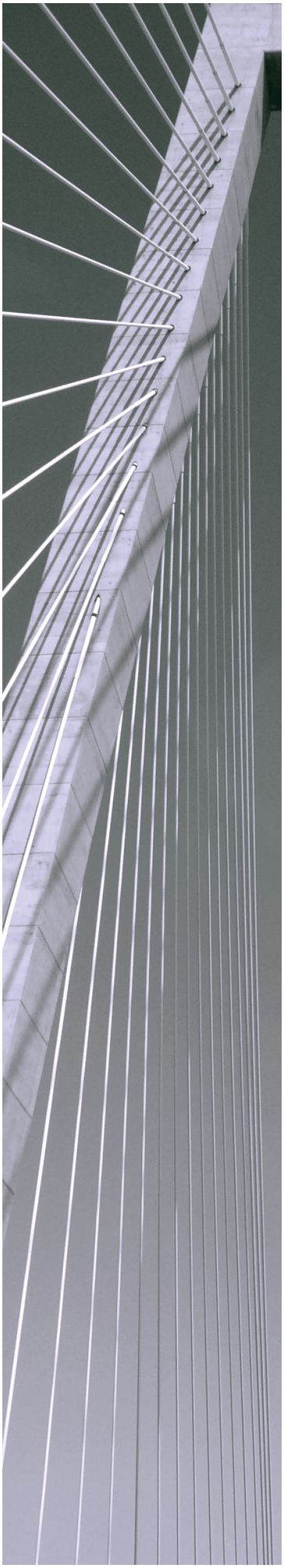

Simba ODBC Driver with SQL Connector for Google BigQuery

Installation and Configuration Guide

Simba Technologies Inc.

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About This Guide

Purpose

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

Audience

The guide is intended for end users of the Simba ODBC Driver for Google BigQuery, as well as administrators and developers integrating the driver.

Knowledge Prerequisites

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

- Familiarity with the platform on which you are using the Simba ODBC Driver for Google BigQuery
- Ability to use the data source to which the Simba ODBC Driver for Google BigQuery is connecting
- An understanding of the role of ODBC technologies and driver managers in connecting to a data source
- Experience creating and configuring ODBC 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.

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About the Simba ODBC Driver for Google BigQuery

The Simba ODBC Driver for Google BigQuery enables Business Intelligence (BI), analytics, and reporting on data that has been uploaded to Google Storage. The driver complies with the ODBC 3.80 data standard and adds important functionality such as Unicode, as well as 32- and 64-bit support for high-performance computing environments on all platforms.

ODBC 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 ODBC driver, which connects an application to the database. For more information about ODBC, see *Data Access Standards* on the Simba Technologies website: https://www.simba.com/resources/data-access-standards-glossary. For complete information about the ODBC specification, see the *ODBC API Reference* from the Microsoft documentation: https://docs.microsoft.com/en-us/sql/odbc/reference/syntax/odbc-api-reference.

The Simba ODBC Driver for Google BigQuery is available for Microsoft® Windows®, Linux, and macOS platforms.

The *Installation and Configuration Guide* is suitable for users who are looking 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 ODBC.

Note:

For information about how to use the driver in various BI tools, see the *Simba ODBC Drivers Quick Start Guide for Windows*: http://cdn.simba.com/docs/ODBC_QuickstartGuide/content/quick_start/intro.htm.

Windows Driver

Windows System Requirements

Install the driver on client machines where the application is installed. Each machine that you install the driver on must meet the following minimum system requirements:

- One of the following operating systems:
  - Windows 10, 8.1, or 7 SP1
  - Windows Server 2016, 2012, or 2008 R2 SP1
- 100 MB of available disk space
- Visual C++ Redistributable for Visual Studio 2013 installed (with the same bitness as the driver that you are installing).
  You can download the installation packages at https://www.microsoft.com/en-ca/download/details.aspx?id=40784.

To install the driver, you must have administrator privileges on the machine.

Installing the Driver on Windows

On 64-bit Windows operating systems, you can execute both 32- and 64-bit applications. However, 64-bit applications must use 64-bit drivers, and 32-bit applications must use 32-bit drivers. Make sure that you use the version of the driver that matches the bitness of the client application:

- `SimbaODBCDriverforGoogleBigQuery32.msi` for 32-bit applications
- `SimbaODBCDriverforGoogleBigQuery64.msi` for 64-bit applications

You can install both versions of the driver on the same machine.

To install the Simba ODBC Driver for Google BigQuery on Windows:

1. Depending on the bitness of your client application, double-click to run **SimbaODBCDriverforGoogleBigQuery32.msi** or **SimbaODBCDriverforGoogleBigQuery64.msi**.
2. Click **Next**.
3. Select the check box to accept the terms of the License Agreement if you agree, and then click **Next**.
4. To change the installation location, click **Change**, then browse to the desired folder, and then click **OK**. To accept the installation location, click **Next**.
5. Click **Install**.

6. When the installation completes, click **Finish**.
7. If you received a license file through email, then copy the license file into the `\lib` subfolder of the installation folder you selected above. You must have Administrator privileges when changing the contents of this folder.

Creating a Data Source Name on Windows

Typically, after installing the Simba ODBC Driver for Google BigQuery, you need to create a Data Source Name (DSN).

Alternatively, for information about DSN-less connections, see Using a Connection String on page 39.

To create a Data Source Name on Windows:

1. Open the ODBC Administrator:
   - If you are using Windows 7 or earlier, click **Start** > **All Programs** > **Simba ODBC Driver for Google BigQuery 2.1** > **ODBC Administrator**.
   - Or, if you are using Windows 8 or later, on the Start screen, type **ODBC administrator**, and then click the **ODBC Administrator** search result.

   Note:

   Make sure to select the ODBC Data Source Administrator that has the same bitness as the client application that you are using to connect to BigQuery.
2. In the ODBC Data Source Administrator, click the **Drivers** tab, and then scroll down as needed to confirm that the Simba ODBC Driver for Google BigQuery appears in the alphabetical list of ODBC drivers that are installed on your system.
3. Choose one:
   - To create a DSN that only the user currently logged into Windows can use, click the **User DSN** tab.
   - Or, to create a DSN that all users who log into Windows can use, click the **System DSN** tab.

   Note:

   It is recommended that you create a System DSN instead of a User DSN. Some applications load the data using a different user account, and might not be able to detect User DSNs that are created under another user account.
4. Click **Add**.

5. In the Create New Data Source dialog box, select **Simba ODBC Driver for Google BigQuery** and then click **Finish**. The Simba ODBC Driver for Google BigQuery DSN Setup dialog box opens.
6. In the **Data Source Name** field, type a name for your DSN.
7. Optionally, in the **Description** field, type relevant details about the DSN.
8. Configure authentication using the options in the Authentication area. For more information, see Configuring Authentication on Windows on page 11.
9. To allow the driver to access Google Drive so that it can support federated tables that combine BigQuery data with data from Google Drive, select the **Request Google Drive Scope Access** check box.
10. Choose one:
    - To verify the server using the trusted CA certificates from a specific `.pem` file, specify the full path to the file in the **Trusted Certificates** field and leave the **Use System Trust Store** check box cleared.
    - Or, to use the trusted CA certificates `.pem` file that is installed with the driver, leave the default value in the **Trusted Certificates** field, and leave the **Use System Trust Store** check box cleared.
    - Or, to use the Windows Trust Store, select the **Use System Trust Store** check box and leave the **Trusted Certificates** field cleared.
11. In the **Catalog (Project)** drop-down list, select the name of your BigQuery project. This project is the default project that the Simba ODBC Driver for Google BigQuery queries against, and also the project that is billed for queries that are run using the DSN.

    Note:

    If you are not signed in to your Google account, then you are prompted to sign in.

12. Optionally, in the **Dataset** drop-down list, select the name of the dataset the driver will query by default. For more information, see Dataset on page 51.
13. To configure a connection through a proxy server, click **Proxy Options**. For more information, see Configuring a Proxy Server on Windows on page 14.
14. To configure logging behavior for the driver, click **Logging Options**. For more information, see Configuring Logging Options on Windows on page 16.
15. To configure advanced driver options, click **Advanced Options**. For more information, see Configuring Advanced Options on Windows on page 14.
16. To test the connection, click **Test**. Review the results as needed, and then click **OK**.
17. To save your settings and close the Simba ODBC Driver for Google BigQuery DSN Setup dialog box, click **OK**.
18. To close the ODBC Data Source Administrator, click **OK**.

Configuring Authentication on Windows

The Simba ODBC 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 11
- Using a Google Service Account on page 13

Using a Google User Account

You can configure the driver to authenticate the connection with a Google user account. This authentication method uses the OAuth 2.0 access and refresh tokens associated with the user account as the credentials.

The access token is transmitted with every API call that the driver makes, and it is required for accessing BigQuery data stores. However, the access token expires after a certain amount of time and must be renewed using the refresh token. If the refresh token is stored in your connection information, the driver automatically uses it to renew access tokens when they expire.

Note:

For more information about OAuth 2.0, see "Using OAuth 2.0 to Access Google APIs" in the Google Identity Platform documentation: https://developers.google.com/identity/protocols/OAuth2.

At minimum, you need to provide the OAuth 2.0 refresh token associated with your account. The driver retrieves and uses an access token based on your specified refresh token.

- If you do not have your refresh token, see Retrieving a Refresh Token on page 11.
- If you already have your refresh token, see Providing a Refresh Token on page 12.
- If you want to provide a `.json` key file that contains your credentials instead of providing your refresh token directly in your connection information, see Providing a Key File on page 12.

Retrieving a Refresh Token

When you authenticate your connection this way, the authentication process provides a temporary confirmation code that you can exchange for an access token and a refresh token.

To configure user account authentication by retrieving a refresh token on Windows:

1. To access authentication options, open the ODBC Data Source Administrator where you created the DSN, then select the DSN, and then click **Configure**.
2. From the **OAuth Mechanism** drop-down list, select **User Authentication**.
3. Click **Sign In**.
4. In the browser that opens, type your credentials for accessing your BigQuery data and sign in to your account.
5. When you are prompted to allow BigQuery Client Tools to access your data in Google BigQuery, click **Accept**.

   The browser displays a confirmation code.
6. Copy and paste the code into the **Confirmation Code** field in the Simba ODBC Driver for Google BigQuery DSN Setup dialog box.
7. Click inside the **Refresh Token** field or press **TAB** to move your caret from the Confirmation Code field into the Refresh Token field.

   The driver automatically populates the field with your refresh token. The refresh token is used whenever the driver needs to access your BigQuery data. You can save the refresh token in the DSN so that you only need to generate it once.

   > **Note:**
   >
   > A confirmation code can only be used once. You must get a new confirmation code from Google whenever you need another refresh token.

Providing a Refresh Token

If you already have your refresh token, then you can provide the token in your connection information without going through the retrieval process described above.

To configure user account authentication by providing a refresh token on Windows:

1. To access authentication options, open the ODBC Data Source Administrator where you created the DSN, then select the DSN, and then click **Configure**.
2. From the **OAuth Mechanism** drop-down list, select **User Authentication**.
3. In the **Refresh Token** field, type the refresh token associated with your user account.

Providing a Key File

As an alternative to providing your refresh token directly in your connection information, you can save the token in a `.json` key file and then specify the path to the

file in your connection information.

The file must define a JSON object of type `authorized_user` containing the refresh token, client ID, and client secret associated with your user account. For example, the `.json` key file must be written in the following format:

```
{
   "type": "authorized_user",
   "client_id": "[YourClientID]",
   "client_secret":"[YourClientSecret]",
   "refresh_token":"[YourRefreshToken]"
}
```

To configure user account authentication by providing a key file on Windows:

1. To access authentication options, open the ODBC Data Source Administrator where you created the DSN, then select the DSN, and then click **Configure**.
2. From the **OAuth Mechanism** drop-down list, select **Service Authentication**.

   > **Note:**
   >
   > Although this is a form of user authentication, the key file must be provided using the service authentication options.

3. In the **Email** field, type your user account email ID.
4. In the **Key File Path** field, type the full path to the `.json` key file.

Using a Google Service Account

You can configure the driver to authenticate the connection with a Google service account. When you authenticate your connection this way, the driver handles authentication on behalf of the service account, so that an individual user account is not directly involved and no user input is required.

To authenticate your connection this way, you must provide a Google service account email address and the full path to a private key file for the service account. You can generate and download the private key file when you set up the service account.

Note:

- For more information about OAuth 2.0 authentication using a service account, see "Using OAuth 2.0 for Server to Server Applications" in the Google Identity Platform documentation: https://developers.google.com/identity/protocols/OAuth2ServiceAccount.
- For information about obtaining service account keys, see "Creating and Managing Service Account Keys" in the Google Cloud Identity & Access Management documentation: https://cloud.google.com/iam/docs/creating-managing-service-account-keys.

To configure service account authentication on Windows:

1. To access authentication options, open the ODBC Data Source Administrator where you created the DSN, then select the DSN, and then click **Configure**.
2. From the **OAuth Mechanism** drop-down list, select **Service Authentication**.
3. In the **Email** field, type your service account email ID.
4. In the **Key File Path** field, type the full path to the `.p12` or `.json` key file that is used to authenticate the service account ID.

Configuring a Proxy Server on Windows

If you are connecting to the data source through a proxy server, you must provide connection information for the proxy server.

To configure a proxy server on Windows:

1. To access proxy server options, open the ODBC Data Source Administrator where you created the DSN, then select the DSN, then click **Configure**, and then click **Proxy Options**.
2. Select the **Use Proxy Server** check box.
3. In the **Proxy Host** field, type the host name or IP address of the proxy server.
4. In the **Proxy Port** field, type the number of the TCP port that the proxy server uses to listen for client connections.
5. In the **Proxy Username** field, type your user name for accessing the proxy server.
6. In the **Proxy Password** field, type the password corresponding to the user name.
7. To save your settings and close the Proxy Options dialog box, click **OK**.

Configuring Advanced Options on Windows

You can configure advanced options to modify the behavior of the driver.

To configure advanced options on Windows:

1. To access advanced options, open the ODBC Data Source Administrator where you created the DSN, then select the DSN, then click **Configure**, and then click **Advanced Options**.
2. In the **Rows Per Block** field, type the maximum number of rows to fetch for each data request.
3. In the **Default String Column Length** field, type the maximum number of characters that can be contained in STRING columns.
4. In the **Dataset Name For Large Result Sets** field, type the ID of the BigQuery dataset that you want to use to store temporary tables.

   Note:
   - The dataset created from the default ID is hidden.
   - This option is available only if the **Allow Large Result Sets** check box is selected.

5. In the **Temporary Table Expiration Time** field, type the length of time (in milliseconds) for which a temporary table exists.

   Note:

   This option is available only if the **Allow Large Result Sets** check box is selected.

6. From the **Language Dialect** drop-down list, select the SQL syntax to use when executing queries:
   - To use standard SQL syntax, select **Standard SQL**.
   - Or, to use the legacy BigQuery SQL syntax, select **Legacy SQL**.
7. To use a customer-managed encryption key (CMEK) when executing queries, in the **Path To CMEK** field, type the resource ID of the CMEK. For more information, see "Protecting Data with Cloud KMS Keys" in the Google BigQuery documentation: https://cloud.google.com/bigquery/docs/customer-managed-encryption.

   Important:
   - Do not specify a CMEK unless you are certain that it is the correct value to use. If you execute an INSERT statement with an incorrect CMEK, the driver returns an error or corrupts the table.
   - The driver uses the specified CMEK for all queries.

8. To allow query results that are larger than 128MB in size, select the **Allow Large Result Sets** check box.
9. To return data as SQL_WVARCHAR data instead of SQL_VARCHAR data, select the **Use SQL_WVARCHAR Instead Of SQL_VARCHAR** check box.

Note:

This option applies only to result set columns that the driver would normally return as SQL_VARCHAR columns. It does not convert all columns into SQL_WVARCHAR.

10. To access public projects and use them as catalogs for the connection, in the **Additional Projects** field, type a comma-separated list of project names.
11. To save your settings and close the Advanced Options dialog box, click **OK**.

Configuring Logging Options on Windows

To help troubleshoot issues, you can enable logging. In addition to functionality provided in the Simba ODBC Driver for Google BigQuery, the ODBC Data Source Administrator provides tracing functionality.

Important:

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

The settings for logging apply to every connection that uses the Simba ODBC Driver for Google BigQuery, so make sure to disable the feature after you are done using it.

To enable driver logging on Windows:

1. To access logging options, open the ODBC Data Source Administrator where you created the DSN, then select the DSN, then click **Configure**, and then click **Logging Options**.
2. From the **Log Level** drop-down list, select the logging level corresponding to the amount of information that you want to include in log files:

Logging Level	Description
OFF	Disables all logging.
FATAL	Logs severe error events that lead the driver to abort.
ERROR	Logs error events that might allow the driver to continue running.

Logging Level	Description
WARNING	Logs events that might result in an error if action is not taken.
INFO	Logs general information that describes the progress of the driver.
DEBUG	Logs detailed information that is useful for debugging the driver.
TRACE	Logs all driver activity.

3. In the **Log Path** field, specify the full path to the folder where you want to save log files. You can type the path into the field, or click **Browse** and then browse to select the folder.
4. In the **Max Number Files** field, type the maximum number of log files to keep.

   Note:

   After the maximum number of log files is reached, each time an additional file is created, the driver deletes the oldest log file.

5. In the **Max File Size** field, type the maximum size of each log file in megabytes (MB).

   Note:

   After the maximum file size is reached, the driver creates a new file and continues logging.

6. Click **OK**.
7. Restart your ODBC application to make sure that the new settings take effect.

The Simba ODBC Driver for Google BigQuery produces a log file named `bigquery_driver.log` at the location that you specify in the Log Path field.

To disable driver logging on Windows:

1. Open the ODBC Data Source Administrator where you created the DSN, then select the DSN, then click **Configure**, and then click **Logging Options**.
2. From the **Log Level** drop-down list, select **LOG_OFF**.
3. Click **OK**.
4. Restart your ODBC application to make sure that the new settings take effect.

Verifying the Driver Version Number on Windows

If you need to verify the version of the Simba ODBC Driver for Google BigQuery that is installed on your Windows machine, you can find the version number in the ODBC Data Source Administrator.

To verify the driver version number on Windows:

1. Open the ODBC Administrator:
   - If you are using Windows 7 or earlier, click **Start** > **All Programs** > **Simba ODBC Driver for Google BigQuery 2.1** > **ODBC Administrator**.
   - Or, if you are using Windows 8 or later, on the Start screen, type **ODBC administrator**, and then click the **ODBC Administrator** search result.

   Note:

   Make sure to select the ODBC Data Source Administrator that has the same bitness as the client application that you are using to connect to BigQuery.
2. Click the **Drivers** tab and then find the Simba ODBC Driver for Google BigQuery in the list of ODBC drivers that are installed on your system. The version number is displayed in the **Version** column.

macOS Driver

macOS System Requirements

Install the driver on client machines where the application is installed. Each machine that you install the driver on must meet the following minimum system requirements:

- macOS version 10.9, 10.10, or 10.11
- 150 MB of available disk space
- iODBC 3.52.7 or later

Installing the Driver on macOS

The Simba ODBC Driver for Google BigQuery is available for macOS as a `.dmg` file named `SimbaODBCDriverforGoogleBigQuery.dmg`. The driver supports both 32- and 64-bit client applications.

To install the Simba ODBC Driver for Google BigQuery on macOS:

1. Double-click **SimbaODBCDriverforGoogleBigQuery.dmg** to mount the disk image.
2. Double-click **SimbaODBCDriverforGoogleBigQuery.pkg** to run the installer.
3. In the installer, click **Continue**.
4. On the Software License Agreement screen, click **Continue**, and when the prompt appears, click **Agree** if you agree to the terms of the License Agreement.
5. Optionally, to change the installation location, click **Change Install Location**, then select the desired location, and then click **Continue**.

   Note:

   By default, the driver files are installed in the `/Library/simba/googlebigqueryodbc` directory.
6. To accept the installation location and begin the installation, click **Install**.
7. When the installation completes, click **Close**.
8. If you received a license file through email, then copy the license file into the `/lib` subfolder in the driver installation directory. You must have root privileges when changing the contents of this folder.

   For example, if you installed the driver to the default location, you would copy the license file into the `/Library/simba/googlebigqueryodbc/lib` folder.

Next, configure the environment variables on your machine to make sure that the ODBC driver manager can work with the driver. For more information, see Configuring the ODBC Driver Manager on Non-Windows Machines on page 24.

Verifying the Driver Version Number on macOS

If you need to verify the version of the Simba ODBC Driver for Google BigQuery that is installed on your macOS machine, you can query the version number through the Terminal.

To verify the driver version number on macOS:

- At the Terminal, run the following command:

```
pkgutil --info com.simba.googlebigqueryodbc
```

The command returns information about the Simba ODBC Driver for Google BigQuery that is installed on your machine, including the version number.

Linux Driver

The Linux driver is available as an RPM file and as a tarball package.

Linux System Requirements

Install the driver on client machines where the application is installed. Each machine that you install the driver on must meet the following minimum system requirements:

- One of the following distributions:
  - Red Hat® Enterprise Linux® (RHEL) 6 or 7
  - CentOS 6 or 7
  - SUSE Linux Enterprise Server (SLES) 11 or 12
  - Debian 7, 8, or 9
  - Ubuntu 14.04 or 16.04
- 150 MB of available disk space
- One of the following ODBC driver managers installed:
  - iODBC 3.52.7 or later
  - unixODBC 2.3.0 or later

To install the driver, you must have root access on the machine.

Installing the Driver Using the RPM File

On 64-bit editions of Linux, you can execute both 32- and 64-bit applications. However, 64-bit applications must use 64-bit drivers, and 32-bit applications must use 32-bit drivers. Make sure to install and use the version of the driver that matches the bitness of the client application:

- `simbagooglebigquery-`*`[Version]`*`-`*`[Release]`*`.i686.rpm` for the 32-bit driver
- `simbagooglebigquery-`*`[Version]`*`-`*`[Release]`*`.x86_64.rpm` for the 64-bit driver

The placeholders in the file names are defined as follows:

- *[Version]* is the version number of the driver.
- *[Release]* is the release number for this version of the driver.

You can install both the 32-bit and 64-bit versions of the driver on the same machine.

To install the Simba ODBC Driver for Google BigQuery using the RPM File:

1. Log in as the root user.
2. Navigate to the folder containing the RPM package for the driver.
3. Depending on the Linux distribution that you are using, run one of the following commands from the command line, where *[RPMFileName]* is the file name of the RPM package:
   - If you are using Red Hat Enterprise Linux or CentOS, run the following command:

     ```
     yum --nogpgcheck localinstall [RPMFileName]
     ```

   - Or, if you are using SUSE Linux Enterprise Server, run the following command:

     ```
     zypper install [RPMFileName]
     ```

   The Simba ODBC Driver for Google BigQuery files are installed in the `/opt/simba/googlebigqueryodbc` directory.
4. If you received a license file through email, then copy the license file into the `/opt/simba/googlebigqueryodbc/lib/32` or `/opt/simba/googlebigqueryodbc/lib/64` folder, depending on the version of the driver that you installed. You must have root privileges when changing the contents of this folder.

Next, configure the environment variables on your machine to make sure that the ODBC driver manager can work with the driver. For more information, see Configuring the ODBC Driver Manager on Non-Windows Machines on page 24.

Installing the Driver Using the Tarball Package

The Simba ODBC Driver for Google BigQuery is available as a tarball package named `SimbaODBCDriverforGoogleBigQuery_[Version].[Release]-Linux.tar.gz`, where *[Version]* is the version number of the driver and *[Release]* is the release number for this version of the driver. The package contains both the 32-bit and 64-bit versions of the driver.

On 64-bit editions of Linux, you can execute both 32- and 64-bit applications. However, 64-bit applications must use 64-bit drivers, and 32-bit applications must use 32-bit drivers. Make sure that you use the version of the driver that matches the bitness of the client application. You can install both versions of the driver on the same machine.

To install the driver using the tarball package:

1. Log in as the root user, and then navigate to the folder containing the tarball package.
2. Run the following command to extract the package and install the driver:

   ```
   tar  --directory=/opt -zxvf [TarballName]
   ```

   Where `[TarballName]` is the name of the tarball package containing the driver.

   The Simba ODBC Driver for Google BigQuery files are installed in the `opt/simba/googlebigqueryodbc` directory.
3. If you received a license file through email, then copy the license file into the `opt/simba/googlebigqueryodbc/lib/32` or `opt/simba/googlebigqueryodbc/lib/64` folder, depending on the version of the driver that you installed. You must have root privileges when changing the contents of this folder.

Next, configure the environment variables on your machine to make sure that the ODBC driver manager can work with the driver. For more information, see Configuring the ODBC Driver Manager on Non-Windows Machines on page 24.

Verifying the Driver Version Number on Linux

If you need to verify the version of the Simba ODBC Driver for Google BigQuery that is installed on your Linux machine, you can query the version number through the command-line interface if the driver was installed using an RPM file.

To verify the driver version number on Linux:

- Depending on your package manager, at the command prompt, run one of the following commands:
  - `yum list 'Simba*'| grep SimbaODBCDriverforGoogleBigQuery`
  - `rpm -qa | grep SimbaODBCDriverforGoogleBigQuery`

The command returns information about the Simba ODBC Driver for Google BigQuery that is installed on your machine, including the version number.

Configuring the ODBC Driver Manager on Non-Windows Machines

To make sure that the ODBC driver manager on your machine is configured to work with the Simba ODBC Driver for Google BigQuery, do the following:

- Set the library path environment variable to make sure that your machine uses the correct ODBC driver manager. For more information, see Specifying ODBC Driver Managers on Non-Windows Machines on page 24.
- If the driver configuration files are not stored in the default locations expected by the ODBC driver manager, then set environment variables to make sure that the driver manager locates and uses those files. For more information, see Specifying the Locations of the Driver Configuration Files on page 25.

After configuring the ODBC driver manager, you can configure a connection and access your data store through the driver. For more information, see Configuring ODBC Connections on a Non-Windows Machine on page 27.

Specifying ODBC Driver Managers on Non-Windows Machines

You need to make sure that your machine uses the correct ODBC driver manager to load the driver. To do this, set the library path environment variable.

macOS

If you are using a macOS machine, then set the DYLD_LIBRARY_PATH environment variable to include the paths to the ODBC driver manager libraries. For example, if the libraries are installed in `/usr/local/lib`, then run the following command to set DYLD_LIBRARY_PATH for the current user session:

```
export DYLD_LIBRARY_PATH=$DYLD_LIBRARY_PATH:/usr/local/lib
```

For information about setting an environment variable permanently, refer to the macOS shell documentation.

Linux

If you are using a Linux machine, then set the LD_LIBRARY_PATH environment variable to include the paths to the ODBC driver manager libraries. For example, if the libraries are installed in `/usr/local/lib`, then run the following command to set LD_LIBRARY_PATH for the current user session:

```
export LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/local/lib
```

For information about setting an environment variable permanently, refer to the Linux shell documentation.

Specifying the Locations of the Driver Configuration Files

By default, ODBC driver managers are configured to use hidden versions of the `odbc.ini` and `odbcinst.ini` configuration files (named `.odbc.ini` and `.odbcinst.ini`) located in the home directory, as well as the `simba.googlebigqueryodbc.ini` file in the `lib` subfolder of the driver installation directory. If you store these configuration files elsewhere, then you must set the environment variables described below so that the driver manager can locate the files.

If you are using iODBC, do the following:

- Set ODBCINI to the full path and file name of the `odbc.ini` file.
- Set ODBCINSTINI to the full path and file name of the `odbcinst.ini` file.
- Set SIMBAGOOGLEBIGQUERYODBCINI to the full path and file name of the `simba.googlebigqueryodbc.ini` file.

If you are using unixODBC, do the following:

- Set ODBCINI to the full path and file name of the `odbc.ini` file.
- Set ODBCSYSINI to the full path of the directory that contains the `odbcinst.ini` file.
- Set SIMBAGOOGLEBIGQUERYODBCINI to the full path and file name of the `simba.googlebigqueryodbc.ini` file.

For example, if your `odbc.ini` and `odbcinst.ini` files are located in `/usr/local/odbc` and your `simba.googlebigqueryodbc.ini` file is located in `/etc`, then set the environment variables as follows:

For iODBC:

```
export ODBCINI=/usr/local/odbc/odbc.ini
export ODBCINSTINI=/usr/local/odbc/odbcinst.ini
export
SIMBAGOOGLEBIGQUERYODBCINI=/etc/simba.googlebigqueryodbc.ini
```

For unixODBC:

```
export ODBCINI=/usr/local/odbc/odbc.ini
export ODBCSYSINI=/usr/local/odbc
export
SIMBAGOOGLEBIGQUERYODBCINI=/etc/simba.googlebigqueryodbc.ini
```

To locate the `simba.googlebigqueryodbc.ini` file, the driver uses the following search order:

1. If the SIMBAGOOGLEBIGQUERYODBCINI environment variable is defined, then the driver searches for the file specified by the environment variable.
2. The driver searches the directory that contains the driver library files for a file named `simba.googlebigqueryodbc.ini`.
3. The driver searches the current working directory of the application for a file named `simba.googlebigqueryodbc.ini`.
4. The driver searches the home directory for a hidden file named `.simba.googlebigqueryodbc.ini` (prefixed with a period).
5. The driver searches the `/etc` directory for a file named `simba.googlebigqueryodbc.ini`.

Configuring ODBC Connections on a Non-Windows Machine

The following sections describe how to configure ODBC connections when using the Simba ODBC Driver for Google BigQuery on non-Windows platforms:

- Creating a Data Source Name on a Non-Windows Machine on page 27
- Configuring a DSN-less Connection on a Non-Windows Machine on page 29
- Configuring Authentication on a Non-Windows Machine on page 32
- Configuring Logging Options on a Non-Windows Machine on page 35
- Testing the Connection on a Non-Windows Machine on page 37

Creating a Data Source Name on a Non-Windows Machine

When connecting to your data store using a DSN, you only need to configure the `odbc.ini` file. Set the properties in the `odbc.ini` file to create a DSN that specifies the connection information for your data store. For information about configuring a DSN-less connection instead, see Configuring a DSN-less Connection on a Non-Windows Machine on page 29.

If your machine is already configured to use an existing `odbc.ini` file, then update that file by adding the settings described below. Otherwise, copy the `odbc.ini` file from the `Setup` subfolder in the driver installation directory to the home directory, and then update the file as described below.

To create a Data Source Name on a non-Windows machine:

1. In a text editor, open the `odbc.ini` configuration file.

   Note:

   If you are using a hidden copy of the `odbc.ini` file, you can remove the period (`.`) from the start of the file name to make the file visible while you are editing it.

2. In the `[ODBC Data Sources]` section, add a new entry by typing a name for the DSN, an equal sign (=), and then the name of the driver.

   For example, on a macOS machine:

   ```
   [ODBC Data Sources]
   ```

```
Sample DSN=Simba ODBC Driver for Google BigQuery
```

As another example, for a 32-bit driver on a Linux machine:

```
[ODBC Data Sources]
Sample DSN=Simba ODBC Driver for Google BigQuery 32-bit
```

3. Create a section that has the same name as your DSN, and then specify configuration options as key-value pairs in the section:
   a. Set the `Driver` property to the full path of the driver library file that matches the bitness of the application.

      For example, on a macOS machine:

      ```
      Driver=/Library/simba/googlebigqueryodbc/lib/libgoog
      lebigqueryodbc_sbu.dylib
      ```

      As another example, for a 32-bit driver on a Linux machine:

      ```
      Driver=/opt/simba/googlebigqueryodbc/lib/32/libgoogl
      ebigqueryodbc_sb32.so
      ```

   b. Set the `Catalog` property to the name of your BigQuery project. This project is the default project that the Simba ODBC Driver for Google BigQuery queries against, and also the project that is billed for queries that are run using this DSN.

      For example:

      ```
      Catalog=testdata
      ```

   c. Configure authentication using a Google user account or a Google service account. For more information, see Configuring Authentication on a Non-Windows Machine on page 32.
   d. Optionally, to use trusted CA certificates from a `.pem` file other than the default file installed with the driver, set the `TrustedCerts` property to the full path of the file.
   e. Optionally, to allow the driver to access Google Drive so that it can support federated tables that combine BigQuery data with data from Google Drive, set the `RequestGoogleDriveScope` property to `1`.
   f. Optionally, set additional key-value pairs as needed to specify other optional connection settings. For detailed information about all the configuration options supported by the Simba ODBC Driver for Google BigQuery, see Driver Configuration Options on page 48.
4. Save the `odbc.ini` configuration file.

> **Note:**
>
> If you are storing this file in its default location in the home directory, then prefix the file name with a period (.) so that the file becomes hidden. If you are storing this file in another location, then save it as a non-hidden file (without the prefix), and make sure that the ODBCINI environment variable specifies the location. For more information, see Specifying the Locations of the Driver Configuration Files on page 25.

For example, the following is an `odbc.ini` configuration file for macOS containing a DSN that connects to Google BigQuery using a refresh token obtained from a user account:

```
[ODBC Data Sources]
Sample DSN=Simba ODBC Driver for Google BigQuery
[Sample DSN]
Driver=/Library/simba/googlebigqueryodbc/lib/libgooglebigque
ryodbc_sbu.dylib
Catalog=testdata
OAuthMechanism=1
RefreshToken=CH01pcNn/qFcYwUlJpkF_yyufYrqj4O4g7cdXvGgs-zT6
```

As another example, the following is an `odbc.ini` configuration file for a 32-bit driver on a Linux machine, containing a DSN that connects to Google BigQuery using a refresh token obtained from a user account:

```
[ODBC Data Sources]
Sample DSN=Simba ODBC Driver for Google BigQuery 32-bit
[Sample DSN]
Driver=/opt/simba/googlebigqueryodbc/lib/32/libgooglebigquer
yodbc_sb32.so
Catalog=testdata
OAuthMechanism=1
RefreshToken=CH01pcNn/qFcYwUlJpkF_yyufYrqj4O4g7cdXvGgs-zT6
```

You can now use the DSN in an application to connect to the data store.

Configuring a DSN-less Connection on a Non-Windows Machine

To connect to your data store through a DSN-less connection, you need to define the driver in the `odbcinst.ini` file and then provide a DSN-less connection string in your application.

If your machine is already configured to use an existing `odbcinst.ini` file, then update that file by adding the settings described below. Otherwise, copy the `odbcinst.ini` file from the `Setup` subfolder in the driver installation directory to the home directory, and then update the file as described below.

To define a driver on a non-Windows machine:

1. In a text editor, open the `odbcinst.ini` configuration file.

   > **Note:**
   >
   > If you are using a hidden copy of the `odbcinst.ini` file, you can remove the period (`.`) from the start of the file name to make the file visible while you are editing it.

2. In the `[ODBC Drivers]` section, add a new entry by typing a name for the driver, an equal sign (=), and then `Installed`.

   For example:

   ```
   [ODBC Drivers]
   Simba ODBC Driver for Google BigQuery=Installed
   ```

3. Create a section that has the same name as the driver (as specified in the previous step), and then specify the following configuration options as key-value pairs in the section:
   a. Set the `Driver` property to the full path of the driver library file that matches the bitness of the application.

      For example, on a macOS machine:

      ```
      Driver=/Library/simba/googlebigqueryodbc/lib/libgoog
      lebigqueryodbc_sbu.dylib
      ```

      As another example, for a 32-bit driver on a Linux machine:

      ```
      Driver=/opt/simba/googlebigqueryodbc/lib/32/libgoogl
      ebigqueryodbc_sb32.so
      ```

   b. Optionally, set the `Description` property to a description of the driver.

      For example:

      ```
      Description=Simba ODBC Driver for Google BigQuery
      ```

4. Save the `odbcinst.ini` configuration file.

> **Note:**
>
> If you are storing this file in its default location in the home directory, then prefix the file name with a period (.) so that the file becomes hidden. If you are storing this file in another location, then save it as a non-hidden file (without the prefix), and make sure that the ODBCINSTINI or ODBCSYSINI environment variable specifies the location. For more information, see Specifying the Locations of the Driver Configuration Files on page 25.

For example, the following is an `odbcinst.ini` configuration file for macOS:

```
[ODBC Drivers]
Simba ODBC Driver for Google BigQuery=Installed
[Simba ODBC Driver for Google BigQuery]
Description=Simba ODBC Driver for Google BigQuery
Driver=/Library/simba/googlebigqueryodbc/lib/libgooglebigque
ryodbc_sbu.dylib
```

As another example, the following is an `odbcinst.ini` configuration file for both the 32- and 64-bit drivers on Linux:

```
[ODBC Drivers]
Simba ODBC Driver for Google BigQuery 32-bit=Installed
Simba ODBC Driver for Google BigQuery 64-bit=Installed
[Simba ODBC Driver for Google BigQuery 32-bit]
Description=Simba ODBC Driver for Google BigQuery (32-bit)
Driver=/opt/simba/googlebigqueryodbc/lib/32/libgooglebigquer
yodbc_sb32.so
[Simba ODBC Driver for Google BigQuery 64-bit]
Description=Simba ODBC Driver for Google BigQuery (64-bit)
Driver=/opt/simba/googlebigqueryodbc/lib/64/libgooglebigquer
yodbc_sb64.so
```

You can now connect to your data store by providing your application with a connection string where the `Driver` property is set to the driver name specified in the `odbcinst.ini` file, and all the other necessary connection properties are also set. For more information, see "DSN-less Connection String Examples" in Using a Connection String on page 39.

For instructions about configuring authentication, see Configuring Authentication on a Non-Windows Machine on page 32.

For detailed information about all the connection properties that the driver supports, see Driver Configuration Options on page 48.

Configuring Authentication on a Non-Windows Machine

The Simba ODBC 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 32
- Using a Google Service Account on page 34

Using a Google User Account

You can configure the driver to authenticate the connection with a Google user account. This authentication method uses the OAuth 2.0 access and refresh tokens associated with the user account as the credentials.

The access token is transmitted with every API call that the driver makes, and it is required for accessing BigQuery data stores. However, the access token expires after a certain amount of time and must be renewed using the refresh token. If the refresh token is stored in the DSN, the driver automatically uses it to renew access tokens when they expire.

Note:

For more information about OAuth 2.0, see "Using OAuth 2.0 to Access Google APIs" in the Google Identity Platform documentation: https://developers.google.com/identity/protocols/OAuth2.

At minimum, you need to provide the OAuth 2.0 refresh token associated with your account. The driver retrieves and uses an access token based on your specified refresh token.

- If you do not have your refresh token, see Retrieving a Refresh Token on page 32.
- If you have your refresh token, see Providing a Refresh Token on page 33.
- If you want to provide a `.json` key file that contains your credentials instead of providing your refresh token directly in your connection information, see Providing a Key File on page 34.

Retrieving a Refresh Token

When you authenticate your connection this way, the authentication process provides a temporary authorization code that you can exchange for an access token and a refresh token.

To configure user account authentication by retrieving a refresh token on a non-Windows machine:

1. Obtain a refresh token based on your user account:
   a. In a web browser, navigate to the Google OAuth 2.0 Playground: https://developers.google.com/oauthplayground/.
   b. In the side panel, expand **BigQuery API v2** and select the appropriate scope for the permissions that you need.

      > **Note:**
      >
      > For information about the permissions associated with each scope, see "OAuth 2.0 Scopes for Google APIs" in the Google Identity Platform documentation: https://developers.google.com/identity/protocols/googlescopes.

   c. Click **Authorize APIs**.
   d. Sign in to your user account.
   e. When you are prompted to allow Google OAuth 2.0 Playground to view and manage your data in Google BigQuery, click **Allow**.

      The authentication process returns you to the Google OAuth 2.0 Playground, and automatically populates the Authorization Code field with an authorization code.
   f. Click **Exchange Authorization Code for Tokens**.

      The Refresh Token and Access Token fields are populated with the appropriate token values.
2. In your DSN or connection string, set the `OAuthMechanism` property to `1`.
3. Set the `Auth_RefreshToken` property to the refresh token that you obtained from Google.

Providing a Refresh Token

If you already have your refresh token, then you can provide the token in your connection information without going through the retrieval process described above.

To configure user account authentication by providing a refresh token on a non-Windows machine:

1. Set the `OAuthMechanism` property to `1`.
2. Set the `RefreshToken` property to the refresh token associated with your user account.

Providing a Key File

As an alternative to providing your refresh token directly in your connection information, you can save the token in a `.json` key file and then specify the path to the file in your connection information.

The file must define a JSON object of type `authorized_user` containing the refresh token, client ID, and client secret associated with your user account. For example, the `.json` key file must be written in the following format:

```
{
   "type": "authorized_user",
   "client_id": "[YourClientID]",
   "client_secret":"[YourClientSecret]",
   "refresh_token":"[YourRefreshToken]"
}
```

To configure user account authentication by providing a key file on a non-Windows machine:

1. Set the `OAuthMechanism` property to `0`.

   Note:

   Although this is a form of user authentication, the driver must be configured to use the service authentication mechansim (`OAuthMechanism=0`) in order to detect and use the key file.

2. Set the `Email` property to your user account email ID.
3. Set the `KeyFilePath` property to the full path to the `.json` key file.

Using a Google Service Account

You can configure the driver to authenticate the connection with a Google service account. When you authenticate your connection this way, the driver handles authentication on behalf of the service account, so that an individual user account is not directly involved and no user input is required.

To authenticate your connection this way, you must provide a Google service account email address and the full path to a private key file for the service account. You can generate and download the private key file when you set up the service account.

Note:

- For more information about OAuth 2.0 authentication using a service account, see "Using OAuth 2.0 for Server to Server Applications" in the Google Identity Platform documentation: https://developers.google.com/identity/protocols/OAuth2ServiceAccount.
- For information about obtaining service account keys, see "Creating and Managing Service Account Keys" in the Google Cloud Identity & Access Management documentation: https://cloud.google.com/iam/docs/creating-managing-service-account-keys.

To configure service account authentication on a non-Windows machine:

1. Set the `OAuthMechanism` property to `0`.
2. Set the `Email` property to your service account email ID.
3. Set the `KeyFilePath` property to the full path to the `.p12` or `.json` key file that is used to authenticate the service account ID.

Configuring Logging Options on a Non-Windows Machine

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.

Logging is configured through driver-wide settings in the `simba.googlebigqueryodbc.ini` file, which apply to all connections that use the driver.

To enable logging on a non-Windows machine:

1. Open the `simba.googlebigqueryodbc.ini` configuration file in a text editor.
2. To specify the level of information to include in log files, set the `LogLevel` property to one of the following numbers:

LogLevel Value	Description
0	Disables all logging.

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

3. Set the `LogPath` key to the full path to the folder where you want to save log files.
4. Set the `LogFileCount` key to the maximum number of log files to keep.

> **Note:**
>
> After the maximum number of log files is reached, each time an additional file is created, the driver deletes the oldest log file.

5. Set the `LogFileSize` key to the maximum size of each log file in megabytes (MB).

> **Note:**
>
> After the maximum file size is reached, the driver creates a new file and continues logging.

6. Save the `simba.googlebigqueryodbc.ini` configuration file.
7. Restart your ODBC application to make sure that the new settings take effect.

The Simba ODBC Driver for Google BigQuery produces a log file named `bigquery_driver.log` at the location you specify using the `LogPath` key.

To disable logging on a non-Windows machine:

1. Open the `simba.googlebigqueryodbc.ini` configuration file in a text editor.

2. Set the `LogLevel` key to `0`.
3. Save the `simba.googlebigqueryodbc.ini` configuration file.
4. Restart your ODBC application to make sure that the new settings take effect.

Testing the Connection on a Non-Windows Machine

To test the connection, you can use an ODBC-enabled client application. For a basic connection test, you can also use the test utilities that are packaged with your driver manager installation. For example, the iODBC driver manager includes simple utilities called iodbctest and iodbctestw. Similarly, the unixODBC driver manager includes simple utilities called isql and iusql.

Using the iODBC Driver Manager

You can use the iodbctest and iodbctestw utilities to establish a test connection with your driver. Use iodbctest to test how your driver works with an ANSI application, or use iodbctestw to test how your driver works with a Unicode application.

> **Note:**
>
> There are 32-bit and 64-bit installations of the iODBC driver manager available. If you have only one or the other installed, then the appropriate version of iodbctest (or iodbctestw) is available. However, if you have both 32- and 64-bit versions installed, then you need to make sure that you are running the version from the correct installation directory.

For more information about using the iODBC driver manager, see http://www.iodbc.org.

To test your connection using the iODBC driver manager:

1. Run **iodbctest** or **iodbctestw**.
2. Optionally, if you do not remember the DSN, then type a question mark (`?`) to see a list of available DSNs.
3. Type the connection string for connecting to your data store, and then press ENTER. For more information, see Using a Connection String on page 39.

If the connection is successful, then the `SQL>` prompt appears.

Using the unixODBC Driver Manager

You can use the isql and iusql utilities to establish a test connection with your driver and your DSN. isql and iusql can only be used to test connections that use a DSN.

Use isql to test how your driver works with an ANSI application, or use iusql to test how your driver works with a Unicode application.

Note:

There are 32-bit and 64-bit installations of the unixODBC driver manager available. If you have only one or the other installed, then the appropriate version of isql (or iusql) is available. However, if you have both 32- and 64-bit versions installed, then you need to make sure that you are running the version from the correct installation directory.

For more information about using the unixODBC driver manager, see http://www.unixodbc.org.

To test your connection using the unixODBC driver manager:

- Run isql or iusql by using the corresponding syntax:
  - `isql [DataSourceName]`
  - `iusql [DataSourceName]`

  `[DataSourceName]` is the DSN that you are using for the connection.

If the connection is successful, then the `SQL>` prompt appears.

Note:

For information about the available options, run isql or iusql without providing a DSN.

Using a Connection String

For some applications, you might need to use a connection string to connect to your data source. For detailed information about how to use a connection string in an ODBC application, refer to the documentation for the application that you are using.

The connection strings in the following sections are examples showing the minimum set of connection attributes that you must specify to successfully connect to the data source. Depending on the configuration of the data source and the type of connection you are working with, you might need to specify additional connection attributes. For detailed information about all the attributes that you can use in the connection string, see Driver Configuration Options on page 48.

DSN Connection String Example

The following is an example of a connection string for a connection that uses a DSN:

```
DSN=[DataSourceName]
```

[DataSourceName] is the DSN that you are using for the connection.

You can set additional configuration options by appending key-value pairs to the connection string. Configuration options that are passed in using a connection string take precedence over configuration options that are set in the DSN.

DSN-less Connection String Examples

Some applications provide support for connecting to a data source using a driver without a DSN. To connect to a data source without using a DSN, use a connection string instead.

The placeholders in the examples are defined as follows, in alphabetical order:

- *[PortNumber]* is the number of the TCP port that the proxy server uses to listen for client connections.
- *[Project]* is the BigQuery project containing the data that you want to use.
- *[Server]* is the IP address or host name of the proxy server to which you are connecting.
- *[ServiceAccount]* is your service account email ID.
- *[ServiceKeyPath]* is the full path to a `.p12` or `.json` key file for service account authentication.

- *[Token]* is the refresh token that you obtain from Google for authorizing access to BigQuery.
- *[UserAccount]* is your user account email ID.
- *[UserKeyPath]* is the full path to a `.json` key file containing your refresh token, client ID, and client secret. For information about the required format of the `.json` file, see Key File Path on page 52.

Connecting to Google BigQuery using a User Account

The following is the format of a DSN-less connection string for a user account connection to Google BigQuery:

```
Driver=Simba ODBC Driver for Google BigQuery;
OAuthMechanism=1;RefreshToken=[Token];Catalog=[Project];
```

For example:

```
Driver=Simba ODBC Driver for Google BigQuery;
OAuthMechanism=1;RefreshToken=CH01pcNn/qFcYwUlJpkF_
yyufYrqj4O4g7cdXvGgs-zT6;Catalog=testdata;
```

As an alternative to providing your refresh token directly in the string, you can save your credentials in a `.json` key file and then provide the full path to that file in your string. In this case, the connection string must be written in the following format:

```
Driver=Simba ODBC Driver for Google BigQuery;
OAuthMechanism=0;Email=[UserAccount];KeyFilePath=
[UserKeyPath];Catalog=[Project];
```

For example:

```
Driver=Simba ODBC Driver for Google BigQuery;
OAuthMechanism=0;Email=simba@gmail.com;
KeyFilePath=C:\SecureFiles\UserKeyFile.json;Catalog=testdat
a;
```

Connecting to Google BigQuery using a Service Account

The following is the format of a DSN-less connection string for a service account connection to Google BigQuery:

```
Driver=Simba ODBC Driver for Google BigQuery;
OAuthMechanism=0;Email=[ServiceAccount];KeyFilePath=
[ServiceKeyPath];Catalog=[Project];
```

For example:

```
Driver=Simba ODBC Driver for Google BigQuery;
OAuthMechanism=0;Email=application-service-
account@iam.gserviceaccount.com;KeyFilePath=C:\SecureFiles\S
erviceKeyFile.p12;Catalog=testdata;
```

Connecting to Google BigQuery through a Proxy Server

The following is the format of a DSN-less connection string for connecting to Google BigQuery with a user account through a proxy server:

```
Driver=Simba ODBC Driver for Google BigQuery;
OAuthMechanism=1;RefreshToken=[Token];Catalog=[Project];
ProxyHost=[Server];ProxyPort=[PortNumber];
```

For example:

```
Driver=Simba ODBC Driver for Google BigQuery;
OAuthMechanism=1;RefreshToken=CH01pcNn/qFcYwUlJpkF_
yyufYrqj4O4g7cdXvGgs-zT6;
Catalog=testdata;ProxyHost=192.168.222.160;
ProxyPort=8000;
```

Features

For more information on the features of the Simba ODBC Driver for Google BigQuery, see the following:

- Data Types on page 42
- Nested and Repeated Records on page 43
- Arrays on page 44
- Security and Authentication on page 45
- Catalog and Schema Support on page 45
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- Write-Back on page 46
- Positional Parameters on page 46
- ODBC Escapes on page 46

Data Types

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

The following table lists the supported data type mappings.

BigQuery Data Type	SQL Data Type
BOOL	SQL_BIT
BYTES	SQL_VARBINARY
DATE	SQL_DATE
DATETIME	SQL_VARCHAR
FLOAT64	SQL_DOUBLE
INT64	SQL_BIGINT

BigQuery Data Type	SQL Data Type
NUMERIC	SQL_NUMERIC
	SQL_DECIMAL **Note:** The driver sends SQL_DECIMAL data to BigQuery as NUMERIC data, because BigQuery does not support a DECIMAL data type. The driver always returns NUMERIC data as SQL_NUMERIC data, and sends SQL_NUMERIC data to BigQuery as NUMERIC data.
STRING	SQL_VARCHAR or SQL_WVARCHAR **Note:** For information about whether STRING data is returned as SQL_VARCHAR or SQL_WVARCHAR, see Use SQL_WVARCHAR instead of SQL_VARCHAR on page 60.
TIME	SQL_TIME
TIMESTAMP	SQL_TYPE_TIMESTAMP

Nested and Repeated Records

The Simba ODBC Driver for Google BigQuery partially 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 ODBC 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"
       }
    ]
}
```

Security and Authentication

To protect data from unauthorized access, BigQuery data stores require all connections to be authenticated using the OAuth 2.0 protocol and encrypted using TLS 1.2 with one-way authentication. The Simba ODBC Driver for Google BigQuery protects your data by providing support for these authentication protocols and further obscuring data from unwanted access by fetching it in a non-text format. The data is compressed using zlib and encrypted using TLS.

The driver provides mechanisms that allow you to complete an OAuth 2.0 authentication flow using a Google user account or a Google service account. The driver retrieves a token based on the account credentials specified in your DSN or connection string, and then uses the token to authenticate the connection to BigQuery. For detailed configuration instructions, see Configuring Authentication on Windows on page 11 or Configuring Authentication on a Non-Windows Machine on page 32.

Additionally, the driver automatically encrypts all connections with TLS. TLS encryption protects data and credentials when they are transferred over the network, and provides stronger security than authentication alone. By default, the driver uses the trusted CA certificates file that is included during installation, but you can configure the driver to use a different file by setting the Trusted Certificates option (the `TrustedCerts` property). On Windows machines, you can configure the driver to use the system trust store by setting the Use System Trust Store option (the `UseSystemTrustStore` property). For detailed configuration instructions, see Creating a Data Source Name on Windows on page 9 or Creating a Data Source Name on a Non-Windows Machine on page 27.

Catalog and Schema Support

The Simba ODBC Driver for Google BigQuery supports both catalogs and schemas to make it easy for the driver to work with various ODBC applications. Projects are mapped to catalogs, and table datasets are mapped to schemas. For more information, see Catalog (Project) on page 49.

Large Result Set Support

The Simba ODBC 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 dataset ID specified using the **Dataset Name For Large Result Sets** driver configuration option. These temporary tables exist for a limited time, specified using the **Temporary Table Expiration Time** driver configuration option, 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 **Allow Large Result Sets** option is selected or the `AllowLargeResults` key is set to `1`.

For more information about large result sets and the limitations of this feature, 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 ODBC 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");
```

The driver also supports Data Definition Language (DDL) statements. Be aware that BigQuery supports specific syntax for DDL statements, and your statements must be written in that syntax. For more information, see "Using Data Definition Language Statements" in Google BigQuery's *Standard SQL Query Reference*: https://cloud.google.com/bigquery/docs/data-definition-language.

Positional Parameters

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

The Simba ODBC 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=?
```

ODBC Escapes

The Simba ODBC Driver for Google BigQuery supports a subset of the ODBC escape syntaxes. For a complete list of the escapes that the driver supports, call SQLGetInfo from the driver.

For more information about ODBC escapes, see "ODBC Escape Sequences" in the Programmer's Reference: https://msdn.microsoft.com/en-us/library/ms711838(v=vs.85).aspx.

For information about known issues that occur for specific ODBC escape use cases, see the "Known Issues" section in the *Simba ODBC Driver with SQL Connector for Google BigQuery Release Notes*.

Driver Configuration Options

Driver Configuration Options lists the configuration options available in the Simba ODBC Driver for Google BigQuery alphabetically by field or button label. Options having only key names, that is, not appearing in the user interface of the driver, are listed alphabetically by key name.

When creating or configuring a connection from a Windows machine, the fields and buttons described below are available in the following dialog boxes:

- Simba ODBC Driver for Google BigQuery DSN Setup
- Advanced Options
- Logging Options

When using a connection string or configuring a connection from a non-Windows machine, use the key names provided below.

Configuration Options Appearing in the User Interface

The following configuration options are accessible via the Windows user interface for the Simba ODBC Driver for Google BigQuery, or via the key name when using a connection string or configuring a connection from a Linux or macOS computer:

- Additional Projects on page 49
- Allow Large Result Sets on page 49
- Catalog (Project) on page 49
- Confirmation Code on page 50
- Dataset Name For Large Result Sets on page 50
- Dataset on page 51
- Default String Column Length on page 51
- Email on page 52
- Key File Path on page 52
- Language Dialect on page 53
- Log Level on page 53
- Log Path on page 54
- Path to CMEK on page 56
- Proxy Host on page 56
- Proxy Password on page 57
- Proxy Port on page 57
- Proxy Username on page 57
- Refresh Token on page 58
- Request Google Drive Scope Access on page 58
- Rows Fetched Per Block on page 58
- Temporary Table Expiration Time on page 59
- Trusted Certificates on page 59
- Use Proxy Server on page 60
- Use SQL_WVARCHAR instead of

- Max File Size on page 54
- Max Number Files on page 55
- OAuth Mechanism on page 55
- SQL_VARCHAR on page 60
- Use System Trust Store on page 61

Additional Projects

Key Name	Default Value	Required
`AdditionalProjects`	None	No

Description

A comma-separated list of public BigQuery projects that the driver can access and use as catalogs. These projects are available as catalogs in metadata functions.

Allow Large Result Sets

Key Name	Default Value	Required
`AllowLargeResults`	Clear (`0`)	No

Description

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

- Enabled (`1`): The driver allows query results that are larger than 128MB in size.
- Disabled (`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 Standard SQL is selected or the `SQLDialect` key is set to `1`, 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 ODBC Driver for Google BigQuery queries against, and is also the project that is billed for queries that are run using the DSN.

Simba ODBC Driver for Google BigQuery supports multiple catalogs, the equivalent of Google BigQuery projects.

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 project specified by the **projectId** connection option.

For catalog functions, in order to retrieve information from the desired catalog, the ODBC **SQLSetConnectAttr** method must be called with **SQL_ATTR_CURRENT_CATALOG** set to the desired catalog.

Confirmation Code

Key Name	Default Value	Required
N/A	None	No

Description

The code that you obtain from Google for generating a refresh token.

Note:

The confirmation code can only be used once. You must get a new confirmation code from Google whenever you need another refresh token.

Dataset Name For Large Result Sets

Key Name	Default Value	Required
`LargeResultDataSetId`	`_odbc_temp_tables`	Yes, if Allow Large Result Sets or the `AllowLargeResults` key is enabled.

Description

The ID of the BigQuery dataset that you want to use to store temporary tables.

Note:

This option is only available when Allow Large Result Sets or the `AllowLargeResults` key is enabled. The dataset created from the default ID is hidden.

Dataset

Key Name	Default Value	Required
`DefaultDataset`	None	No

Description

The name of a dataset that the driver queries by default.

Specifying a default dataset enables you to use unqualified table names in SQL statements. The driver treats unqualified tables as part of the default dataset. Additionally, it treats the default dataset as part of the project that is being billed. For information about specifying the project to bill, see Catalog (Project) on page 49.

Default String Column Length

Key Name	Default Value	Required
`Default StringColumnLength`	`16384`	No

Description

The maximum number of characters that can be contained in STRING columns.

Email

Key Name	Default Value	Required
Email	None	Yes, if OAuth Mechanism is set to Service Authentication (OAuthMechanism=0).

Description

When configuring Service Authentication, set this option to the service account email ID.

When configuring User Authentication with a .json key file, set this option to your user account email ID.

Key File Path

Key Name	Default Value	Required
KeyFilePath	None	Yes, if OAuth Mechanism is set to Service Authentication (OAuthMechanism=0).

Description

When configuring Service Authentication, set this option to the full path to the .p12 or .json key file that is used to authenticate the service account email address.

When configuring User Authentication with a .json key file, set this option to the full path to the .json key file containing your OAuth 2.0 credentials. The file must define a JSON object of type authorized_user containing the refresh token, client ID, and client secret associated with your user account. For example, the .json key file must be written in the following format:

```
{
   "type": "authorized_user",
   "client_id": "[YourClientID]",
   "client_secret":"[YourClientSecret]",
   "refresh_token":"[YourRefreshToken]"
```

```
}
```

Language Dialect

Key Name	Default Value	Required
SQLDialect	Standard SQL (1)	No

Description

This option specifies whether the driver executes queries using standard SQL syntax or the legacy BigQuery SQL syntax.

- Standard SQL (1): The driver uses standard SQL.
- Legacy SQL (0): The driver uses legacy SQL.

Log Level

Key Name	Default Value	Required
LogLevel	OFF (0)	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.
- The settings for logging apply to every connection that uses the Simba ODBC Driver for Google BigQuery, so make sure to disable the feature after you are done using it.
- This option is not supported in connection strings. To configure logging for the Windows driver, you must use the Logging Options dialog box. To configure logging for a non-Windows driver, you must use the `simba.googlebigqueryodbc.ini` file.

Set the property to one of the following values:

- OFF (0): Disable all logging.
- FATAL (1): Logs severe error events that lead the driver to abort.
- ERROR (2): Logs error events that might allow the driver to continue running.
- WARNING (3): Logs events that might result in an error if action is not taken.
- INFO (4): Logs general information that describes the progress of the driver.
- DEBUG (5): Logs detailed information that is useful for debugging the driver.
- TRACE (6): Logs all driver activity.

When logging is enabled, the driver produces a log file named `bigquery_driver.log` in the location specified in the Log Path (`LogPath`) property.

Log Path

Key Name	Default Value	Required
`LogPath`	None	Yes, if logging is enabled.

Description

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

! Important:

This option is not supported in connection strings. To configure logging for the Windows driver, you must use the Logging Options dialog box. To configure logging for a non-Windows driver, you must use the `simba.googlebigqueryodbc.ini` file.

Max File Size

Key Name	Default Value	Required
`LogFileSize`	`20`	No

Description

The maximum size of each log file in megabytes (MB). After the maximum file size is reached, the driver creates a new file and continues logging.

! Important:

This option is not supported in connection strings. To configure logging for the Windows driver, you must use the Logging Options dialog box. To configure logging for a non-Windows driver, you must use the `simba.googlegooglebigqueryodbc.ini` file.

Max Number Files

Key Name	Default Value	Required
`LogFileCount`	`50`	No

Description

The maximum number of log files to keep. After the maximum number of log files is reached, each time an additional file is created, the driver deletes the oldest log file.

! Important:

This option is not supported in connection strings. To configure logging for the Windows driver, you must use the Logging Options dialog box. To configure logging for a non-Windows driver, you must use the `simba.googlegooglebigqueryodbc.ini` file.

OAuth Mechanism

Key Name	Default Value	Required
`OAuthMechanism`	User Authentication (`1`)	No

Description

The OAuth 2.0 authentication mechanism used to authenticate the driver.

- User Authentication (`1`): The driver authenticates as a user, through a Google user account.
- Service Authentication (`0`): The driver authenticates as a service, through a Google service account.

Path to CMEK

Key Name	Default Value	Required
KMSKeyName	None. The driver uses the default encryption key from Google.	No

Description

The resource ID of the customer-managed encryption key (CMEK) that you want the driver to use when executing queries. When this property is not set, such as by default, the driver uses the default encryption key from Google.

For information about CMEKs and Cloud KMS encryption, see "Protecting Data with Cloud KMS Keys" in the Google BigQuery documentation: https://cloud.google.com/bigquery/docs/customer-managed-encryption.

! Important:

- Do not set this property unless you are certain that you are specifying the correct CMEK. If you execute an INSERT statement with an incorrect CMEK, the driver returns an error or corrupts the table.
- When this property is set, the driver uses the specified CMEK for all queries.

Proxy Host

Key Name	Default Value	Required
ProxyHost	None	Yes, if connecting through a proxy server.

Description

The host name or IP address of a proxy server that you want to connect through.

Proxy Password

Key Name	Default Value	Required
ProxyPwd	None	Yes, if connecting to a proxy server that requires authentication.

Description

The password that you use to access the proxy server.

Proxy Port

Key Name	Default Value	Required
ProxyPort	None	Yes, if connecting through a proxy server.

Description

The number of the port that the proxy server uses to listen for client connections.

Proxy Username

Key Name	Default Value	Required
ProxyUid	None	Yes, if connecting to a proxy server that requires authentication.

Description

The user name that you use to access the proxy server.

Refresh Token

Key Name	Default Value	Required
RefreshToken	None	Yes, if authenticating through a user account.

Description

The refresh token that you obtain from Google for authorizing access to BigQuery.

When you configure a DSN with the Windows driver, the refresh token is generated automatically after you provide the confirmation code.

When you configure a DSN with the Linux or macOS versions of the driver, you can use the Google OAuth 2.0 Playground to generate the token. For more information, see Using a Google User Account on page 32.

Request Google Drive Scope Access

Key Name	Default Value	Required
RequestGoogleDriveScope	Clear (0)	No

Description

This option specifies whether the driver requests access to Google Drive. Allowing the driver to access Google Drive enables support for federated tables that combine BigQuery data with data from Google Drive.

- Enabled (1): The driver requests access to Google Drive.
- Disabled (0): The driver does not request access to Google Drive.

Rows Fetched Per Block

Key Name	Default Value	Required
RowsFetchedPerBlock	100000	No

Description

The maximum number of rows that the driver can fetch for each data request.

Temporary Table Expiration Time

Key Name	Default Value	Required
LargeResultsTempTableExpirationTime	3600000	Yes, if Allow Large Result Sets or the AllowLargeResults key is enabled.

Description

The length of time, in milliseconds, for which a temporary table exists.

Note:

This option is only available when Allow Large Result Sets or the AllowLargeResults key is enabled. The default value is one hour in milliseconds.

Trusted Certificates

Key Name	Default Value	Required
TrustedCerts	The cacerts.pem file in the \lib subfolder within the driver's installation directory. The exact file path varies depending on the version of the driver that is installed. For example, the path for the Windows driver is different from the path for the macOS driver.	No

Description

The full path of the .pem file containing trusted CA certificates, for verifying the server.

If this option is not set, then the driver defaults to using the trusted CA certificates `.pem` file installed by the driver.

Use Proxy Server

Key Name	Default Value	Required
N/A	Clear (`0`)	No

Description

This option specifies whether the driver uses a proxy server to connect to the data store.

- Enabled (`1`): The driver connects to a proxy server based on the information provided in the Proxy Host, Proxy Port, Proxy Username, and Proxy Password fields or the `ProxyHost`, `ProxyPort`, `ProxyUID`, and `ProxyPWD` keys.
- Disabled (`0`): The driver connects directly to the BigQuery server.

Use SQL_WVARCHAR instead of SQL_VARCHAR

Key Name	Default Value	Required
`UseWVarChar`	Clear (`0`)	No

Description

This option specifies how data types are mapped to SQL.

- Enabled (`1`): The driver returns data as SQL_WVARCHAR data instead of SQL_VARCHAR data.
- Disabled (`0`): The driver returns data as SQL_VARCHAR data.

Note:

This option applies only to result set columns that the driver would normally return as SQL_VARCHAR columns. It does not convert all columns into SQL_WVARCHAR.

Use System Trust Store

Key Name	Default Value	Required
`UseSystemTrustStore`	Clear (`0`)	No

Description

This option specifies whether to use a CA certificate from the system trust store, or from a specified PEM file.

- Enabled (`1`): The driver verifies the connection using a certificate in the system trust store.
- Disabled (`0`): The driver verifies the connection using a specified PEM file. For information about specifying a PEM file, see Trusted Certificates on page 59.

Note:

This option is only available on Windows.

Configuration Options Having Only Key Names

The following configuration options do not appear in the Windows user interface for the Simba ODBC Driver for Google BigQuery. They are accessible only when you use a connection string or configure a connection on macOS or Linux.

- Driver on page 62
- FilterTablesOnDefaultDataset on page 62
- Timeout on page 64
- UseQueryCache on page 64

Driver

Key Name	Default Value	Required
`Driver`	`Simba ODBC Driver for Google BigQuery` when installed on Windows, or the absolute path of the driver shared object file when installed on a non-Windows machine.	Yes

Description

On Windows, the name of the installed driver (`Simba ODBC Driver for Google BigQuery`).

On other platforms, the name of the installed driver as specified in `odbcinst.ini`, or the absolute path of the driver shared object file.

FilterTablesOnDefaultDataset

Key Name	Default Value	Required
`FilterTablesOnDefaultDataset`	`FALSE`	No

Description

This option determines whether the driver filters tables in the `SQLTables` call and columns in the `SQLColumns` call to return only tables and columns that belong to the default dataset.

- `FALSE`: The driver returns all tables in the `SQLTables` call and all columns in the `SQLColumns` call.
- `TRUE`: The driver only returns tables and columns that belong to the default dataset.

Note:

To filter tables and columns, you must define a default dataset. For details, see Dataset on page 51.

When this option is set to `TRUE`, the driver behaves as described below for the functions SQLTables and SQLColumns.

For the function SQLTables:

Catalog	Schema	Table	Table Type	Returned List
NULL	NULL	NULL or %	NULL or %	All tables that belong to the default dataset under the default catalog
%	NULL	NULL or %	NULL or %	All tables that belong to the default dataset under all catalogs
NULL	%	NULL or %	NULL or %	All tables that belong to all schemas under the default catalog
%	%	NULL or %	NULL or %	All tables that belong to all schemas under all catalogs
NULL	<schema>	NULL or %	NULL or %	All tables that belong to the specified schema under the default catalog
<catalog>	<schema>	NULL or %	NULL or %	All tables that belong to the specified schema under the specified catalog

For the function SQLColumns:

Catalog	Schema	Table	Column	Returned List
NULL	NULL	NULL	NULL	All columns of all tables that belong to the default dataset under the default catalog
<catalog>	NULL	NULL	NULL	All columns of all tables that belong to the default dataset under the speficied catalog
NULL	%	NULL	NULL	All columns of all tables that belong to all datasets under the default catalog

Catalog	Schema	Table	Column	Returned List
<catalog>	%	NULL	NULL	All columns of all tables that belong to all datasets under the specified catalog
NULL	<schema>	NULL	NULL	All columns of all tables that belong to the specified dataset under the default catalog
<catalog>	<schema>	NULL	NULL	All columns of all tables that belong to the specified dataset under the specified catalog

Timeout

Key Name	Default Value	Required
`Timeout`	`300`	No

Description

The length of time, in seconds, for which the driver retries a failed API call before timing out. The specified value must be an integer. A value of 0 indicates no timeout.

UseQueryCache

Key Name	Default Value	Required
`UseQueryCache`	`1`	No

Description

This option determines whether the driver uses the query cache when retrieving results.

- `1`: The driver uses cached query results, if they are available.
- `0`: The driver does not use the query cache.

For detailed information about cached query results, see "Using Cached Query Results" in the Google Cloud Platform documentation: https://cloud.google.com/bigquery/docs/cached-results.

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