section).

Values	Transactional
--------	---------------

## 10.3.11 Driver Capabilities

```
<Parameter Name="Driver Capabilities">Procedures,Query</Parameter>
```

Description	The capabilities of the driver, that is whether it can access stored procedures and queries available in the database software. This parameter is set using the connection wizard. You can include both values in the parameter.
-------------	--

### Note

This parameter must be set to `Procedures` for a JavaBean driver. The functionality of a JavaBean driver is defined as stored procedures as far as SAP BusinessObjects applications are concerned.

Values	<p><code>Procedures</code>: the driver can use procedures stored in the database to retrieve data.</p> <p><code>Query</code>: the driver can use a query language such as SQL to retrieve data.</p>
Default	<code>Query</code>

## 10.3.12 Driver Name

```
<Parameter Name="Driver Name">Adaptive Server IQ</Parameter>
```

Description	<p>Specifies the name of the driver that displays in <a href="#">Drivers</a> tab of ODBC Data Source Administrator on Microsoft Windows.</p> <p>This parameter is ODBC-specific. It helps you filter drivers in the ODBC Data Source Name (DSN) list.</p>
-------------	---

Values	The name of the driver.
--------	-------------------------

### Note

You can use a regular expression based on the GNU regexp syntax from PERL.

Default	No default value.
---------	-------------------

### 10.3.13 Escape Character

```
<Parameter Name="Escape Character">/</Parameter>
```

Description	Specifies the character to use to escape strings of special characters, for example patterns.
Values	The character to use as the escape character.
Default	If not specified, Connection Server retrieves the value from the middleware.

### 10.3.14 Extensions

```
<Parameter Name="Extensions">oracle10,oracle,jdbc</Parameter>
```

Description

#### Note

Do not edit this parameter.

Specifies the list of possible names for PRM and RSS files of data access drivers. This list also specifies the possible names for directories where you can store JAR files.

## Related Information

[To Create a JDBC Connection with Extensions \[page 48\]](#)

### 10.3.15 Family

```
<Parameter Name="Family">Sybase</Parameter>
```

Description

#### Note

Do not edit this parameter.

Specifies the family of the database engine that is displayed in the [Database Middleware Selection](#) page of the connection wizard. The set of middleware that corresponds to your license is displayed on this page in a tree view.

## 10.3.16 Force Execute

```
<Parameter Name="Force Execute">Never</Parameter>
```

### Description

#### Note

Do not edit this parameter.

Specifies whether the SQL query is executed before retrieving result descriptions.

### Values

**Never:** SQL query is never executed before retrieving result descriptions.

**Procedures:** SQL query is executed before retrieving result descriptions, but only for stored procedures.

**Always:** SQL query is always executed before retrieving result descriptions.

### Default

Never

## 10.3.17 Identifier Case

```
<Parameter Name="Identifier Case">LowerCase</Parameter>
```

### Description

Specifies how the database handles the case behavior of simple identifiers.

### Values

**CaseSensitive:** The database treats mixed case SQL identifiers as case sensitive.

**LowerCase:** The database treats mixed case SQL identifiers as case insensitive and stores them in lower case.

**MixedCase:** The database treats mixed case SQL identifiers as case insensitive and stores them in mixed case.

**UpperCase:** The database treats mixed case SQL identifiers as case insensitive and stores them in upper case.

## 10.3.18 Identifier Quote String

```
<Parameter Name="Identifier Quote String">"</Parameter>
```



Description	Specifies the character used to quote database identifiers.
Values	The character used to quote database identifiers. Usually quotes (&quot; ;).
Default	If not specified, Connection Server retrieves the information from the database middleware.

### 10.3.19 Include Synonyms

```
<Parameter Name="Include Synonyms">False</Parameter>
```

Description	Specifies if columns for Oracle Synonyms are retrieved from the Oracle database. This is valid for Oracle connections through JDBC or Oracle OCI network layers.
Values	True: columns for Oracle Synonyms are retrieved and display as table columns. False: columns for Oracle Synonyms are not retrieved.
Default	False

### 10.3.20 Integer Max Length

```
<Parameter Name="Integer Max Length">18</Parameter>
```

Description	Specifies the maximum length of table columns whose XML built-in type is integer, nonPositiveInteger, negativeInteger, noNegativeInteger, and positiveInteger.  Data returned is truncated if larger than specified.  Integer Max Length applies to XML data sources and web services.
Default	18

## Related Information

[XML Driver - Configuring Column Maximum Size \[page 98\]](#)

[Web Service Driver - Configuring Column Maximum Size \[page 105\]](#)


## 10.3.21 Max Rows Available

```
<Parameter Name="Max Rows Available">No</Parameter>
```

Description	Specifies if the driver can limit the maximum number of rows that can be retrieved from a data source.
Values	Yes: the maximum number of rows can be limited. No: the maximum number of rows cannot be limited.
Default	No

## 10.3.22 Native Int64 Available

```
<Parameter Name="Native Int64 Available">False</Parameter>
```

Description	<div> <b>Note</b> Do not edit this parameter.</div> Indicates if 64-bit integers can be handled directly by the middleware.
Values	True: 64-bit integers can be handled by the middleware. False: the Data Access Layer emulates the Int64 methods.
Default	False

## 10.3.23 Optimize Execute

```
<Parameter Name="Optimize Execute">False</Parameter>
```

Description	Specifies whether Connection Server optimizes the execution of SQL queries. This parameter is supported by JDBC and ODBC drivers only.
Values	True: SQL queries are optimized on execution wherever possible. False: SQL queries are not optimized for execution.
Default	False

## 10.3.24 Owners Available

```
<Parameter Name="Owners Available">No</Parameter>
```

Description	Specifies whether data access drivers handle database owners. <div><b>Note</b> To set table owners manually in the information design tool, you must set this parameter to Yes.</div>
Values	Yes: owners are supported. No: owners are not supported.
Default	Not specified. Connection Server retrieves this information from the database middleware.

## 10.3.25 Qualifiers Available

```
<Parameter Name="Qualifiers Available">No</Parameter>
```

Description	Specifies whether data access drivers handle database qualifiers. <div><b>Note</b> To set table qualifiers manually in the information design tool, you must set this parameter to Yes.</div>
Values	Yes: qualifiers are supported. No: qualifiers are not supported.
Default	Not specified. Connection Server retrieves this information from the database middleware.

## 10.3.26 Query TimeOut Available

```
<Parameter Name="Query TimeOut Available">False</Parameter>
```

Description	Specifies whether a query timeout is supported by the database middleware, that is if a query that is running can be cancelled after a time period has expired.
Values	<p>True: the database middleware handles query timeouts.</p> <p>False: the database middleware does not handle query timeouts.</p>
Default	False

### 10.3.27 Quote Identifiers

```
<Parameter Name="Quote Identifiers">True</Parameter>
```

Description	Specifies whether the identifier of the stored procedure supports quotes.
Values	<p>True: quotes are supported.</p> <p>False: quotes are not supported.</p>
Default	True

### 10.3.28 Skip SAML SSO

```
<Parameter Name="Skip SAML SSO">False</Parameter>
```

Description	<p>Specifies whether the SAML implementation of single sign-on (SSO) is skipped when connecting to the SAP HANA database.</p> <p>For more information about single sign-on, refer to <i>SAP BusinessObjects Business Intelligence platform Administrator Guide</i>.</p>
Values	<p>True: SAML is skipped.</p> <p>False: SAML is used first.</p>
Default	False

## 10.3.29 SQL External File

```
<Parameter Name="SQL External File"><filename></Parameter>
```

### Description

#### Note

Do not edit this parameter.

The SQL external file holds configuration details used by the data access layer.

## 10.3.30 SQL Parameter File

```
<Parameter Name="SQL Parameter File">oracle</Parameter>
```

### Description

The name of the file that stores database parameters. The extension of this file is `.prm`.

You must ensure that this file is located in the same directory as the SBO configuration file.

### Values

See the list of values in the SBO file.

### Default

The listed values.

## 10.3.31 SSO Available

```
<Parameter Name="SSO Available">False</Parameter>
```

### Description

Specifies whether single sign-on (SSO) is supported.

For more information about single sign-on, refer to *SAP BusinessObjects Business Intelligence platform Administrator Guide*.

### Values

True: single sign-on is supported.

False: single sign-on is not supported.

### Default

False

## 10.3.32 Strategies File

```
<Parameter Name="Strategies File">oracle</Parameter>
```

Description	<p>Specifies the name, with no extension, of the Strategy file (.stg).</p> <p>This file contains the external strategies that universe design tool uses for automatic universe creation. Strategy files are stored in the same directory as the SBO file.</p>
Values	<p>db2 for IBM DB2 data access drivers</p> <p>informix for IBM Informix</p> <p>oracle for Oracle</p> <p>sqlsrv for Microsoft SQL Server</p> <p>sybase for Sybase</p> <p>teradata for Teradata</p>
Default	The listed values.

## 10.3.33 String Max Length

```
<Parameter Name="String Max Length">32768</Parameter>
```

Description	<p>Specifies the string maximum length of table columns mapped to ABAP function parameters whose length of value is equal to zero.</p> <p>Also specifies the maximum length of table columns whose type is the following:</p> <ul style="list-style-type: none"><li>• String and MaxLength value is Max for OData data sources</li><li>• String and any of the following for XML data sources: anyURI, QName, NOTATION, duration, gYear-Month, gYear, gMonthDay, gDay, gMonth, TYPE_NORMALIZEDSTRING, token, language, Name, NCName, XSD_TYPE_ID, IDREF, IDREFS, ENTITY, ENTITIES</li></ul> <p>Data returned is truncated if larger than specified.</p>
Default	32768

## Related Information

[OData Driver \[page 65\]](#)

[SAP ERP Driver - Access to ABAP Functions \[page 82\]](#)

[XML Driver \[page 85\]](#)

[Web Service Driver \[page 98\]](#)

### 10.3.34 Temp Data Dir

```
<Parameter Name="Temp Data Dir">C:\temp\</Parameter>
```

Description	<p>Specifies the directory path for the temporary data written on the disk. Use this parameter if the operating system does not specify any default temporary folder, for example: C:\Users\&lt;myName&gt;\AppData\Local\Temp.</p> <p>The following data access drivers can use Temp Data Dir:</p> <ul style="list-style-type: none"><li>• CSV OpenDriver</li><li>• OData driver</li><li>• SAP ERP driver</li><li>• XML and Web Service drivers</li></ul> <p>When the driver performs an ORDER BY, GROUP BY or DISTINCT operation, the data is written to this folder if the number of records to be sorted exceeds the Bucket Split Size parameter value.</p>
Default	<p>The parameter is commented out. Remove the comment syntax to enable the parameter.</p>

## Related Information

[Local Disk Used as a Cache for Sorting Operations \[page 106\]](#)

[Bucket Split Size \[page 195\]](#)

### 10.3.35 Transactional Available

```
<Parameter Name="Transactional Available">Yes</Parameter>
```

Description	<p>Specifies if SQL operations run against the database are run as block transactions or individually.</p> <p>This parameter is not listed by default in the SBO file. Add it to the SBO file if your data access driver does not support transactional mode.</p>
Values	<p>Yes: operations against the database are run as a block when committed.</p> <p>No: each SQL statement is immediately committed, that is, Autocommit is deactivated.</p> <div> <p><b>Note</b></p> <p>Do not use a driver with <code>Transactional Available=No</code> to access the SAP BusinessObjects repository.</p> </div>
Default	Yes. This is set in the <code>cs.cfg</code> file.

## Related Information

[To Set the Transaction Mode for IBM Informix Connections \[page 132\]](#)

[To Make salesforce.com Connections Work in the Universe Design Tool \[page 145\]](#)

### 10.3.36 Type

```
<Parameter Name="Type">Relational</Parameter>
```

Description

#### Note

Do not edit this parameter.

Specifies the data source type.

### 10.3.37 Unicode

```
<Parameter Name="Unicode">UTF8</Parameter>
```



Description	<p>Specifies if the access driver can benefit from the Unicode configuration of the client middleware.</p> <p>This parameter appears as a driver default in the <code>cs.cfg</code> file. Its value applies to all data access drivers. It is not listed by default in the SBO file. If you want to override the default value, you must add it to the <code>Defaults</code> section of the SBO file for the target data access driver.</p>
Values	<p>UTF8: 8-bit UCS/Unicode Transformation Format coding.</p> <p>CharSet: Character Set coding.</p> <p>UCS2: 2-byte Universal Character Set coding</p>
Default	The value set in the <code>cs.cfg</code> file.

### 10.3.38 URL Format

```
<Parameter Name="URL Format "><string></Parameter>
```

Description	<p>Specifies the URL Format.</p> <p>The JDBC specification does not specify the format of the connection string that it requires. Vendors use different kinds of URL format, for example:</p> <ul style="list-style-type: none"> <li>MySQL vendor:  <code>jdbc:mysql://\$DATASOURCE/\$DATABASE\$</code></li> <li>Oracle vendor:  <code>jdbc:oracle:thin:@\$DATASOURCE:\$DATABASE\$</code></li> </ul> <div data-bbox="820 1482 1402 1617"> <p><b>Note</b></p> <p>This parameter is supported by JDBC and JavaBean driver files only.</p> </div>
Values	The URL Format.
Default	No default value.

### 10.3.39 XML Max Size

```
<Parameter Name="XML Max Size">65536</Parameter>
```

Description	Specifies the maximum size of data retrieved in XML format.
Values	The maximum allowed XML size (in bytes).
Default	This varies depending on the database.

## 10.4 JCO SBO Parameters

These parameters apply to the SAP ERP database technology. They are used to configure a connection to a SAP ERP system.

These parameters are defined in the `\\<connectionserver-install-dir>\connectionServer\jco\jco.sbo` file.

### 10.4.1 ERP Max Rows

```
<Parameter Name="ERP Max Rows">2147483647</Parameter>
```

Description	Specifies the maximum number of rows that can be returned by a query to an InfoSet or SAP Query with no filter.
Values	An integer equal or lower than 2147483647.
Default	2147483647

## Related Information

[SAP ERP Driver \[page 79\]](#)

## 10.5 JDBC SBO Parameters

These parameters apply to the JDBC SBO file. They are used to configure a JDBC connection.

These parameters are defined in the SBO files of `\\<connectionserver-install-dir>\connectionServer\jdbc` directory.

## 10.5.1 Default Col Size if Not Specified

```
<Parameter Name="Default Col Size if Not Specified">512</Parameter>
```

Description	Specifies the default column size (in characters) to use if the column size is '0' in the metadata.
Values	Limited by the database.
Default	512.

## 10.5.2 Escape Character Available

```
<Parameter Name="Escape Character Available">True</Parameter>
```

Description	Specifies whether the JDBC network layer handles an escape clause after the like expression of the SQL query. This clause helps you to specify a character to escape specific characters such as underscores (_).
Values	True: an escape clause is supported. False: no escape clause is supported.
Default	True

## 10.5.3 ForeignKeys Available

```
<Parameter Name="ForeignKeys Available">True</Parameter>
```

Description	Specifies if foreign keys of database tables can be retrieved.
Values	True: foreign keys can be retrieved. False: foreign keys cannot be retrieved.
Default	True

## 10.5.4 JDBC Class

```
<Parameter Name="JDBC Class"><string></Parameter>
```

Description	The fully qualified Java class of JDBC driver.
Values	Depends on the vendor or data source, for example: <ul style="list-style-type: none"> <li>• <code>oracle.jdbc</code> for OracleDriver for Oracle</li> <li>• <code>com.ibm.db2.jcc.DB2Driver</code> for DB2</li> </ul>
Default	No default value.

## 10.5.5 PrimaryKey Available

```
<Parameter Name="PrimaryKey Available">True</Parameter>
```

Description	Specifies whether the primary keys of database tables can be retrieved.
Values	True: primary keys can be retrieved. False: primary keys cannot be retrieved.
Default	True


## 10.5.6 PVL Available

```
<Parameter Name="PVL Available">True</Parameter>
```

Description	Specifies whether the connection supports Preferred Viewing Locale (PVL) functionality.  It is only supported by SAP HANA connections in this release.
Values	True: PVL is supported. False: PVL is not supported.

## 10.5.7 JDBC ResultSet Type

```
<Parameter Name="JDBC ResultSet Type">1003</Parameter>
```

Description	<div data-bbox="821 297 928 331"> <b>Note</b></div> <p data-bbox="821 347 1337 412">You must use this parameter along with <code>JDBC ResultSet Concurrency</code>. It is not mandatory.</p> <p data-bbox="798 454 1345 519">Specifies the <code>resultSetType</code> argument value of the <code>createStatement</code> Java method.</p> <p data-bbox="798 544 1393 678">This method belongs to the <code>java.sql.Connection</code> interface. You add this parameter to create a default <code>Statement</code> object and fine-tune your connection performance.</p>
Values	You set either standard Java values or database-specific values. Values must be integers.


## Related Information

[createStatement method](#) ➞

[ResultSet interface](#) ➞

## 10.5.8 JDBC ResultSet Concurrency

```
<Parameter Name="JDBC ResultSet Concurrency">1007</Parameter>
```

Description	<div data-bbox="821 1420 928 1453"> <b>Note</b></div> <p data-bbox="821 1469 1279 1534">You must use this parameter along with <code>JDBC ResultSet Type</code>. It is not mandatory.</p> <p data-bbox="798 1576 1385 1641">Specifies the <code>resultSetConcurrency</code> argument value of the <code>createStatement</code> Java method.</p> <p data-bbox="798 1666 1393 1800">This method belongs to the <code>java.sql.Connection</code> interface. You add this parameter to create a default <code>Statement</code> object and fine-tune your connection performance.</p>
Values	You set either standard Java values or database-specific values. Values must be integers.

## Related Information

[createStatement method](#) ➦

[ResultSet interface](#) ➦

## 10.6 OData SBO Parameters

These parameters are used to configure connections to data sources that are using the OData protocol.

These parameters are defined in the `\\<connectionserver-install-dir>\connectionServer\odata\odata.sbo` file.

### 10.6.1 Enforce Max Protocol Version

```
<Parameter Name="Enforce Max Protocol Version">Yes</Parameter>
```

Description	<p>Specifies if the driver sends the supported version of the OData protocol to the OData provider.</p> <p>If it does, the OData provider can decide whether it answers the driver in the given protocol. This parameter can be helpful when the BI platform is connecting to a provider that is using the OData 3.0 protocol.</p>
Values	<p>Yes: the driver sends the supported version of the OData protocol.</p> <p>No: the driver does not send the supported version of the OData protocol.</p>
Default	Yes

## 10.7 ODBC SBO Parameters

These parameters apply to the ODBC network layer. They are used to configure an ODBC connection.

These parameters are defined in the SBO files of `\\<connectionserver-install-dir>\connectionServer\odbc` subdirectory.

## 10.7.1 CharSet

```
<Parameter Name="CharSet">ISO88591</Parameter>
```

### Description

#### Note

Do not edit this parameter.

Specifies the character set of the data returned by the database middleware.

### Values

A valid charset name.

### Default

If not specified, Connection Server uses the character set specified in the database middleware.

## 10.7.2 Connection Status Available

```
<Parameter Name="Connection Status Available">True</Parameter>
```

### Description

Specifies whether the middleware can detect a bad connection (ping function).

### Values

True: the middleware can detect a bad connection.

False: the middleware cannot detect a bad connection.

### Default

The value set in the middleware.

## 10.7.3 Cost Estimate Available

```
<Parameter Name="Cost Estimate Available">False</Parameter>
```

### Description

Specifies if the database middleware supports cost estimation of the SQL query execution. This parameter is only used with Teradata database.

### Values

True: the middleware supports cost estimation.

False: the middleware does not support cost estimation.

### Default

False

## 10.7.4 Empty String

```
<Parameter Name="Empty String">EmptyString</Parameter>
```

Description	Specifies that certain functions, for example SQL tables, receive either an empty string or a null pointer to replace missing parameters.
Values	<p>NullString: a null string is used.</p> <p>EmptyString: an empty string used.</p>
Default	EmptyString

## 10.7.5 ODBC Cursors

```
<Parameter Name="ODBC Cursors">No</Parameter>
```

Description	Specifies if the ODBC cursor library is used by the data access driver. It can help you to improve the performance of your system.
Values	<p>Yes: the ODBC cursor library is used by the data access driver.</p> <p>No: the ODBC cursor library is not used by the data access driver.</p>
Default	The value set in the <code>cs.cfg</code> file.

## 10.7.6 SQLDescribeParam Available

```
<Parameter Name="SQLDescribeParam Available">True</Parameter>
```

Description	Specifies whether the middleware handles the SQLDescribeParam ODBC function. This function helps you describe the parameters of a stored procedure. This parameter is only used for IBM Informix database.
Values	<p>True: the SQLDescribeParam function is available.</p> <p>False: the SQLDescribeParam function is not available.</p>



Default	The value set in the database middleware.
---------	---

## 10.7.7 SQLMoreResults Available

```
<Parameter Name="SQLMoreResults Available">True</Parameter>
```

Description	<p>Specifies whether the middleware handles the SQLMoreResults ODBC function.</p> <p>This function helps you to retrieve more result sets from SQL execution, if any. This parameter is supported by ODBC drivers only.</p>
Values	<p>True: the SQLMoreResults function is supported.</p> <p>False: the SQLMoreResults function is not supported.</p>
Default	The value set in the middleware.

## 10.7.8 Use DataDirect OEM Driver

```
<Parameter Name="Use DataDirect OEM Driver">No</Parameter>
```

Description	Specifies whether connections to Microsoft SQL Server databases can use DataDirect ODBC branded drivers.
Values	<p>Yes: the connection can use the branded driver.</p> <p>No: the connection cannot use the branded driver.</p>
Default	No

## Related Information

[About DataDirect ODBC Drivers \[page 189\]](#)

## 10.7.9 V5toV6DriverName

```
<Parameter Name="V5toV6DriverName">{Informix 3.34 32 BIT}</Parameter>
```

Description	Specifies the conversion rule from Informix Connect to Informix ODBC. The value of this parameter determines which Informix Driver is used to define the ODBC Data Source Name (DSN) without the connection string. This parameter is only used for IBM Informix database.
Values	The exact name of the Informix driver installed on the machine.
Default	The value set in the <code>cs.cfg</code> file.

## 10.8 OLE DB SBO Parameters

These parameters apply to the OLE DB database technology. They are used to configure an OLE DB connection.

These parameters are defined in the `\\<connectionserver-install-dir>\connectionServer\oledb\oledb.sbo` and `\sqlsrv.sbo` files.

### 10.8.1 Enumerator CLSID

```
<Parameter Name="Enumerator CLSID">MSDASQL Enumerator</Parameter>
```

Description

#### Note

Do not edit this parameter.

Specifies class ID of OLE DB enumerator. This parameter is used with OLE DB only.

### 10.8.2 Provider CLSID

```
<Parameter Name="Provider CLSID">MSDASQL</Parameter>
```

Description

#### Note

Do not edit this parameter.

Specifies class ID of OLE DB provider. This parameter is used with OLE DB only.

## 10.9 Sybase SBO Parameters

These parameters apply to the Sybase ASE/CTLIB SBO file. These parameters are used to configure a Sybase ASE/CTLIB connection.

These parameters are defined in the \\<connectionserver-install-dir>\connectionServer\sybase\sybase.sbo file.

### 10.9.1 Driver Behavior

```
<Parameter Name="Driver Behavior">Dynamic</Parameter>
```

Description	Specifies which one of the Sybase drivers is used.
Values	Dynamic: the ct_dynamic driver is used. Any other value enables the use of the CTLib driver.
Default	Dynamic.

### 10.9.2 Password Encryption

```
<Parameter Name="Password Encryption">True</Parameter>
```

Description	Specifies if you want to use the encryption password mechanism specified in the middleware for the password entered in the <i>Connection details</i> dialog box.  This parameter is used only with Sybase. It is included in the Defaults section for future compatibility.
Values	True: the encryption password mechanism of the middleware is used.  False: the encryption password mechanism of the middleware is not used.
Default	The value set in the cs.cfg file.

### 10.9.3 Quoted Identifier

```
<Parameter Name="Quoted Identifier">False</Parameter>
```

Description	Specifies whether quoted identifiers are supported. This parameter is supported by Sybase middleware only.
Values	True: quoted identifiers are supported. False: quoted identifiers are not supported.
Default	False


## 10.9.4 Recover Errors

```
<Parameter Name="Recover Errors">True</Parameter>
```

Description	Specifies whether the Client Library driver is usable after ct_dynamic driver failure.
Values	True: the Client Library driver is used. False: the Client Library driver is not used.
Default	True

## 10.9.5 Text Size

```
<Parameter Name="Text Size">32768</Parameter>
```

Description	<div>  <b>Note</b> This parameter is not mandatory. </div> <p>Specifies the maximum size of large variable length binary or character data supported.</p> <p>Large variable length binary or character data retrieved from Sybase CTL database is truncated if larger than 32 KBytes. You add this parameter to the appropriate Database section of the configuration file to avoid the data truncation.</p>
Default	32768

## 10.10 Teradata SBO Parameters

These parameters apply to the Teradata SBO files. These parameters are used to configure a Teradata connection through JDBC or ODBC.

These parameters are defined in the `\\<connectionserver-install-dir>\connectionServer\jdbc\teradata.sbo` and `\\<connectionserver-install-dir>\connectionServer\odbc\teradata.sbo` files.

### 10.10.1 Replace Current Owner With Database

```
<Parameter Name="Replace Current Owner With Database">Yes</Parameter>
```

Description	Specifies if the driver returns the current database name when the data source is queried for the current owner. Only used with ODBC connections.
Values	Yes: the current owner is mapped to the Teradata database name. No: the current owner is mapped to the current user name.
Default	No

## Related Information

[Teradata Connections - Mapping Teradata Database to Current Owner \[page 163\]](#)

# 11 Configuring Database Capability Parameters

## 11.1 About Database Capability Parameters

Database capability parameters describe capabilities of databases used as sources of data for the contents of a universe. You can set these parameters to operate at the following levels:

- Universe level  
You set these parameters when you create or modify a universe.
- Database level  
You set these parameters in the PRM file of the database. They are overridden by any corresponding setting at universe level.

### Note

To view the operators and functions available for your data access driver, open the `<driver>.prm` file in an XML editor.

## 11.2 About PRM Files

PRM files provide you with parameters that describe capabilities of databases used as sources of data for SAP BusinessObjects applications. They allow database-dependent factors to control what SQL can be used with the universe, based on the connection and the database that it is attached to. There is a PRM file corresponding to each database driver.

You can configure some database capability parameters from inside a universe. They override PRM file settings consequently.

PRM files are located in the following folders:


- `<connectionserver-install-dir>\connectionServer\<RDBMS>` directories, where `<RDBMS>` is the network layer or middleware name.
- `<connectionserver-install-dir>\connectionServer\<RDBMS>\extensions\qt` directories.  
These PRM files are called extended files. For more information about parameters of extended files, see the SQL and MDX reference chapter in the *Information Design Tool User Guide*.

### Note

Help text files in other languages are also available in the same directories.

## 11.2.1 PRM Parameter File Structure

There is a PRM file for each supported database driver. Each file is divided into sections, which contain specific parameters. The following table describes the content and meaning of each PRM file section.

File Section	Description
Configuration	<p>Parameters used to describe capabilities of databases used as source of data for universes, for example <code>EXT_JOIN</code>, <code>ORDER_BY</code>, and <code>UNION</code>. They are not directly available to any SAP BusinessObjects product.</p> <p>These parameters can be edited to optimize queries run against universes using the target data access driver.</p> <div> <b>Note</b> They are described in the next chapter.</div>
DateOperations	Date operators available to universe design tool and information design tool, for example <code>YEAR</code> , <code>QUARTER</code> , <code>MONTH</code> .
Operators	Operators available to universe design tool and information design tool, for example <code>ADD</code> , <code>SUBTRACT</code> , <code>MULTIPLY</code> .
Functions	<p>Functions available to universe design tool and information design tool, for example <code>Average</code>, <code>Sum</code>, <code>Variance</code>. See the <i>Information Design Tool User Guide</i> for more information.</p> <p>Help text that appears when functions in this section are selected in universe designer tool and information design tool is listed in the file <code>&lt;driver&gt;&lt;language&gt;.prm</code>, for example, <code>oracleen.prm</code>. This file is found in the same directory as the <code>&lt;driver&gt;.prm</code> file. You can open it to view descriptions of all the functions available in the <code>&lt;driver&gt;.prm</code> file.</p> <p>The <code>Functions</code> section has the following child elements:</p> <ul style="list-style-type: none"><li>• <code>Group</code>: whether the usage of this function in a query generates a <code>group by</code> clause.<ul style="list-style-type: none"><li>• <code>True</code> sets that the query generates a <code>group by</code> clause.</li><li>• <code>False</code> sets that the query does not generate a <code>group by</code> clause.</li></ul></li><li>• <code>ID</code>: this is the name that appears in the <i>User Objects</i> function list in Desktop Intelligence. Deprecated in this release.</li><li>• <code>InMacro</code>: if this value is <code>True</code>, then the function is listed in the <i>User Objects</i> function list in Desktop Intelligence. Deprecated in this release.</li><li>• <code>Type</code>: function data type.</li><li>• <code>Arguments</code>: arguments accepted by the function. A function can have a maximum of only four arguments, and any additional arguments are not taken into account.</li><li>• <code>SQL</code>: the SQL syntax for the function.</li></ul>

## Related Information

[To View and Edit a Function Help Text File \[page 225\]](#)

### 11.3 To View and Edit PRM Files

1. Browse to the directory that stores the PRM file for your target data access driver.  
PRM files are stored in `<connectionserver-install-dir>\connectionServer\<RDBMS>` directories.
2. Open a `<driver>.prm` file in an XML editor.
3. Expand sections as required.
4. Set values by entering the value in the appropriate tag.
5. Save and close the file.

### 11.4 To Verify and Add Analytic Function Support to PRM Files

The PRM files may not contain all the analytic functions available in the targeted database. Before using an analytic function, you should verify that it is present in the file, and if necessary, add it to the list.

You need to update the PRM file only if the function is both analytic and aggregate, such as SUM.

1. Browse to the directory that stores the extended PRM file for your target data access driver.
2. Open the `<driver>.prm` file in an XML editor.
3. Under the Configuration section, verify that the following parameter is present:

```
<Parameter Name="OVER_CLAUSE">Y</Parameter>
```

For a definition of this parameter, see the *Information Design Tool User Guide*.

4. Browse to the directory that stores the PRM file for your target data access driver.
5. Open the `<driver>.prm` file in an XML editor.
6. Under the Configuration section, verify that the ID of the analytic function is listed in the ANALYTIC\_FUNCTIONS parameter value.
7. If not present, type the ID of the function at the end of the list.
8. Under Functions, add the Function section and specify the ID, name, argument types and SQL definition of the analytic function.

```
<Function Group="False" ID="<Function_ID>" InMacro="False"
Name="<Function_Name>" Type="All">
  <Arguments>
    <Argument Type="<Argument_Type>"></Argument>
    ...
  </Arguments>
```



```
<SQL><SQL_Definition></SQL>
</Function>
```

#### → Remember

Give different names and IDs to a function that is both analytic and aggregate. For example, the name of SUM as aggregate function is SUM. The name of SUM as analytic function is SUM\_OVER.

9. Save any modifications and close the file.

You have added support of an analytic function to the information design tool.

You need to restart the information design tool for any changes to the PRM file to take effect.

## Related Information

[About PRM Files \[page 222\]](#)

## 11.5 To View and Edit a Function Help Text File

The Help text that appears under each function when selected in the universe design tool or information design tool, is maintained in a separate XML file. You can edit and add text to describe a function by editing the `<driver><language>.prm` file. There is a Help text file for each language version of SAP BusinessObjects products installed.

When you add a function to the PRM file, you need to add the Help text for the new function to the appropriate `<driver><language>.prm` file, for example, if you add a function to the `oracle.prm` file, then you also add the function name and the Help text for the function to the `oracleen.prm` file, if you are working with the English version of the tool. See the ISO639-1 standard.

## 11.6 To Edit the Help Text for a PRM Function

1. Browse to the directory that stores the PRM language file for your target data access driver.  
PRM language files are stored in `<connectionserver-install-dir>\connectionServer\<RDBMS>` directories.
2. Open a `<driver><language>.prm` file in an XML editor.
3. Expand the `Messages` section.
4. To add Help for a new function do the following:
  - Add a new section for a function. The easiest way to do this is to copy an existing function entry and copy it into the `Function` section. You then edit the new function text.
  - Enter Help text for the function.

5. To view or edit existing function Help text, do the following:
  - Expand the `Function` section.
  - Expand the `Message` section for a function.
  - Edit Help text as required.
6. Save and close the file.

# 12 PRM Parameter Reference

## 12.1 PRM file Configuration Reference

The database capability parameters are listed alphabetically. To view functions, date operators, and other operators available, open a `<driver>.prm` file in an XML editor, each parameter is defined in the following tag:

```
<Parameter Name="<parameter>"><value></Parameter>
```

where `<parameter>` is the name of the parameter, and `<value>` is the value attributed to the parameter.

Each parameter is shown with the following information:

- Example of how the parameter appears in the XML file
- Description of the parameter
- Possible values that can be set for the parameter
- Default value for the parameter if any

### ⓘ Note

Certain configuration parameters must not be edited. These parameters have values set for use internally within SAP BusinessObjects solutions. These parameters are described in this section but contain a warning not to edit the value. You must not edit these parameters. Before editing any other PRM file parameter, you should make a backup copy of the PRM file.

### 12.1.1 ANALYTIC\_CLAUSE

```
<Parameter Name="ANALYTIC_CLAUSE">WHEN</Parameter>
```

Description	Specifies which SQL keyword must be used if a function specified in the ANALYTIC_FUNCTIONS parameter is used in the SQL statement.
Values	<p>WHEN: indicates a WHEN clause is used. This is the default value for IBM Red Brick databases.</p> <p>QUALIFY: indicates a QUALIFY clause is used. This is the default value for Teradata databases.</p> <div><h3>ⓘ Note</h3><p>Refer to your documentation database to find how it implements the SQL clause.</p></div>

Default

See values above.

## Related Information

[ANALYTIC\\_FUNCTIONS \[page 228\]](#)

### 12.1.2 ANALYTIC\_FUNCTIONS

```
<Parameter Name="ANALYTIC_FUNCTIONS">RANK,SUM,AVG,COUNT,MIN,MAX</Parameter>
```

Description	Lists the analytic functions supported by the database.
Values	See values in the PRM files.
Default	The listed values.

### 12.1.3 CALCULATION\_FUNCTION

```
<Parameter Name="CALCULATION_FUNCTION">YES</Parameter>
```

Description	Specifies if the database supports calculation functions.
Values	YES: the database supports calculation functions. If so, the information design tool is able to create calculation columns. NO: the database does not support calculation functions.

### 12.1.4 CONSTANT\_SAMPLING\_SUPPORTED

```
<Parameter Name="CONSTANT_SAMPLING_SUPPORTED">YES</Parameter>
```

Description	Specifies if the database supports random sampling. Random sampling consists in extracting random rows from a dataset.
-------------	--

Values	<p>YES: the database supports random sampling.</p> <p>NO: the database does not support random sampling.</p>
Default	YES

## 12.1.5 DISTINCT

```
<Parameter Name="DISTINCT">YES</Parameter>
```

Description	Specifies if the database supports the DISTINCT keyword in SQL statements.
Values	<p>YES: the database supports the DISTINCT keyword.</p> <p>NO: the database does not support the DISTINCT keyword. This behavior disables the following features:</p> <ul style="list-style-type: none"> <li>The <i>Distinct Values</i> option that appears when you click the <i>View Values</i> button in the <i>Quick Design</i> wizard of the universe design tool.</li> <li>The Countdistinct function that appears when you create a condition with the Calculation operand in the <i>Query Panel</i>.</li> </ul>
Default	YES

## 12.1.6 EXT\_JOIN

```
<Parameter Name="EXT_JOIN">YES</Parameter>
```

Description	Specifies if the database supports outer joins. This parameter is used by all data access drivers.
Values	<p>YES: the database supports outer joins.</p> <p>NO: the database does not support outer joins. The <i>Outer join</i> check boxes in the <i>Edit Join</i> dialog box of the universe design tool are greyed.</p>
Default	YES

## 12.1.7 FULL\_EXT\_JOIN

<Parameter Name="FULL\_EXT\_JOIN">YES</Parameter>

Description	Specifies if the database supports full outer joins.
Values	YES: the database supports full outer joins. NO: the database does not support full outer joins.
Default	YES

## 12.1.8 GROUP\_BY

<Parameter Name="GROUP\_BY">NO</Parameter>

Description	Specifies if the database supports the GROUP BY clause in the SQL statements.
Values	YES: the database supports the GROUP BY clause. NO: the database does not support the GROUP BY clause.

## 12.1.9 GROUP\_BY\_SUPPORTS\_COLUMN\_INDEX

<Parameter Name="GROUP\_BY\_SUPPORTS\_COLUMN\_INDEX">NO</Parameter>

Description	Specifies if the database supports the use of column indexes from the SELECT statement in the GROUP BY clause.
Values	YES: the database supports the use of column indexes from the SELECT statement instead of column names. NO: the database does not support the use of column indexes from the SELECT statement instead of column names.
Default	NO

## 12.1.10 GROUP\_BY\_SUPPORTS\_COMPLEX

Parameter Name="GROUP\_BY\_SUPPORTS\_COMPLEX">NO</Parameter>

Description	<p>Specifies if the database supports complex expressions in the GROUP BY clause. Complex expressions mean anything than column names or indexes present in the SELECT statement, for example functions or columns absent from the SELECT statement. This parameter is used with IBM DB2.</p> <div> <div>📘 Note</div> <p>If you run a query containing measure objects and complex objects, that is, objects using functions and concatenation, your application displays the following error message: Your database does not allow you to do aggregations with the <code>&lt;object name&gt;</code> object.</p> </div>
Values	<p>YES: the database supports complex expressions in the GROUP BY clause.</p> <p>NO: the database does not support complex expressions in the GROUP BY clause.</p>
Default	NO

### 12.1.11 GROUP\_BY\_SUPPORTS\_CONSTANT

```
<Parameter Name="GROUP_BY_SUPPORTS_CONSTANT">YES</Parameter>
```

Description	<p>Specifies if the database supports the use of constant objects in the GROUP BY clause. This parameter is used by IBM DB2 and Microsoft SQL Server databases.</p>
Values	<p>YES: the database supports the use of constant objects in the GROUP BY clause.</p> <p>NO: the database does not support the use of constant objects in the GROUP BY clause.</p>
Default	YES

### 12.1.12 HAVING

```
<Parameter Name="HAVING">NO</Parameter>
```

Description	Specifies if the database supports the HAVING clause in SQL statements.
Values	YES: the database supports the HAVING clause. NO: the database does not support the HAVING clause.
Default	NO

### 12.1.13 INTERSECT

```
<Parameter Name="INTERSECT">INTERSECT</Parameter>
```

Description	Specifies the keyword supported by the database for the INTERSECT set operation.
Values	INTERSECT: the keyword supported by the database is INTERSECT. No value: the database does not support any keyword for the INTERSECT set operation. In this case, two queries are generated.
Default	INTERSECT

### 12.1.14 INTERSECT\_ALL

```
<Parameter Name="INTERSECT_ALL">YES</Parameter>
```

Description	Specifies if the database supports the INTERSECT ALL set operation.
Values	YES: the database supports the INTERSECT ALL set operation. NO: the database does not support the INTERSECT ALL set operation.
Default	YES

### 12.1.15 INTERSECT\_IN\_SUBQUERY

```
<Parameter Name="INTERSECT_IN_SUBQUERY">YES</Parameter>
```



Description	Specifies if the database supports the INTERSECT set operation in subqueries.
Values	<p>YES: the database supports the INTERSECT set operation in subqueries.</p> <p>NO: the database does not support the INTERSECT set operation in subqueries.</p>

## 12.1.16 JOIN

```
<Parameter Name="JOIN">YES</Parameter>
```

Description	Specifies if the database supports a JOIN operation between two tables.
Values	<p>YES: the database supports joins between any columns of two tables.</p> <p>STRUCTURE_JOIN: the database supports joins between two tables that are related with referential constraints. Is identical to NO in this release.</p> <p>NO: the database does not support joins between two tables.</p>

## 12.1.17 LEFT\_EXT\_JOIN

```
<Parameter Name="LEFT_EXT_JOIN">YES</Parameter>
```

Description	Specifies if the database supports left external joins.
Values	<p>YES: the database supports left external joins.</p> <p>NO: the database does not support left external joins.</p>

## 12.1.18 LEFT\_OUTER

```
<Parameter Name="LEFT_OUTER">$(+)</Parameter>
```

```
<Parameter Name="LEFT_OUTER">$*</Parameter>
```

Description	Specifies the syntax to be used for left outer join expressions.
Values	<p>\$ ( + ) : this syntax is used with Oracle.</p> <p>\$ * : this syntax is used with Sybase, Microsoft SQL Server and IBM Red Brick.</p> <div> <b>Note</b>  \$ represents a join expression. </div>
Default	See values above.
Example	If <code>table1.col1</code> is joined to <code>table2.col2</code> in Oracle, the expression generated is then : <code>table1.col1 ( + ) = table2.col2</code> .

## 12.1.19 LIKE\_SUPPORTS\_ESCAPE\_CLAUSE

<Parameter Name="LIKE\_SUPPORTS\_ESCAPE\_CLAUSE">YES</Parameter>

Description	Specifies if the database supports the use of an ESCAPE clause within the LIKE condition of the SQL statement.
Values	<p>YES: the database supports the ESCAPE clause in the LIKE condition.</p> <p>NO: the database does not support the ESCAPE clause in the LIKE condition.</p>
Default	If this setting is not specified, Connection Server retrieves the information from the database middleware.

## 12.1.20 MINUS

<Parameter Name="MINUS">MINUS</Parameter>

Description	Specifies the keyword supported by the database for the MINUS set operation.
-------------	--

Values	<p>MINUS: the database supports the MINUS set operator.</p> <p>EXCEPT: the database supports the EXCEPT set operator.</p> <p>No value: the database does not support any keyword for the MINUS set operation. In this case, two queries are generated.</p>
Default	MINUS

## 12.1.21 MINUS\_ALL

```
<Parameter Name="MINUS_ALL">Yes</Parameter>
```

Description	Specifies if the database supports the MINUS ALL set operation.
Values	<p>YES: the database supports the MINUS ALL set operation.</p> <p>NO: the database does not support the MINUS ALL set operation.</p>

## 12.1.22 MINUS\_IN\_SUBQUERY

```
<Parameter Name="MINUS_IN_SUBQUERY ">YES</Parameter>
```

Description	Specifies if the database supports the MINUS set operation in subqueries.
Values	<p>YES: the database supports the MINUS set operation in subqueries.</p> <p>NO: the database does not support the MINUS set operation in subqueries.</p>

## 12.1.23 ORDER\_BY

```
<Parameter Name="ORDER_BY">YES</Parameter>
```

Description	Specifies if the database supports the ORDER BY clause.
-------------	---

Values	YES: the database supports the ORDER BY clause. NO: the database does not support the ORDER BY clause.
--------	---

## 12.1.24 ORDER\_BY\_REQUIRES\_SELECT

```
<Parameter Name="ORDER_BY_REQUIRES_SELECT">NO</Parameter>
```

Description	Specifies if the database requires columns used in the ORDER BY clause to be referenced in the SELECT statement.
Values	YES: users are not allowed to sort on columns if they are not included in the SELECT statement. In this case, the <a href="#">Manage Sorts</a> button is greyed in the <a href="#">Query</a> Panel of the universe design tool.  NO: users are allowed to sort on columns even if they are not included in the SELECT statement.
Default	NO

## 12.1.25 ORDER\_BY\_SUPPORTS\_COLUMN\_INDEX

```
<Parameter Name="ORDER_BY_SUPPORTS_COLUMN_INDEX">YES</Parameter>
```

Description	Specifies if the database supports the use of column indexes from the SELECT statement in the ORDER BY clause.
Values	YES: the database supports the use of column indexes from the SELECT statement instead of column names.  NO: the database does not support the use of column indexes from the SELECT statement instead of column names.

## 12.1.26 PERCENT\_RANK\_SUPPORTED

```
<Parameter Name="PERCENT_RANK_SUPPORTED">YES</Parameter>
```

Description	Specifies if the database supports the Percent Rank analytical function. Refer to your database documentation to find how it implements percent rank.
Values	YES: the database supports Percent Rank. NO: the database does not support Percent Rank.
Default	YES

## 12.1.27 RANK\_SUPPORTED

```
<Parameter Name="RANK_SUPPORTED">YES</Parameter>
```

Description	Specifies if the database supports the Rank analytical function in SQL statements.
Values	YES: the database supports Rank. NO: the database does not support Rank.
Default	YES

## 12.1.28 RIGHT\_EXT\_JOIN

```
<Parameter Name="RIGHT_EXT_JOIN">YES</Parameter>
```


Description	Specifies if the database supports right external joins.
Values	YES: the database supports right external joins. NO: the database does not support right external joins.

## 12.1.29 RIGHT\_OUTER

```
<Parameter Name="RIGHT_OUTER">$(+)</Parameter>
```

```
<Parameter Name="RIGHT_OUTER">*$</Parameter>
```

Description	Specifies the syntax to be used for right outer join expressions.
-------------	---

Values	<p>\$ ( + ) : this syntax is used with Oracle.</p> <p>*\$ : this syntax is used with Sybase, Microsoft SQL Server and IBM Red Brick.</p> <div>  <b>Note</b>            \$ represents a join expression.         </div>
Default	See values above.

### 12.1.30 SEED\_SAMPLING\_SUPPORTED

```
<Parameter Name="SEED_SAMPLING_SUPPORTED">YES</Parameter>
```

Description	Specifies if the database supports seed sampling. Seed sampling is a variation of random sampling in which the random seed is provided by the user.
Values	<p>YES: the database supports seed sampling.</p> <p>NO: the database does not support seed sampling.</p>
Default	NO

### 12.1.31 SELECT\_SUPPORTS\_NULL

```
<Parameter Name="NULL_IN_SELECT_SUPPORTED">YES</Parameter>
```

Description	Specifies if the database supports NULL as a column in the SELECT statement.
Values	<p>YES: the database supports NULL as a column in the SELECT statement.</p> <p>NO: the database does not support NULL as a column in the SELECT statement.</p>
Default	<p>YES</p> <p>NO for Teradata, IBM DB2, IBM Informix and IBM Red Brick databases, which do not support the NULL value as column.</p>

## 12.1.32 SUBQUERY\_IN\_FROM

```
<Parameter Name="SUBQUERY_IN_FROM">YES</Parameter>
```

Description	Specifies if the database supports the use of subqueries inside the FROM clause.
Values	YES: the database supports the use of subqueries inside the FROM clause. NO: the database does not support the use of subqueries inside the FROM clause.

## 12.1.33 SUBQUERY\_IN\_IN

```
<Parameter Name="SUBQUERY_IN_IN">YES</Parameter>
```

Description	Specifies if the database supports the use of subqueries inside the IN clause.
Values	YES: the database supports the use of subqueries inside the IN clause. NO: the database does not support the use of subqueries inside the IN clause.

## 12.1.34 SUBQUERY\_IN\_WHERE

```
<Parameter Name="SUBQUERY_IN_WHERE">YES</Parameter>
```

Description	Specifies if the database supports the use of subqueries inside the WHERE clause.
Values	YES: the database supports the use of subqueries inside the WHERE clause. NO: the database does not support the use of subqueries inside the WHERE clause.

## 12.1.35 TECHNICAL\_COLUMN\_NAME\_PATTERN

```
<Parameter Name="TECHNICAL_COLUMN_NAME_PATTERN">^(-idref)(.)*</Parameter>
```

Description	Specifies that all columns beginning with <code>-idref</code> pattern are not displayed in the connections, data foundations and business layers of universes based on OData data sources. Consequently, the information designer cannot build queries with these columns.
-------------	--

#### Note

Do not edit this parameter.

Value	<code>^(-idref)(.)*</code>
-------	----------------------------

## 12.1.36 UNION

```
<Parameter Name="UNION">UNION</Parameter>
```

Description	Specifies the keyword supported by the database for the UNION set operation.
Values	UNION: the keyword supported by the database is UNION.  No value : the database does not support any ekyword for the UNION set operation. In this case, two queries are generated.
Default	UNION

## 12.1.37 UNION\_ALL

```
<Parameter Name="UNION_ALL">YES</Parameter>
```

Description	Specifies if the database supports the UNION ALL set operation.
Values	YES: the database supports the UNION ALL set operation.  NO: the database does not support the UNION ALL set operation.

## 12.1.38 UNION\_IN\_SUBQUERY

```
<Parameter Name="UNION_IN_SUBQUERY">YES</Parameter>
```

Description	Specifies if the database supports the use of the UNION set operation in subqueries.
-------------	--



Values

YES: the database supports the UNION set operation in subqueries.

NO: the database does not support the UNION set operation in subqueries.

---

# 13 Data Type Conversion Reference

## 13.1 Data Type Conversion

In the information design tool, data foundations expose tables from one or more relational databases, which are the basis for business layers. The data type associated with each table column is displayed in a data foundation with other column details. Business layers expose table columns as metadata objects, like dimensions and hierarchies, and display the data type associated with each object. The following table describes the mapping between these two sets of data types:

Data Type Shown in the Data Foundation	Data Type Shown in the Business Layer
BINARY, LONGVARBINARY, VARBINARY	BLOB
BIT	Boolean
DATE	Date
TIME, TIMESTAMP	DateTime
LONGVARCHAR	Long Text
BIGINT, DECIMAL, DOUBLE, FLOAT, INTEGER, NUMERIC, REAL, SMALLINT, TINYINT	Numeric
CHAR, VARCHAR, XML	String
UNDEFINED	Unknown

### Note

From any database, a time is managed as a DateTime in the BI platform. The date part of the DateTime should be normally displayed as the current date in end-user reports.

The Data Access layer manages the conversion of data types exposed by network layers into Connection Server data types, which are then mapped to data types exposed in data foundations.

This section provides conversion tables between generic network layer data types (JDBC and ODBC) and data foundation data types. It also provides conversion tables for specific network layers such as OLE DB, Oracle OCI, and Sybase CTL, and describes nontrivial conversions and exceptions for specific databases, such as CSV files, SAP ERP systems, and the SAP HANA database.

## Related Information

[CSV File Data Types \[page 243\]](#)  
[JDBC Data Types \[page 244\]](#)  
[ODBC Data Types \[page 246\]](#)  
[OData Data Types \[page 248\]](#)  
[OLE DB Data Types \[page 249\]](#)  
[Oracle OCI Data Types \[page 250\]](#)  
[SAP ERP Data Types \[page 251\]](#)  
[SAP HANA Data Types \[page 252\]](#)  
[Sybase CTL Data Types \[page 253\]](#)  
[XML Data Types \[page 254\]](#)

### 13.1.1 CSV File Data Types

#### Syntax:

The following table lists the data types declared in DDL files for schema detection of CSV files, and their equivalent in data foundations

Type Declared in the DDL File	Data Foundation Data Type
BIT, BOOLEAN	BIT
DATE	DATE
TIME	TIME
TIMESTAMP	TIMESTAMP
BIGINT, DECIMAL	DECIMAL
FLOAT, DOUBLE, REAL	DOUBLE
INTEGER, INT, SMALLINT	INTEGER
NUMBER, NUMERIC	NUMERIC
VARCHAR	VARCHAR

## Related Information

[CSV Schema Detection \[page 63\]](#)

## 13.1.2 JDBC Data Types

### Syntax:

The following table lists the data types that show up through JDBC and their equivalent in data foundations.

JDBC Data Type	Data Foundation Data Type
BINARY	BINARY
VARBINARY	VARBINARY
BLOB, LONGVARBINARY	LONGVARBINARY
BIT, BOOLEAN	NUMERIC
CLOB, NCLOB	LONGVARCHAR
DATE	DATE
TIME	TIME
TIMESTAMP	TIMESTAMP
DOUBLE	DOUBLE
FLOAT	FLOAT
REAL	REAL
SMALLINT	SMALLINT
CHAR, NCHAR	CHAR
LONGNVARCHAR, LONGVARCHAR, NVARCHAR, ROWID, VARCHAR	VARCHAR
SQLXML	XML

## IBM Informix

The following table lists the data types that could show up in results when the user queries an IBM Informix database through JDBC, and their equivalent in data foundations. These data types overwrite the generic ones.

Informix JDBC Data Type	Data Foundation Data Type
TIMESTAMP	<p>It can be mapped to the following type:</p> <ul style="list-style-type: none"> <li>DATE if the Informix data type follows the pattern <code>DATETIME\ \s+ ( HOUR   MINUTE   SECOND ) \s+TO\ \s+ ( HOUR   MINUTE   SECOND )</code></li> <li>TIME if the Informix data type follows the pattern <code>DATETIME\ \s+ ( YEAR   MONTH   DAY ) \s+TO\ \s+ ( YEAR   MONTH   DAY )</code></li> <li>TIMESTAMP in the other cases</li> </ul>
BOOLEAN	SMALLINT

## Microsoft SQL Server

The following table lists the data types that could show up in results when the user queries an Microsoft SQL Server database through JDBC, and their equivalent in data foundations. The data type mapping also depends on the SQL type name associated with the network layer data type. These data types overwrite the generic ones.

Microsoft SQL Server JDBC Data Type	SQL Type Name	Data Foundation Data Type
LONGVARCHAR	any other value than "xml"	VARCHAR
LONGVARCHAR	xml	XML

## Oracle

The following table lists the data types that could show up in results when the user queries an Oracle database through JDBC, and their equivalent in data foundations. The data type mapping also depends on the SQL type name associated with the network layer data type. These data types overwrite the generic ones.

Oracle JDBC Data Type	SQL Type Name	Data Foundation Data Type
BFILE	any value	LONGVARBINARY
any value	BFILE	LONGVARBINARY
DATE	any value	TIMESTAMP
any value	TIMESTAMP	TIMESTAMP
BINARY_DOUBLE	any value	DOUBLE

Oracle JDBC Data Type	SQL Type Name	Data Foundation Data Type
OTHER	FLOAT	DOUBLE
BINARY_FLOAT	any value	REAL
any value	NCHAR	CHAR
any value	NVARCHAR2, ROWID, UROWID	VARCHAR

### 13.1.3 ODBC Data Types

#### Syntax:

The following table lists the data types that show up through ODBC and their equivalent in data foundations.

ODBC Data Type	Data Foundation Data Type
SQL_BINARY	BINARY
SQL_VARBINARY	VARBINARY
SQL_LONGVARBINARY	LONGVARBINARY
SQL_BIT	BIT
SQL_DATE, SQL_TYPE_DATE	DATE
SQL_DATETIME, SQL_TIME, SQL_TIMESTAMP, SQL_TYPE_TIME, SQL_TYPE_TIMESTAMP	TIMESTAMP
SQL_LONGVARCHAR, SQL_WLONGVARCHAR	LONGVARCHAR
SQL_BIGINT	BIGINT
SQL_DECIMAL	DECIMAL
SQL_DOUBLE	DOUBLE
SQL_FLOAT	FLOAT
SQL_INTEGER	INTEGER
SQL_NUMERIC	NUMERIC
SQL_REAL	REAL
SQL_SMALLINT	SMALLINT

ODBC Data Type	Data Foundation Data Type
SQL_TINYINT	TINYINT
SQL_CHAR, SQL_GUID, SQL_WCHAR	CHAR
SQL_VARCHAR, SQL_WVARCHAR	VARCHAR

## IBM DB2

The following table lists the data types that could show up in results when the user queries an IBM DB2 database through ODBC, and their equivalent in data foundations. These data types overwrite the generic ones.

DB2 ODBC Data Type	Data Foundation Data Type
SQL_BLOB	LONGVARBINARY
SQL_CLOB, SQL_DBCLOB, SQL_LONGVARGRAPHIC	LONGVARCHAR
SQL_DECFLOAT	DOUBLE
SQL_GRAPHIC	CHAR
SQL_VARGRAPHIC	VARCHAR
SQL_XML	XML

## IBM Informix

The following table lists the data types that could show up in results when the user queries an IBM Informix database through ODBC, and their equivalent in data foundations. These data types overwrite the generic ones.

Informix ODBC Data Type	Data Foundation Data Type
SQL_BIT	SMALLINT
SQL_INFX_UDT_BLOB	LONGVARBINARY

Informix ODBC Data Type	Data Foundation Data Type
SQL_TIMESTAMP, SQL_TYPE_TIMESTAMP	<p>It can be mapped to the following type:</p> <ul style="list-style-type: none"> <li>DATE if the Informix data type follows the pattern <code>DATETIME\ \s+ ( HOUR   MINUTE   SECOND ) \ \s+TO\ \s+ ( HOUR   MINUTE   SECOND )</code></li> <li>TIME if the Informix data type follows the pattern <code>DATETIME\ \s+ ( YEAR   MONTH   DAY ) \ \s+TO\ \s+ ( YEAR   MONTH   DAY )</code></li> <li>TIMESTAMP in the other cases</li> </ul>
SQL_INFX_UDT_CLOB	LONGVARCHAR

## Microsoft SQL Server

The following table lists the data types that could show up in results when the user queries an Microsoft SQL Server database through ODBC, and their equivalent in data foundations. These data types overwrite the generic ones.


Microsoft SQL Server ODBC Data Type	Data Foundation Data Type
SQL_SS_TIME2, SQL_SS_TIMESTAMPOFFSET	TIMESTAMP
SQL_SS_XML	XML

### 13.1.4 OData Data Types

#### Syntax:

The following table lists the Entity Data Model (EDM) data types internal to OData data sources and their equivalent in data foundations.

OData Data Type	Data Foundation Data Type
Edm.Binary	BINARY
Edm.Boolean	BIT
Edm.DateTime, Edm.Time	TIMESTAMP

 **Note**  
Nanoseconds are not mapped.



OData Data Type	Data Foundation Data Type
Edm.Int64	BIGINT
Edm.Decimal	DECIMAL
Edm.Double	DOUBLE
Edm.Float, Edm.Single	FLOAT
Edm.Int32	INTEGER
Edm.Byte, Edm.Int16, Edm.SByte	SMALLINT
Edm.DateTimeOffset, Edm.Guid, Edm.String	VARCHAR

## 13.1.5 OLE DB Data Types

### Syntax:

The following table lists the data types that show up through OLE DB and their equivalent in data foundations.

#### Note

For some data types, the mapping depends on the values of `DBCOLUMNFLAGS_ISLONG` and `DBCOLUMNFLAGS_ISFIXEDLENGTH` parameters associated with each type.

OLE DB Data Type	Data Foundation Data Type
DBTYPE_BYTES	VARBINARY
DBTYPE_BYTES if <code>DBCOLUMNFLAGS_ISLONG=true</code>	LONGVARBINARY
DBTYPE_BYTES if <code>DBCOLUMNFLAGS_ISFIXEDLENGTH=true</code>	BINARY
DBTYPE_BOOL	BIT
DBTYPE_DBDATE	DATE
DBTYPE_DBTIME	TIME
DBTYPE_DBTIMESTAMP	TIMESTAMP
DBTYPE_DECIMAL	DECIMAL
DBTYPE_I1, DBTYPE_UI1	TINYINT
DBTYPE_I2, DBTYPE_UI2	SMALLINT

OLE DB Data Type	Data Foundation Data Type
DBTYPE_I4, DBTYPE_UI4	INTEGER
DBTYPE_I8, DBTYPE_UI8	BIGINT
DBTYPE_R4	REAL
DBTYPE_R8	DOUBLE
DBTYPE_CY, DBTYPE_NUMERIC	NUMERIC
DBTYPE_STR, DBTYPE_WSTR	VARCHAR
DBTYPE_STR, DBTYPE_WSTR if DBCOLUMNFLAGS_ISLONG=true	LONGVARCHAR
DBTYPE_STR, DBTYPE_WSTR if DBCOLUMNFLAGS_ISFIXEDLENGTH=true	CHAR

## Microsoft SQL Server Data Types

The following table shows the data types that could show up in results when the user queries an Microsoft SQL Server database through OLE DB, and their equivalent in data foundations. These data types overwrite the previous ones.

Microsoft SQL Server OLE DB Data Type	Data Foundation Data Type
DBTYPE_DBTIME2, DBTYPE_DBTIMESTAMPOFFSET	TIMESTAMP
DBTYPE_GUID	CHAR
DBTYPE_XML	XML

## 13.1.6 Oracle OCI Data Types

### Syntax:

The following table lists the data types that show up through Oracle OCI and their equivalent in data foundations.

Oracle OCI Data Type	Data Foundation Data Type
SQLT_BIN	BINARY

Oracle OCI Data Type	Data Foundation Data Type
SQLT_BFILE, SQLT_BLOB, SQLT_LBI	LONGVARBINARY
SQLT_DAT, SQLT_DATE, SQLT_TIME, SQLT_TIMESTAMP, SQLT_TIMESTAMP_LTZ, SQLT_TIMESTAMP_TZ	TIMESTAMP
SQLT_CLOB, SQLT_LNG	LONGVARCHAR
SQLT_FLT, SQLT_IBDOUBLE	DOUBLE
SQLT_IBFLOAT	REAL
SQLT_NUM	NUMERIC
SQLT_AFC	CHAR
SQLT_CHR, SQLT_RDD, SQLT_RID	VARCHAR

## 13.1.7 SAP ERP Data Types

### Syntax:

The following table lists the ABAP data types used by SAP ERP systems and their equivalent in data foundations.

ABAP Data Type	Data Foundation Data Type
HEXADECIMAL	BINARY
DATE	DATE
TIME	TIME
FLOAT	FLOAT
INTEGER	INTEGER
NUMERIC TEXT, PACKED NUMBER	NUMERIC
TEXT	CHAR
VARIABLE LENGTH STRING	VARCHAR

## Date Format in SQL Expressions

The date format that the application user must use when building queries in the SQL Expression Editor is DATE'yyyy-mm-dd', for example: DATE'2013-04-10'.

The format is specified in the `jco.prm` extended PRM file with the `USER_INPUT_DATE_FORMAT` parameter. See the *Information Design Tool User Guide*.

## Related Information

[About PRM Files \[page 222\]](#)

## 13.1.8 SAP HANA Data Types

### Syntax:

The following table lists the data types used in the SAP HANA database and their equivalent in data foundations. For more information on SAP HANA data types, see the SAP HANA Data Type Reference.

SAP HANA Data Type	Data Foundation Data Type
BLOB	LONGVARBINARY
VARBINARY	VARBINARY
DATE	DATE
TIME	TIME
LONGDATE, SECONDDATE, TIMESTAMP	TIMESTAMP
<div><div>📘 Note</div><div>SECONDDATE is converted into TIMESTAMP without milliseconds.</div></div>	
DECIMAL, REAL, SMALLDECIMAL	FLOAT
BIGINT, INTEGER, SMALLINT, TINYINT	INTEGER
DOUBLE	DOUBLE
CLOB, NCLOB, TEXT	LONGVARCHAR
ALPHANUM, NVARCHAR, SHORTTEXT, VARCHAR	VARCHAR

## Related Information

[SAP HANA Data Type Reference](#)

### 13.1.9 Sybase CTL Data Types

#### Syntax:

The following table lists the data types that show up through Sybase CTL and their equivalent in data foundations.

#### Note

Sybase CTL data types are values of `datatype` field of `CS_DATAFMT` structure, which is actually exposed by the network layer. The `usertype` field value of the structure is also provided for some data types and used for mapping by the Data Access layer.

Sybase CTL datatype	Sybase CTL usertype	Data foundation Data Type
CS_BINARY_TYPE	CS_BINARY_USERTYPE	BINARY
CS_BINARY_TYPE	CS_VARBINARY_USERTYPE or no value	VARBINARY
CS_LONGBINARY_TYPE	Any value	VARBINARY
CS_IMAGE_TYPE	Any value	LONGVARBINARY
CS_BIT_TYPE	Any value	BIT
CS_DATE_TYPE	Any value	DATE
CS_BIGDATETIME_TYPE, CS_BIGTIME_TYPE, CS_DATE- TIME_TYPE, CS_DATETIME4_TYPE, CS_TIME_TYPE	Any value	TIMESTAMP
CS_LONGCHAR_TYPE, CS_TEXT_TYPE	Any value	LONGVARCHAR
CS_BIGINT_TYPE, CS_UBIGINT_TYPE	Any value	BIGINT
CS_DECIMAL_TYPE, CS_MONEY_TYPE, CS_MONEY4_TYPE	Any value	DECIMAL
CS_FLOAT_TYPE	Any value	DOUBLE
CS_INT_TYPE , CS_UINT_TYPE	Any value	INTEGER


Sybase CTL datatype	Sybase CTL usertype	Data foundation Data Type
CS_NUMERIC_TYPE	Any value	NUMERIC
CS_REAL_TYPE	Any value	REAL
CS_SMALLINT_TYPE, CS_USMALLINT_TYPE	Any value	SMALLINT
CS_TINYINT_TYPE	Any value	TINYINT
CS_CHAR_TYPE	CS_CHAR_USERTYPE or CS_NCHAR_USERTYPE or CS_UNI-CHAR_USERTYPE	CHAR
CS_CHAR_TYPE	CS_VARCHAR_USERTYPE or CS_NVARCHAR_USERTYPE or CS_UNIVARCHAR_USERTYPE or CS_SYS-NAME_USERTYPE or no value	VARCHAR
CS_UNICHAR_TYPE	USER_UNICHAR_TYPE	CHAR
CS_UNICHAR_TYPE	USER_UNIVARCHAR_TYPE or no value	VARCHAR

## 13.1.10 XML Data Types

### Syntax:

The following table lists the XML built-in data types and their equivalent in data foundations.

XML Built-in Data Type	Data Foundation Data Type
boolean	BIT
base64Binary, hexBinary	<ul style="list-style-type: none"> <li>BINARY if a length is defined</li> <li>VARBINARY</li> </ul>
date	DATE
time	TIME
dateTime	TIMESTAMP
float	FLOAT
double, decimal	DOUBLE

XML Built-in Data Type	Data Foundation Data Type
integer, negativeInteger, nonPositiveInteger, noNegativeInteger, positiveInteger	DECIMAL
long, unsignedLong	BIGINT
int, unsignedInt	INTEGER
short, unsignedShort	SMALLINT
byte, unsignedByte	TINYINT
string	<ul style="list-style-type: none"> <li>CHAR if a length is defined</li> <li>VARCHAR</li> </ul>
<div>  <b>Note</b>            Data types derived from string are mapped to CHAR or VARCHAR.         </div>	
anySimpleType, anyType, anyURI, duration, gDay, gMonth, gMonthDay, gYear, gYearMonth, NOTATION, QName	VARCHAR

## Mapping of Column Metadata

- Signed or unsigned is determined from the data type.
- Nullable is determined from the `nullable` and `minOccurs` attributes.
- Column size, decimal digits, and display size are determined from the data type. If the type does not give any indication, a user-configurable maximum length is returned.

## 13.2 Large Variable Length Data Restriction

### ⚠ Restriction

The following only relates to Crystal Reports applications.

Due to the Data Access layer implementation, the maximum size of a column for large variable length binary and character data is limited to 16MB for the following data sources:

- IBM DB2 through ODBC
- Microsoft SQL Server through ODBC
- Sybase CTL

If an application user inserts large variable length data larger than 16MB into a report, the system performance may be affected.

## 13.3 Data Type Mapping for Multisource-Enabled Universes

In the case of a multisource-enabled data foundation, the Connection Server data types are converted into the data types exposed through the Data Federation Service.

Data Federation data types are the following:

- BIT
- DATE
- TIME
- TIMESTAMP
- DOUBLE
- DECIMAL
- INTEGER
- VARCHAR

They are mapped to the corresponding data foundation data types.

### Caution

BINARY, VARBINARY, and LONGVARBINARY types are not supported and values of these types are mapped to NULL.





# Important Disclaimers and Legal Information

## Hyperlinks

Some links are classified by an icon and/or a mouseover text. These links provide additional information.

About the icons:

- Links with the icon  : You are entering a Web site that is not hosted by SAP. By using such links, you agree (unless expressly stated otherwise in your agreements with SAP) to this:
  - The content of the linked-to site is not SAP documentation. You may not infer any product claims against SAP based on this information.
  - SAP does not agree or disagree with the content on the linked-to site, nor does SAP warrant the availability and correctness. SAP shall not be liable for any damages caused by the use of such content unless damages have been caused by SAP's gross negligence or willful misconduct.
- Links with the icon  : You are leaving the documentation for that particular SAP product or service and are entering an SAP-hosted Web site. By using such links, you agree that (unless expressly stated otherwise in your agreements with SAP) you may not infer any product claims against SAP based on this information.

## Videos Hosted on External Platforms

Some videos may point to third-party video hosting platforms. SAP cannot guarantee the future availability of videos stored on these platforms. Furthermore, any advertisements or other content hosted on these platforms (for example, suggested videos or by navigating to other videos hosted on the same site), are not within the control or responsibility of SAP.

## Beta and Other Experimental Features

Experimental features are not part of the officially delivered scope that SAP guarantees for future releases. This means that experimental features may be changed by SAP at any time for any reason without notice. Experimental features are not for productive use. You may not demonstrate, test, examine, evaluate or otherwise use the experimental features in a live operating environment or with data that has not been sufficiently backed up.

The purpose of experimental features is to get feedback early on, allowing customers and partners to influence the future product accordingly. By providing your feedback (e.g. in the SAP Community), you accept that intellectual property rights of the contributions or derivative works shall remain the exclusive property of SAP.

## Example Code

Any software coding and/or code snippets are examples. They are not for productive use. The example code is only intended to better explain and visualize the syntax and phrasing rules. SAP does not warrant the correctness and completeness of the example code. SAP shall not be liable for errors or damages caused by the use of example code unless damages have been caused by SAP's gross negligence or willful misconduct.

## Bias-Free Language

SAP supports a culture of diversity and inclusion. Whenever possible, we use unbiased language in our documentation to refer to people of all cultures, ethnicities, genders, and abilities.

© 2024 SAP SE or an SAP affiliate company. All rights reserved.

No part of this publication may be reproduced or transmitted in any form or for any purpose without the express permission of SAP SE or an SAP affiliate company. The information contained herein may be changed without prior notice.

Some software products marketed by SAP SE and its distributors contain proprietary software components of other software vendors. National product specifications may vary.

These materials are provided by SAP SE or an SAP affiliate company for informational purposes only, without representation or warranty of any kind, and SAP or its affiliated companies shall not be liable for errors or omissions with respect to the materials. The only warranties for SAP or SAP affiliate company products and services are those that are set forth in the express warranty statements accompanying such products and services, if any. Nothing herein should be construed as constituting an additional warranty.

SAP and other SAP products and services mentioned herein as well as their respective logos are trademarks or registered trademarks of SAP SE (or an SAP affiliate company) in Germany and other countries. All other product and service names mentioned are the trademarks of their respective companies.

Please see <https://www.sap.com/about/legal/trademark.html> for additional trademark information and notices.