



Simba JDBC Driver with SQL Connector for Google BigQuery

Installation and Configuration Guide

Simba Technologies Inc.

Version 1.0.2
October 21, 2016



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About This Guide

Purpose

The *Simba JDBC Driver with SQL Connector for Google BigQuery Installation and Configuration Guide* explains how to install and configure the Simba JDBC Driver with SQL Connector for Google BigQuery on all supported platforms. The guide also provides details related to features of the driver.

Audience

The guide is intended for end users of the Simba JDBC Driver for Google BigQuery.

Knowledge Prerequisites

To use the Simba JDBC Driver for Google BigQuery, the following knowledge is helpful:

- Familiarity with the platform on which you are using the Simba JDBC Driver for Google BigQuery
- Ability to use the data store to which the Simba JDBC Driver for Google BigQuery is connecting
- An understanding of the role of JDBC technologies in connecting to a data store
- Experience creating and configuring JDBC connections
- Exposure to SQL

Document Conventions

Italics are used when referring to book and document titles.

Bold is used in procedures for graphical user interface elements that a user clicks and text that a user types.

Monospace font indicates commands, source code or contents of text files.

Note:

A text box with a pencil icon indicates a short note appended to a paragraph.

! Important:

A text box with an exclamation mark indicates an important comment related to the preceding paragraph.

Table of Contents

About the Simba JDBC Driver for Google BigQuery	7
System Requirements	8
Simba JDBC Driver for Google BigQuery Files	9
Installing and Using the Simba JDBC Driver for Google BigQuery	10
Setting the Class Path	10
Registering the Driver Class	10
Building the Connection URL	11
Configuring Authentication	13
Using a Google User Account	13
Using a Google Service Account	14
Configuring Logging	16
Features	18
SQL Connector	18
Data Types	18
Nested and Repeated Records	19
Arrays	19
Authentication	20
Catalog and Schema Support	20
Large Result Set Support	21
Write-Back	21
Positional Parameters	21
Driver Configuration Options	22
AllowLargeResults	22
Catalog (Project)	22
LargeResultDataset	23
LargeResultTable	23
LogLevel	24
LogPath	25
MaxResults	25
OAuthPvtKeyPath	25
OAuthServiceAcctEmail	26
OAuthType	26

Installation and Configuration Guide

ProjectId	26
SQLDialect	27
Timeout	27
Contact Us	28
Third-Party Trademarks	29
Third-Party Licenses	30

About the Simba JDBC Driver for Google BigQuery

The Simba JDBC Driver for Google BigQuery enables Business Intelligence (BI), analytics, and reporting on data that is stored in BigQuery. The driver complies with the JDBC 4.1 and 4.2 data standards.

JDBC is one of the most established and widely supported APIs for connecting to and working with databases. At the heart of the technology is the JDBC driver, which connects an application to the database. For more information about JDBC, see *Data Access Standards Glossary*: <http://www.simba.com/resources/data-access-standards-library>.

This guide is suitable for users who want to access data residing within BigQuery from their desktop environment. Application developers might also find the information helpful. Refer to your application for details on connecting via JDBC.

System Requirements

Each machine where you use the Simba JDBC Driver for Google BigQuery must have Java Runtime Environment (JRE) installed. The version of JRE that must be installed depends on the version of the JDBC API you are using with the driver. The following table lists the required version of JRE for each version of the JDBC API.

Simba JDBC Driver for Google BigQuery Files

The Simba JDBC Driver for Google BigQuery is delivered in the following two ZIP archives, where *[Version]* is the version number of the driver:

- `BigQueryJDBC41_[Version].zip`
- `BigQueryJDBC42_[Version].zip`

Each archive contains the driver supporting the JDBC API version indicated in the archive name, as well as release notes and third party license information.

! Important:

Before you can use the Simba JDBC Driver for Google BigQuery, you must place the license file `SimbaBigQueryJDBCDriver.lic` in the same directory as the `BigQueryJDBC41_[Version].jar` file or the `BigQueryJDBC42_[Version].jar` file. **the `BigQueryJDBC41_[Version].jar` file or the `BigQueryJDBC42_[Version].jar` file.**

Installing and Using the Simba JDBC Driver for Google BigQuery

To install the Simba JDBC Driver for Google BigQuery on your machine, extract the files from the appropriate ZIP archive to the directory of your choice.

! Important:

Before you can use the Simba JDBC Driver for Google BigQuery, you must place the license file `SimbaBigQueryJDBCDriver.lic` in the same directory as the `BigQueryJDBC41_[Version].jar` file or the `BigQueryJDBC42_[Version].jar` file **the** `BigQueryJDBC41_[Version].jar` file or the `BigQueryJDBC42_[Version].jar` file.

To access using the Simba JDBC Driver for Google BigQuery, you need to configure the following:

- The class path (see [Setting the Class Path](#) on page 10)
- The Driver or DataSource class (see [Registering the Driver Class](#) on page 10)
- The connection URL for the driver (see [Building the Connection URL](#) on page 11)

Setting the Class Path

The class path is the path that the Java Runtime Environment searches for classes and other resource files. For more information, see "Setting the Class Path" in the Java SE Documentation:

- For Windows:
<http://docs.oracle.com/javase/7/docs/technotes/tools/windows/classpath.html>
- For Linux and Solaris:
<http://docs.oracle.com/javase/7/docs/technotes/tools/solaris/classpath.html>

Registering the Driver Class

Before connecting to the data store, you must register the appropriate class for your application.

The following is a list of the classes used to connect the Simba JDBC Driver for Google BigQuery to . The `Driver` classes extend `java.sql.Driver`, and the `DataSource` classes extend `javax.sql.DataSource` and `javax.sql.ConnectionPoolDataSource`.

To support JDBC 4.1, classes with the following fully-qualified class names (FQCNs) are available:

- `com.simba.googlebigquery.jdbc41.Driver`
- `com.simba.googlebigquery.jdbc41.DataSource`

To support JDBC 4.2, classes with the following FQCNs are available:

- `com.simba.googlebigquery.jdbc42.Driver`
- `com.simba.googlebigquery.jdbc42.DataSource`

The following sample code shows how to use the `DriverManager` to establish a connection for JDBC 4:

```
private static Connection connectViaDM() throws Exception
{
    Connection connection = null;
    connection = DriverManager.getConnection(CONNECTION_URL);
    return connection;
}
```

The following sample code shows how to use the `DataSource` class to establish a connection:

```
private static Connection connectViaDS() throws Exception
{
    Connection connection = null;
    DataSource ds = new
    com.simba.googlebigquery.jdbc4.DataSource();
    ds.setURL(CONNECTION_URL);
    connection = ds.getConnection();
    return connection;
}
```

Building the Connection URL

Use the connection URL to supply connection information to the data store that you are accessing. The following is the format of the connection URL for the Simba JDBC Driver for Google BigQuery:

```
jdbc:bigquery://[Host]:[Port];ProjectId=[Project];OAuthType=
[AuthValue];[Property1]=[Value1];[Property2]=[Value2];...
```

The variables are defined as follows:

- *[Host]* is the DNS or IP address of the server.
- *[Port]* is the number of the TCP port to connect to. Specifying the port number is optional if you are connecting to port 443.
- *[Project]* is the name of your BigQuery project.
- *[AuthValue]* corresponds to the type of authentication used by the driver:
 - 1: The driver uses user-based OAuth authentication. For more information on building a connection URL for user-based authentication, see [Using a Google User Account](#) on page 13.
 - 0: The driver uses service-based OAuth authentication. For more information on building a connection URL for service-based authentication, see [Using a Google Service Account](#) on page 14.
- *[Property1..N]* and *[Value1..N]* are additional connection properties supported by the driver. For a list of the properties available in the driver, see [Driver Configuration Options](#) on page 22.

! Important:

- Properties are case-sensitive.
- Do not duplicate properties in the connection URL.

Configuring Authentication

The Simba JDBC Driver for Google BigQuery uses the OAuth 2.0 protocol for authentication and authorization. It authenticates your connection through Google OAuth APIs. You can configure the driver to provide your credentials and authenticate the connection to the database using one of the following methods:

- [Using a Google User Account](#) on page 13
- [Using a Google Service Account](#) on page 14

Using a Google User Account

You can configure the driver to authenticate the connection with a Google user account.

You must provide your Google user account credentials to connect to the server. For more information about authenticating through OAuth 2.0 with a Google user account, see "Using OAuth 2.0 to Access Google APIs" in the Google Developers documentation: <https://developers.google.com/identity/protocols/OAuth2>.

To configure user account authentication:

1. Connect to the server using a connection URL written in the following format:

```
jdbc:bigquery://[Host]:[Port];ProjectId=[Project];OAuthType=1;
```

The variables are defined as follows:

- *[Host]* is the DNS or IP address of the server.
- *[Port]* is the number of the TCP port to connect to. Specifying the port number is optional if you are connecting to port 443.
- *[Project]* is the name of your BigQuery project.

For example:

```
jdbc:bigquery://https://www.googleapis.com/bigquery/v2:443;ProjectId=MyBigQueryProject;OAuthType=1;
```

The driver returns a connection URL, and requests an access token.

2. In a web browser, navigate to the connection URL, and provide your Google account name and password for authentication.

The browser returns an access token.

3. In the driver, type or paste the access token and press Enter.

For more information about connection URL syntax, see [Building the Connection URL](#) on page 11.

Using a Google Service Account

You can configure the driver to authenticate the connection with a Google service account. The service account can handle the authentication process so that no user input is required.

You must provide a Google service account email address and the full path to a private key file for the service account. You can download the private key file from the Google API console web page. For more information about OAuth authentication using a service account, see "Using OAuth 2.0 for Server to Server Applications" in the Google Developers documentation:

<https://developers.google.com/identity/protocols/OAuth2ServiceAccount>.

To configure service account authentication:

- Connect to the server using a connection URL written in the following format:

```
jdbc:bigquery://[Host]:[Port];ProjectId=[Project];OAuthType=0;OAuthServiceAcctEmail=[Email];OAuthPvtKeyPath=[KeyPath];
```

The variables are defined as follows:

- *[Host]* is the DNS or IP address of the server.
- *[Port]* is the number of the TCP port to connect to. Specifying the port number is optional if you are connecting to port 443.
- *[Project]* is the name of your BigQuery project.
- *[Email]* is your Google service account email address.
- *[KeyPath]* is the full path to the key file that is used to authenticate the service account email address. Supports both `.p12` or `.json` formatted keys.

For example:

```
jdbc:bigquery://https://www.googleapis.com/bigquery/v2:443;ProjectId=MyBigQueryProject;OAuthType=0;OAuthServiceAcctEmail=bqttest1@data-driver-
```

```
testing.iam.gserviceaccount.com;OAuthPvtKeyPath=C:\Secure  
Files\ServiceKeyFile.p12;
```

For more information about connection URL syntax, see [Building the Connection URL](#) on page 11.

Configuring Logging

To help troubleshoot issues, you can enable logging in the driver.

! Important:

Only enable logging long enough to capture an issue. Logging decreases performance and can consume a large quantity of disk space.

Set the `LogLevel` key in your connection URL to enable logging and specify the amount of detail included in log files. The following table lists the logging levels provided by the Simba JDBC Driver for Google BigQuery, in order from least verbose to most verbose.

LogLevel Value	Description
0	Disable all logging.
1	Log severe error events that lead the driver to abort.
2	Log error events that might allow the driver to continue running.
3	Log events that might result in an error if action is not taken.
4	Log general information that describes the progress of the driver.
5	Log detailed information that is useful for debugging the driver.
6	Log all driver activity.

To enable logging:

1. Set the `LogLevel` property to the desired level of information to include in log files.
2. Set the `LogPath` property to the full path to the folder where you want to save log files. To make sure that the connection URL is compatible with all JDBC applications, escape the backslashes (`\`) in your file paths by typing another backslash.

For example, the following connection URL enables logging level 3 and saves the log files in the `C:\temp` folder:

```
jdbc:bigquery://localhost;LogLevel=3;LogPath=C:\\temp
```

3. To make sure that the new settings take effect, restart your JDBC application and reconnect to the server.

The Simba JDBC Driver for Google BigQuery produces the following log files in the location specified in the `LogPath` property:

- A `BigQuery_connection_[Number].log` file for each connection made to the database, where `[Number]` is a number that identifies each log file. This file logs driver activity that is specific to the connection.

If the `LogPath` value is invalid, then the driver sends the logged information to the standard output stream (`System.out`).

To disable logging:

1. Remove the `LogLevel` and `LogPath` properties from the connection URL.
2. To make sure that the new settings take effect, restart your JDBC application and reconnect to the server.

Features

More information is provided on the following features of the Simba JDBC Driver for Google BigQuery:

- [Data Types](#) on page 18
- [Nested and Repeated Records](#) on page 19
- [Authentication](#) on page 20
- [Catalog and Schema Support](#) on page 20
- [Large Result Set Support](#) on page 21

SQL Connector

The SQL Connector feature of the driver allows applications to execute standard SQL queries or BigQuery SQL queries against BigQuery.

Data Types

The Simba JDBC Driver for Google BigQuery supports many common data formats, converting between BigQuery, SQL, and Java data types.

The following table lists the supported data type mappings.

BigQuery Type	SQL Type	Java Type
BOOL	SQL_BOOLEAN	BOOLEAN
BYTES	SQL_VARBINARY	BYTE[]
DATE	SQL_DATE	DATE
DATETIME	SQL_VARCHAR	STRING
FLOAT64	SQL_DOUBLE	DOUBLE
INT64	SQL_BIGINT	BIGINTEGER
STRING	SQL_VARCHAR	STRING
TIME	SQL_TIME	TIME
TIMESTAMP	SQL_TIMESTAMP	TIMESTAMP

Nested and Repeated Records

The Simba JDBC Driver for Google BigQuery fully supports nested and repeated records.

The Standard SQL syntax represents the sub-components of record data as nested sub-types. In the example below, `city` and `years` belong to the base record type of `address`.

If the record column is specified in a query projection list, the driver returns the base record as a text representation of the JSON record object, and no flattening occurs. The dot operator (`.`) is used to select sub-components. For example, to select from `city`, the column name `address.city` should be used.

```
{
  "address": [
    {
      "city": "Vancouver",
      "years": 5
    }
  ],
  "name": "Google"
}
```

In Legacy SQL, sub-components of record types are implicitly flattened and are represented as individual attributes. In the example below, the sub-components of `city` and `years` of the record `address` are represented as individual columns of `address_city` and `address_years`.

```
{
  "address_city": "Vancouver",
  "address_years": "5",
  "name": "Google"
}
```

Arrays

The Simba JDBC Driver for Google BigQuery fully supports array data types. The driver returns the base array type as a text representation of the JSON array object.

For example, the SQL statement `SELECT [1,2,3]` returns the following JSON:

```
{
  "v": [
```

```
{
  "v": "1",
},
{
  "v": "2",
},
{
  "v": "3"
}
]
```

Authentication

The Simba JDBC Driver for Google BigQuery uses the OAuth 2.0 protocol for authentication and authorization. When you connect to BigQuery, the driver automatically initiates an OAuth 2.0 authentication flow. The driver retrieves an access token based on the credentials specified in the connection URL, and then uses the token to authenticate the connection to the database.

You can authenticate your connection with a personal Google account. When you initiate a connection through the driver, you must authenticate the connection at the URL provided by the driver. For detailed instructions, see [Using a Google User Account](#) on page 13.

If you have a Google developer account, you can assign a service account to the driver. You must provide a private key file to authenticate this service account. The driver then handles authentication on behalf of the service account, so that an individual user account is not directly involved. For detailed instructions, see [Using a Google Service Account](#) on page 14.

For more information about OAuth 2.0, see "Using OAuth 2.0 to Access Google APIs" in the Google Developers documentation: <https://developers.google.com/identity/protocols/OAuth2>. For information about configuring a service account, see "Using OAuth 2.0 for Server to Server Applications" in the Google Developers documentation: <https://developers.google.com/identity/protocols/OAuth2ServiceAccount>.

Catalog and Schema Support

The Simba JDBC Driver for Google BigQuery supports both catalogs and schemas to make it easy for the driver to work with various JDBC applications. Projects are

mapped to catalogs, and table datasets are mapped to schemas. For more information, see [Catalog \(Project\)](#) on page 22.

Large Result Set Support

The Simba JDBC Driver for Google BigQuery supports the `AllowLargeResults` option in BigQuery job configurations, enabling result sets greater than 128MB (compressed).

To store large query results, the driver creates temporary tables in BigQuery under the table and dataset ID specified using the `LargeResultTable` and `LargeResultDataset` options. These temporary tables exist for a limited time before they are deleted.

Large result sets are always supported if Standard SQL is used. If Legacy SQL is used, large result sets are only supported if the `AllowLargeResults` key is set to 1.

For more information about large result sets and the limitations of enabling this option, see the following sections in the BigQuery documentation:

- "Queries" in *Quota Policy*: <https://developers.google.com/bigquery/quota-policy>.
- "Returning large query results" in *Query Data*: <https://developers.google.com/bigquery/querying-data>.

Write-Back

The Simba JDBC Driver for Google BigQuery supports Data Manipulation Language (DML) statements such as INSERT, UPDATE, and DELETE.

For example, the following INSERT statement is supported:

```
INSERT INTO MyTable (Col1, Col2) VALUES ("Key", "Value");"
```

Positional Parameters

A parameterized query contains placeholders that are used for parameters. The values of those parameters are supplied at execution time.

The Simba JDBC Driver for Google BigQuery supports SQL positional parameters. Parameters are specified in queries with a question mark (?).

For example, the following parameterized query is supported:

```
SELECT * FROM MyTable WHERE Col1=?"
```

Driver Configuration Options

Driver Configuration Options lists and describes the properties that you can use to configure the behavior of the Simba JDBC Driver for Google BigQuery.

You can set configuration properties using the connection URL. For more information, see [Building the Connection URL](#) on page 11.

Note:

Property names and values are case-sensitive.

AllowLargeResults

Default Value	Data Type	Required
0	Integer	No

Description

This option specifies the driver's response to query results greater than 128MB.

- 1: The driver allows query results that are larger than 128MB in size.
- 0: The driver returns an error when query results are larger than 128MB in size.

Important:

This option can only be disabled if Legacy SQL is used. If the `SQLDialect` key is set to `BIG_QUERY`, this option is always considered to be enabled.

Catalog (Project)

Key Name	Default Value	Required
Catalog	None	Yes

Description

The name of your BigQuery project. This project is the default project that the Simba JDBC Driver for Google BigQuery queries against, and is also the project that is billed

for queries that are run using the DSN.

Simba JDBC Driver for Google BigQuery supports multiple catalogs, which are equivalent to projects in Google BigQuery terms.

For queries, tables in the projection list must be fully qualified, in the format of ``catalog.schema.table``. If the catalog is not specified, the driver will assume the `projectId` specified by the “`projectId`” connection option.

For catalog functions, in order to retrieve information from the desired catalog, the JDBC **`Connection.setCatalog(myCatalog)`** method must be called with **`myCatalog`** set to the desired catalog.

LargeResultDataset

Default Value	Data Type	Required
None	String	Yes, if <code>AllowLargeResults=1</code>

Description

The destination dataset for queries that are executed because the `AllowLargeResults` key is enabled.

LargeResultTable

Default Value	Data Type	Required
None	String	Yes, if <code>AllowLargeResults=1</code>

Description

The destination table for queries that are executed because the `AllowLargeResults` key is enabled.

LogLevel

Default Value	Data Type	Required
0	Integer	No

Description

Use this property to enable or disable logging in the driver and to specify the amount of detail included in log files.

! Important:

Only enable logging long enough to capture an issue. Logging decreases performance and can consume a large quantity of disk space.

Set the property to one of the following numbers:

- 0: Disable all logging.
- 1: Enable logging on the FATAL level, which logs very severe error events that will lead the driver to abort.
- 2: Enable logging on the ERROR level, which logs error events that might still allow the driver to continue running.
- 3: Enable logging on the WARNING level, which logs events that might result in an error if action is not taken.
- 4: Enable logging on the INFO level, which logs general information that describes the progress of the driver.
- 5: Enable logging on the DEBUG level, which logs detailed information that is useful for debugging the driver.
- 6: Enable logging on the TRACE level, which logs all driver activity.

When logging is enabled, the driver produces the following log files in the location specified in the `LogPath` property:

- A `BigQuery_connection_[Number].log` file for each connection made to the database, where `[Number]` is a number that distinguishes each log file from the others. This file logs driver activity that is specific to the connection.

If the `LogPath` value is invalid, then the driver sends the logged information to the standard output stream (`System.out`).

LogPath

Default Value	Data Type	Required
The current working directory	String	No

Description

The full path to the folder where the driver saves log files when logging is enabled.

MaxResults

Default Value	Data Type	Required
0	Integer	No

Description

The maximum number of results that are displayed per page.

To allow an unlimited number of results to be displayed per page, set the value to 0.

OAuthPvtKeyPath

Default Value	Data Type	Required
None	String	Yes, if OAuthUserAuth=0

Description

The full path to the .p12 or .json key file that is used to authenticate the service account email address.

OAuthServiceAcctEmail

Default Value	Data Type	Required
None	String	Yes, if OAuthUserAuth=0

Description

The service account email ID that is used for authentication.

OAuthType

Default Value	Data Type	Required
1	Integer	No

Description

This option specifies whether the driver uses OAuth user authentication or OAuth service authentication.

- 1: The driver uses user-based OAuth authentication.
- 0: The driver uses service-based OAuth authentication.

ProjectId

Default Value	Data Type	Required
None	String	Yes

Description

The name of your BigQuery project. This project is the default project that the Simba JDBC Driver for Google BigQuery queries against, and also the project that is billed for queries that are run using the DSN.

SQLDialect

Default Value	Data Type	Required
SQL	Enumerated	No

Description

This option specifies whether the driver uses native BigQuery SQL queries or SQL:2011 queries.

- `SQL`: The driver uses SQL:2011.
- `BIG_QUERY`: The driver uses legacy BigQuery SQL.

Timeout

Default Value	Data Type	Required
10	Integer	No

Description

The length of time, in seconds, for the driver to wait for the query to retrieve the results of an executed job.

Contact Us

If you have difficulty using the driver, please contact our Technical Support staff. We welcome your questions, comments, and feature requests.

Technical Support is available Monday to Friday from 8 a.m. to 6 p.m. Pacific Time.

 **Note:**

To help us assist you, prior to contacting Technical Support please prepare a detailed summary of the client and server environment including operating system version, patch level, and configuration.

You can contact Technical Support via:

- **E-mail:** support@simba.com
- **Web site:** www.simba.com
- **Telephone:** (604) 633-0008 Extension 3
- **Fax:** (604) 633-0004

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