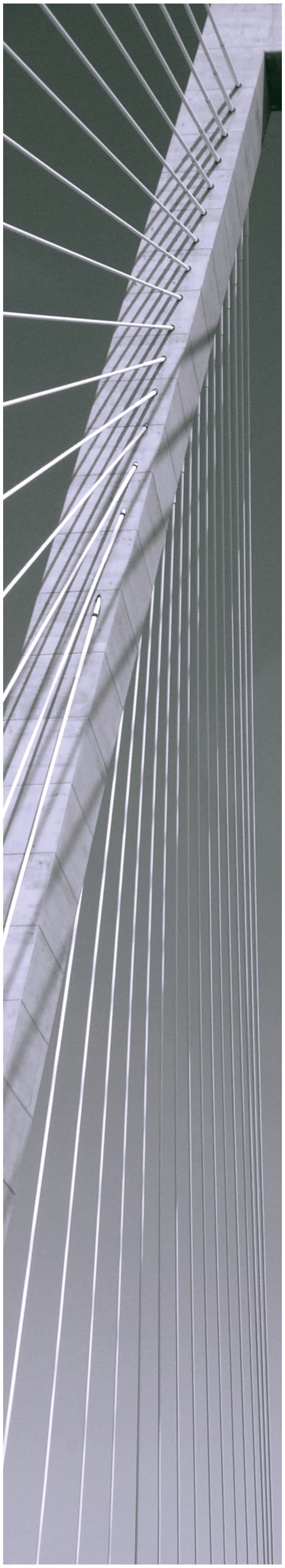

Simba Athena JDBC Driver with SQL Connector

Installation and Configuration Guide

Simba Technologies Inc.

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About This Guide

Purpose

The *Simba Athena JDBC Driver with SQL Connector Installation and Configuration Guide* explains how to install and configure the Simba Athena JDBC Driver with SQL Connector 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 Athena JDBC Driver.

Knowledge Prerequisites

To use the Simba Athena JDBC Driver, the following knowledge is helpful:

- Familiarity with the platform on which you are using the Simba Athena JDBC Driver
- Ability to use the data store to which the Simba Athena JDBC Driver 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 Athena JDBC Driver

About Amazon Athena

Amazon Athena is a serverless interactive query service capable of querying data from Amazon Simple Storage Service (S3) using SQL. It is designed for short, interactive queries that are useful for data exploration. Athena enables you to run ad-hoc queries and quickly analyze data that is stored in S3 without ETL processes. Query results are stored in an S3 bucket and made available for analysis in BI tools.

The data formats that Athena supports include CSV, JSON, Parquet, Avro, and ORC. Unlike traditional RDBMS or SQL-on-Hadoop solutions that require centralized schema definitions, Athena can query self-describing data as well as complex or multi-structured data that is commonly seen in big data systems. Moreover, Athena does not require a fully structured schema and can support semi-structured or nested data types such as JSON.

Amazon Athena processes the data in record batches and discovers the schema during the processing of each record batch. Thus, Athena has the capability to support changing schemas over the lifetime of a query. Athena reconfigures its operators and handles these situations to ensure that data is not lost.

Note:

- Access from Athena to your S3 data store is configured through Amazon Web Services (AWS). For information about enabling Athena to access S3 data stores, see the Amazon Athena documentation: http://docs.aws.amazon.com/athena/latest/ug/what-is.html.
- When using Athena, you are charged for each query that you run. The amount that you are charged is based on the amount of data scanned by the query. For more information, see *Amazon Athena Pricing*: https://aws.amazon.com/athena/pricing/.

About the Driver

The Simba Athena JDBC Driver enables organizations to connect their BI tools to the Amazon Athena query service, enabling Business Intelligence, analytics, and reporting on the data that Athena returns from Amazon S3 databases. If the AWS Glue service is available in the region and Athena has been migrated to use AWS Glue to manage the data catalog, then the driver retrieves catalog metadata via the AWS Glue service. Otherwise, the driver retrieves catalog metadata from the Athena-managed data catalog.

The Simba Athena JDBC 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* on the Simba Technologies website: https://www.simba.com/resources/data-access-standards-glossary.

The *Simba Athena JDBC Driver with SQL Connector Installation and Configuration Guide* is suitable for users who are looking to access data returned by the Athena query service from their desktop environment. Application developers may also find the information helpful. Refer to your application for details on connecting via JDBC.

System Requirements

Each machine where you use the Simba Athena JDBC Driver must have Java Runtime Environment (JRE) 7.0 or 8.0 installed. If you are using the driver with JDBC API version 4.2, then you must use JRE 8.0.

Simba Athena JDBC Driver Files

The Simba Athena JDBC Driver is delivered in the ZIP archive `SimbaAthenaJDBC-[Version].zip`, where *[Version]* is the version number of the driver.

This archive contains the fat JARs for all of the JDBC API versions that are supported by the driver: JDBC 4.1 and 4.2. Each JAR contains all of the required third-party libraries and dependencies for the driver.

Installing and Using the Simba Athena JDBC Driver

To install the Simba Athena JDBC Driver on your machine, extract the appropriate JAR file from the ZIP archive to the directory of your choice.

! **Important:**

If you received a license file through email, then you must copy the file into the same directory as the driver JAR file before you can use the Simba Athena JDBC Driver.

To access the Athena service using the Simba Athena JDBC Driver, you need to configure the following:

- The list of driver library files (see Referencing the JDBC Driver Libraries on page 12)
- The `Driver` or `DataSource` class (see Registering the Driver Class on page 13)
- The connection URL for the driver (see Building the Connection URL on page 14)

You can use the Simba Athena JDBC Driver in a JDBC application or a Java application.

- For an example workflow that demonstrates how to use the driver in a JDBC application, see Example: Using the Driver in SQL Workbench on page 15.
- For code examples that demonstrate how to use the driver in a Java application, see Examples: Using the Driver in a Java Application on page 21.

Referencing the JDBC Driver Libraries

Before you use the Simba Athena JDBC Driver, the JDBC application or Java code that you are using to connect to your data must be able to access the driver JAR file. In the application or code, specify the appropriate fat JAR file for the JDBC version that you are using.

Using the Driver in a JDBC Application

Most JDBC applications provide a set of configuration options for adding a list of driver library files. Use the provided options to include the appropriate fat JAR file from the ZIP archive as part of the driver configuration in the application. For more information, see the documentation for your JDBC application.

Using the Driver in Java Code

You must include all the driver library files in the class path. This 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 appropriate Java SE Documentation.

For Java SE 7:

- 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

For Java SE 8:

- For Windows: http://docs.oracle.com/javase/8/docs/technotes/tools/windows/classpath.html
- For Linux and Solaris: http://docs.oracle.com/javase/8/docs/technotes/tools/solaris/classpath.html

Registering the Driver Class

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

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

The driver supports the following fully-qualified class names (FQCNs) that are independent of the JDBC version:

- `com.simba.athena.jdbc.Driver`
- `com.simba.athena.jdbc.DataSource`

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

```
private static Connection connectViaDM() throws Exception
{
   Connection connection = null;
   Class.forName(DRIVER_CLASS);
   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;
   Class.forName(DRIVER_CLASS);
   DataSource ds = new com.simba.athena.jdbc.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.

Standard Connection String

The following is the format of the connection URL for the Simba Athena JDBC Driver:

```
jdbc:awsathena://AwsRegion=[Region];User=
[AccessKey];Password=[SecretKey];S3OutputLocation=[Output];
[Property1]=[Value1];[Property2]=[Value2];...
```

Using an Endpoint URL

The following is the format of a connection URL using an endpoint.

```
jdbc:awsathena://athena.[Region].amazonaws.com:443;User=
[AccessKey];Password=[SecretKey];S3OutputLocation=[Output];
[Property1]=[Value1];[Property2]=[Value2];...
```

Note:

If both AwsRegion and endpoint are present the AWSRegion takes precedence.

The variables are defined as follows:

- *[Region]* is the AWS region of the Athena instance that you want to connect to.
- *[AccessKey]* is the access key provided by your AWS account.
- *[SecretKey]* is the secret key provided by your AWS account.
- *[Output]* is the path of the Amazon S3 location where you want to store query results, prefixed by `s3://`.
- *[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 54.

! Important:

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

Example: Using the Driver in SQL Workbench

SQL Workbench is one of many applications that use drivers to query and view data. The instructions below provide general guidelines for configuring and using the Simba Athena JDBC Driver in SQL Workbench.

Before You Begin

Before you can use the driver in SQL Workbench, you must do the following:

- Download and install SQL Workbench. You can download the application from http://www.sql-workbench.net/downloads.html.
- Download and extract the driver ZIP archive (`SimbaAthenaJDBC-`*`[Version]`*`.zip`) into the SQL Workbench directory.
- Set up the Athena service. For more information, see "Setting Up" in the Amazon Athena Documentation: http://docs.aws.amazon.com/athena/latest/ug/setting-up.html.

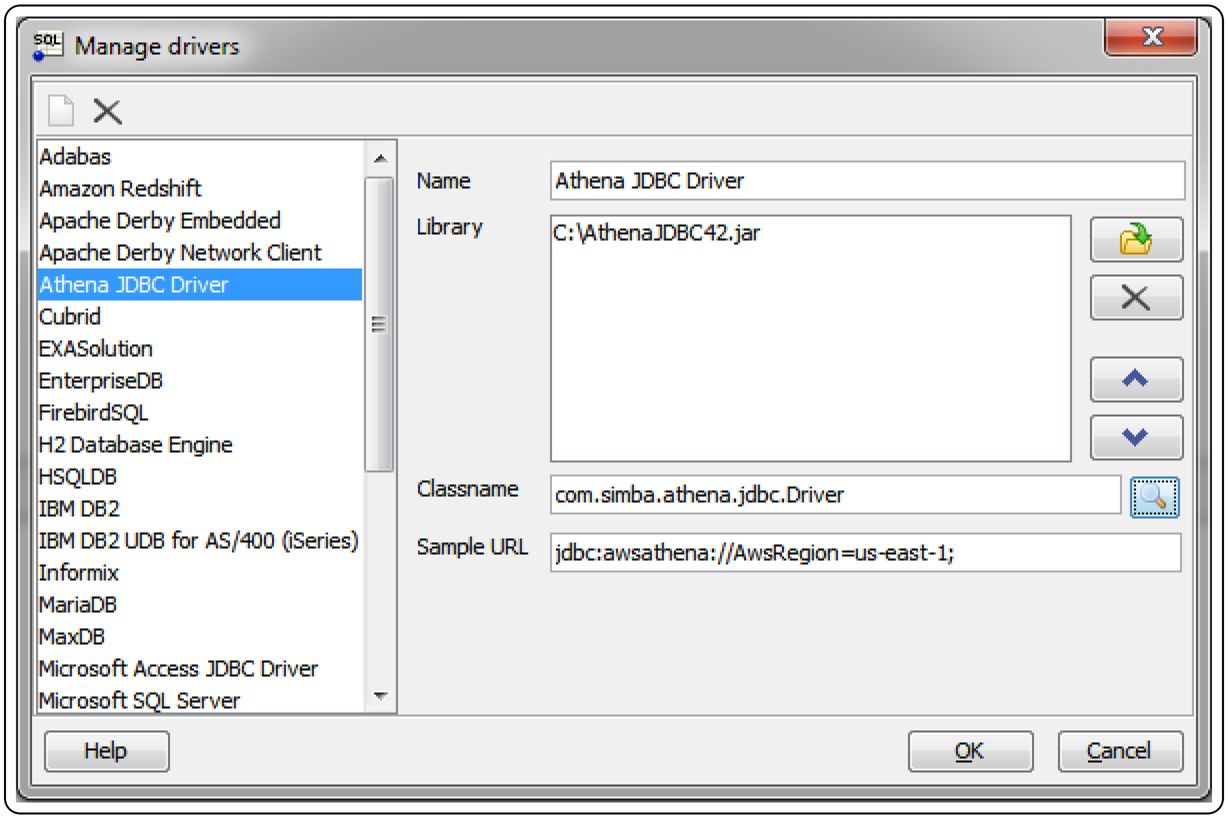
Configuring SQL Workbench to Use the Driver

Add the Simba Athena JDBC Driver to the list of drivers in SQL Workbench, and then create a connection profile that contains the necessary connection information.

To configure SQL Workbench to use the driver:

1. In SQL Workbench, select **File > Manage Drivers**.
2. In the Manage Drivers dialog box, specify the following values in the fields:

Field Name	Value
Name	A name that you want to use to identify the Simba Athena JDBC Driver in SQL Workbench. For example, **Athena JDBC Driver**.
Library	The full path and name of the `AthenaJDBC` *`[APIVersion]`*`.jar` file, where *[APIVersion]* is the JDBC version number that the driver supports. For example, **AthenaJDBC42.jar** for the driver that supports JDBC 4.2.
Classname	**com.simba.athena.jdbc.Driver**
Sample URL	A connection URL that only specifies the AWS region of the Athena instance that you want to connect to, using the format `jdbc:awsathena://AwsRegion=`*`[Region]`*`;`. For example, **jdbc:awsathena://AwsRegion=us-east-1;**.

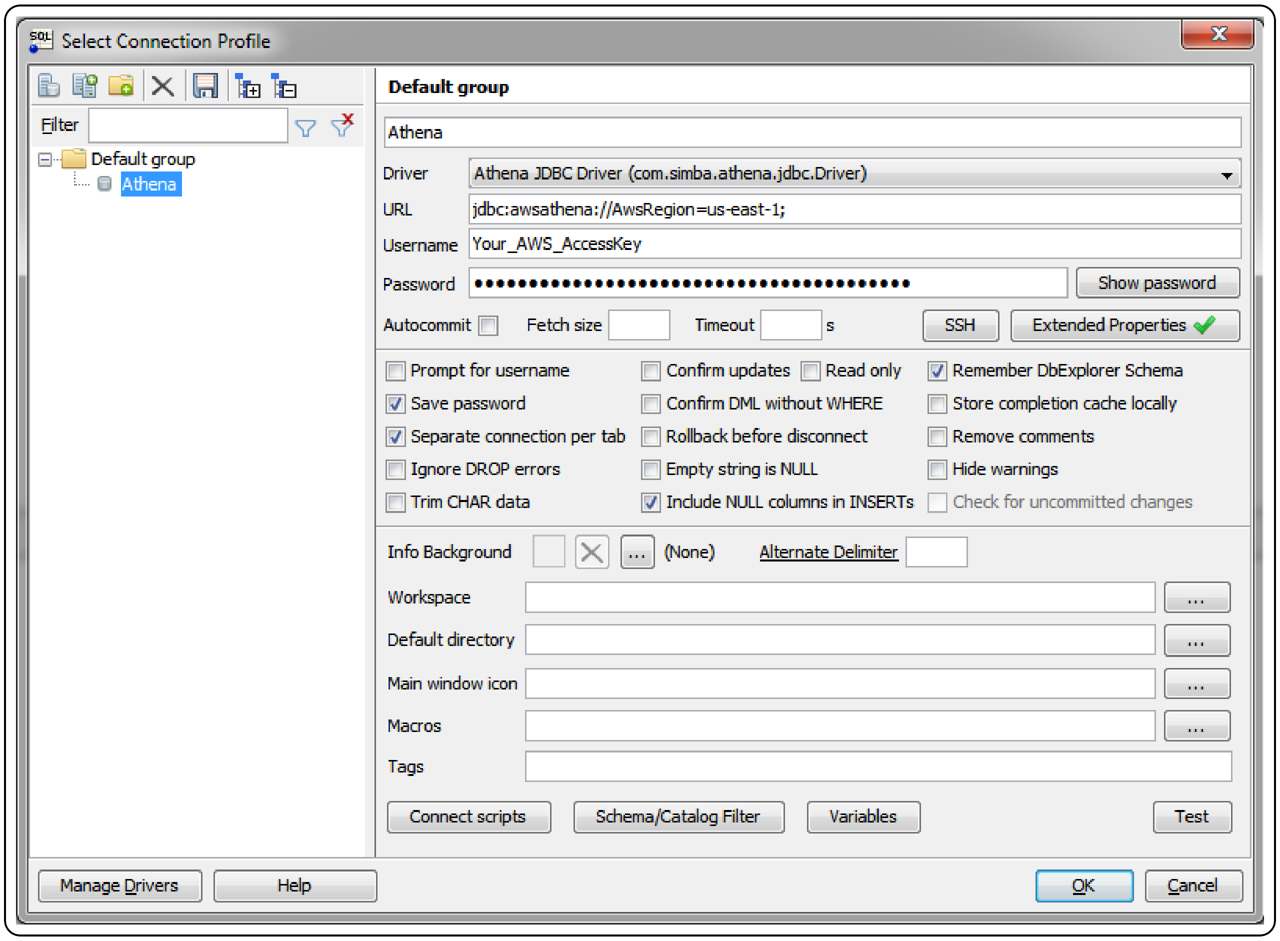


Adabas
Amazon Redshift
Apache Derby Embedded
Apache Derby Network Client
Athena JDBC Driver
Cubrid
EXASolution
EnterpriseDB
FirebirdSQL
H2 Database Engine
HSQLDB
IBM DB2
IBM DB2 UDB for AS/400 (iSeries)
Informix
MariaDB
MaxDB
Microsoft Access JDBC Driver
Microsoft SQL Server

Name	Athena JDBC Driver
Library	C:\AthenaJDBC42.jar
Classname	com.simba.athena.jdbc.Driver
Sample URL	jdbc:awsathena://AwsRegion=us-east-1;

3. Click **OK** to save your settings and close the Manage Drivers dialog box.
4. Click **File > Connect Window**.
5. In the Select Connection Profile dialog box, create a new connection profile named "Athena".
6. From the **Driver** drop-down list, select the driver that you configured in step 2. The driver is listed with the name that you specified in step 2, followed by the classname.
7. To specify required connection information, specify the following values in the fields:

Field Name	Value
URL	A connection URL that only specifies the AWS region of the Athena instance that you want to connect to, using the format `jdbc:awsathena://AwsRegion=[Region];`. For example, **jdbc:awsathena://AwsRegion=us-east-1;**. By default, this field is automatically populated with the Sample URL value that you specified for the selected driver.
Username	The access key provided by your AWS account.
Password	The secret key provided by your AWS account.



Athena
Driver: Athena JDBC Driver (com.simba.athena.jdbc.Driver)
URL: jdbc:awsathena://AwsRegion=us-east-1;
Username: Your_AWS_AccessKey
Password: ••
Autocommit ☐ Fetch size Timeout s

☐ Prompt for username ☐ Confirm updates ☐ Read only ☑ Remember DbExplorer Schema
☑ Save password ☐ Confirm DML without WHERE ☐ Store completion cache locally
☑ Separate connection per tab ☐ Rollback before disconnect ☐ Remove comments
☐ Ignore DROP errors ☐ Empty string is NULL ☐ Hide warnings
☐ Trim CHAR data ☑ Include NULL columns in INSERTs ☐ Check for uncommitted changes

Workspace
Default directory
Main window icon
Macros
Tags

8. Click **Extended Properties**, and add a property named `S3OutputLocation`. Set the value of this property to the path of the Amazon S3 location where you want to store query results, prefixed by `s3://`.

   For example, to store Athena query results in a folder named "test-folder-1" inside an S3 bucket named "query-results-bucket", you would set the `S3OutputLocation` property to `s3://query-results-bucket/test-folder-1`.
9. Click **OK** to save your settings and close the Edit Extended Properties dialog box.
10. Click **OK** to save your connection profile and close the Select Connection Profile dialog box.

You can now use the Simba Athena JDBC Driver in SQL Workbench to query and view data.

Querying Data with SQL Workbench

Use the Statement window in SQL Workbench to execute queries on your data. You can also execute CREATE statements to add new tables, and create and use custom databases.

Note:

By default, the driver queries the default database. To distinguish between tables in the default and custom databases, when writing your queries, use the database identifier as a namespace prefix to your table name.

To query data with SQL Workbench:

1. In the Statement window, type a query that creates a table in the default database. For example:

```
CREATE EXTERNAL TABLE IF NOT EXISTS integer_table (
   KeyColumn STRING,
   Column1 INT)
   ROW FORMAT SERDE
   'org.apache.hadoop.hive.serde2.lazy.LazySimpleSerDe'
   WITH SERDEPROPERTIES ('serialization.format' = ',',
   'field.delim' = ',')
   LOCATION 's3://athena-examples/integer_table/'
```

2. Click **Execute**.
3. Run a simple query to retrieve some data, and then view the results. For

example:

```
SELECT * FROM integer_table
```

You can now view details about the retrieved data in the Data Explorer tab, as described below.

Exploring Data with SQL Workbench

Use the Data Explorer tab to view details about your retrieved data.

To explore data with SQL Workbench:

1. Select the **Data Explorer** tab, and then select the default schema (or database).
2. Select the **integer_table** table. SQL Workbench loads the Columns tab, which shows the table schema.

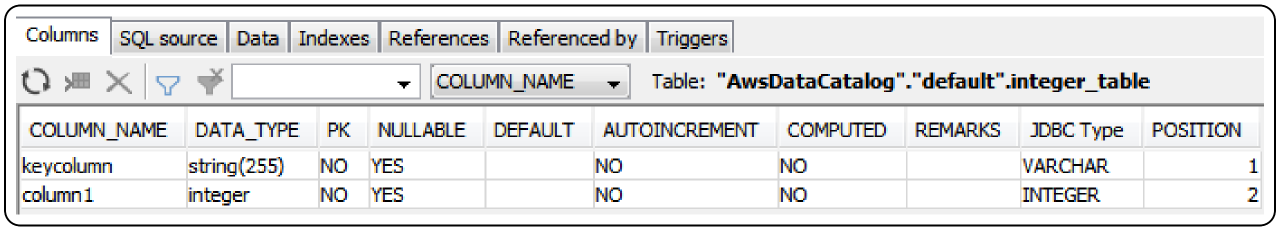
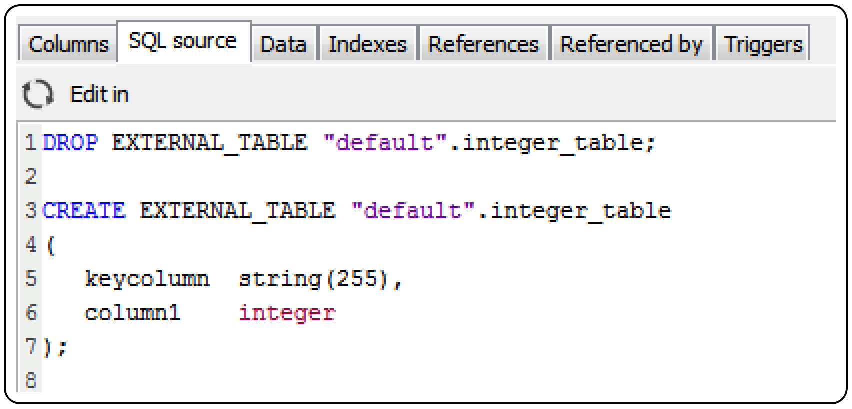


Table: "AwsDataCatalog"."default".integer_table

COLUMN_NAME	DATA_TYPE	PK	NULLABLE	DEFAULT	AUTOINCREMENT	COMPUTED	REMARKS	JDBC Type	POSITION
keycolumn	string(255)	NO	YES		NO	NO		VARCHAR	1
column1	integer	NO	YES		NO	NO		INTEGER	2

3. Select the other tabs to view more information about the integer_table table. For example:
   - Select the **SQL Source** tab to view the queries that were used to generate the table.



```
DROP EXTERNAL_TABLE "default".integer_table;

CREATE EXTERNAL_TABLE "default".integer_table
(
   keycolumn  string(255),
   column1    integer
);

```

- Select the **Data** tab to view a list of the rows returned from the table.

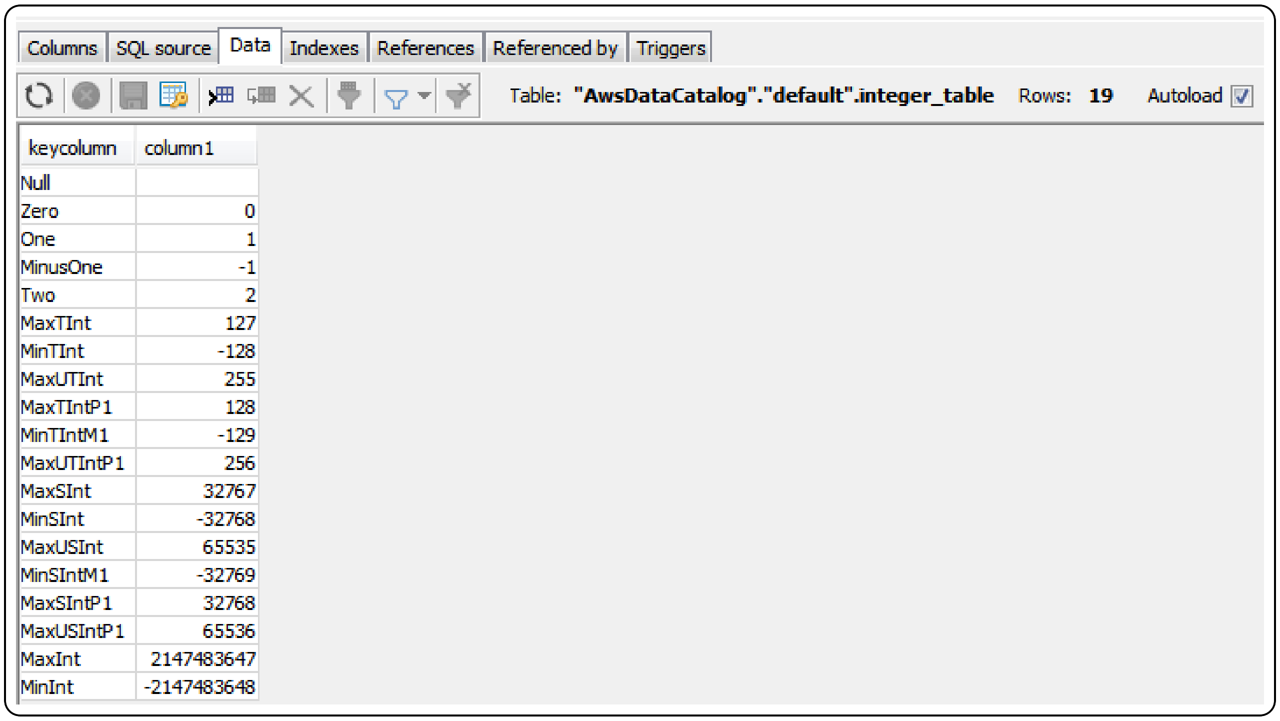


Table: **"AwsDataCatalog"."default".integer_table** Rows: **19**

keycolumn	column1
Null	
Zero	0
One	1
MinusOne	-1
Two	2
MaxTInt	127
MinTInt	-128
MaxUTInt	255
MaxTIntP1	128
MinTIntM1	-129
MaxUTIntP1	256
MaxSInt	32767
MinSInt	-32768
MaxUSInt	65535
MinSIntM1	-32769
MaxSIntP1	32768
MaxUSIntP1	65536
MaxInt	2147483647
MinInt	-2147483648

You can repeat the procedures described above to retrieve and explore different data using the Simba Athena JDBC Driver in SQL Workbench.

Examples: Using the Driver in a Java Application

The following code examples demonstrate how to use the Simba Athena JDBC Driver in a Java application:

- Example: Creating a Driver on page 21
- Examples: Using a Credentials Provider on page 22
- Example: Executing a SELECT Query on page 25
- Example: Running a CREATE Statement on page 25
- Example: Listing Tables on page 26

Example: Creating a Driver

This example demonstrates how to create an instance of the Simba Athena JDBC Driver in a Java application:

```
Properties info = new Properties();
info.put("User", "AWSAccessKey");
info.put("Password", "AWSSecretAccessKey");
info.put("S3OutputLocation", "s3://my-athena-result-
bucket/test/");

Class.forName("com.simba.athena.jdbc.Driver");

Connection connection = DriverManager.getConnection
("jdbc:awsathena://AwsRegion=us-east-1;", info);
```

Examples: Using a Credentials Provider

The following examples demonstrate different ways of using a credentials provider that implements the AWSCredentialsProvider interface with the JDBC driver:

- Example: DefaultAWSCredentialsProviderChain on page 22
- Example: PropertiesFileCredentialsProvider on page 22
- Example: InstanceProfileCredentialsProvider on page 23
- Example: CustomSessionCredentialsProvider on page 23
- Example: Session token provided in profile on page 25

For more information about configuring the driver to authenticate your connection using a credentials provider, see Using the AWSCredentialsProvider Interface on page 28.

Example: DefaultAWSCredentialsProviderChain

This example demonstrates how to use the DefaultAWSCredentialsProviderChain. You do not need to supply any credential provider arguments because they are taken from one of the locations in the default credentials provider chain. For detailed information about configuring default credentials, see "Using the Default Credential Provider Chain" in the *AWS SDK for Java Developer Guide*: http://docs.aws.amazon.com/sdk-for-java/v1/developer-guide/credentials.html#credentials-default.

```
Properties info = new Properties();
info.put("AwsCredentialsProviderClass",
"com.simba.athena.amazonaws.auth.DefaultAWSCredentialsProvid
erChain");
```

Example: PropertiesFileCredentialsProvider

This example demonstrates how to use the PropertiesFileCredentialsProvider, which uses only one argument and obtains the required credentials from a file:

```
Properties info = new Properties();
```

```
info.put("AwsCredentialsProviderClass",
"com.simba.athena.amazonaws.auth.PropertiesFileCredentialsPr
ovider");
info.put("AwsCredentialsProviderArguments",
"/Users/myUser/.athenaCredentials");
```

With the implementation shown above, the credentials provider obtains the required credentials from a file named `/Users/myUser/.athenaCredentials`, which should contain the following text:

```
accessKey=[YourAccessKey]
secretKey=[YourSecretKey]
```

The variables are defined as follows:

- *[YourAccessKey]* is the access key provided by your AWS account.
- *[YourSecretKey]* is the secret key provided by your AWS account.

Example: InstanceProfileCredentialsProvider

This example demonstrates how to use the InstanceProfileCredentialsProvider. You do not need to supply any credential provider arguments because they are provided using the EC2 instance profile for the instance on which you are running your application. However, you still need to set the `AwsCredentialsProviderClass` property to this class name.

```
Properties info = new Properties();
info.put("AwsCredentialsProviderClass",
"com.simba.athena.amazonaws.auth.InstanceProfileCredentialsP
rovider");
```

Example: CustomSessionCredentialsProvider

CustomSessionsCredentialsProvider is not included with the driver, so you must create it before you can use it.

The credentials object can use either BasciSessionCredentials or AWSCredentials.

This example demonstrates how to create a custom credentials provider named CustomSessionCredentialsProvider that uses an access key, secret key, and session token:

```
package com.example;

import import com.amazonaws.auth.AWSCredentials;
import com.amazonaws.auth.AWSCredentialsProvider;
import
com.simba.athena.amazonaws.auth.BasicSessionCredentials;

public class CustomSessionCredentialsProvider implements
AWSCredentialsProvider
{
    private BasicSessionCredentials m_credentials;
     // AWSCredentials can also be used instead of
BasicSessionCredentials
     //Set aws_credentials_provider_class =
"com.amazonaws.custom.athena.jdbc.CustomIAMRoleAssumptionSAM
LCredentialsProvider"
     // set AwsCredentialsProviderArguments =
"<accessID>,<secretKey>,<sessionToken>"

    public CustomSessionCredentialsProvider(
        String awsAccessKey,
        String awsSecretKey,
        String sessionToken)
    {
        m_credentials =
            new BasicSessionCredentials(
                awsAccessKey,
                awsSecretKey,
                sessionToken);
    }

    @Override
    public AWSCredentials getCredentials()
    {
        return m_credentials;
    }

    @Override
    public void refresh(){
          //Use this method if refresh token
     }
}
```

The following example demonstrates how to use CustomSessionCredentialsProvider after it has been created:

```
Properties info = new Properties();
info.put("AwsCredentialsProviderClass",
"com.example.CustomSessionCredentialsProvider");
String providerArgs = "My_Access_Key," + "My_Secret_Key," +
"My_Token";
info.put("AwsCredentialsProviderArguments", providerArgs);
```

Example: Session token provided in profile

This example demonstrates how to connect with a session token provided in a profile.

Connection string:

```
jdbc:awsathena://AwsRegion=us-east-
1;S3OutputLocation=s3://my-athena-
resultbucket/test/;AwsCredentialsProviderClass=com.simba.ath
ena.amazonaws.auth.profile.ProfileCredentialsProvider;AwsCre
dentialsProviderArguments=simba_session;
```

Profile:

```
[simba_session]
aws_access_key_id=[YourAccessKey]
aws_secret_access_key=[YourSecretKey]
aws_session_token=[YourSessionToken]
```

Example: Executing a SELECT Query

This example demonstrates how to execute a SELECT query:

```
Statement statement = connection.createStatement();
ResultSet queryResults = statement.executeQuery("SELECT *
FROM integer_table");
```

Example: Running a CREATE Statement

This example demonstrates how to run a CREATE statement:

```
Statement statement = connection.createStatement();
ResultSet queryResults = statement.executeQuery("CREATE
EXTERNAL TABLE IF NOT EXISTS tableName (Col1 String)
LOCATION 's3://bucket/tableLocation'");
```

Example: Listing Tables

This example demonstrates how to list the tables from the result set of a query:

```
import java.sql.*;
import java.util.Properties;

public class AthenaJDBCDemo {

   static final String athenaUrl =
   "jdbc:awsathena://AwsRegion=us-east-1;";

   public static void main(String[] args) {

      Connection conn = null;
      Statement statement = null;

      try {
         Class.forName("com.simba.athena.jdbc.Driver");
         Properties info = new Properties();
         info.put("S3OutputLocation", "s3://my-athena-
         result-bucket/test/");
         info.put("LogPath", "/Users/myUser/athenaLog");
         info.put("LogLevel","6");
         info.put
         ("AwsCredentialsProviderClass","com.simba.athena.am
         azonaws.auth.PropertiesFileCredentialsProvider");
         info.put
         ("AwsCredentialsProviderArguments","/Users/myUser/.
         athenaCredentials");
         String databaseName = "default";

         System.out.println("Connecting to Athena...");
         conn = DriverManager.getConnection(athenaUrl,
         info);

         System.out.println("Listing tables...");
         String sql = "show tables in "+ databaseName;
         statement = conn.createStatement();
         ResultSet rs = statement.executeQuery(sql);

         while (rs.next()) {
            //Retrieve table column.
            String name = rs.getString("tab_name");

            //Display values.
            System.out.println("Name: " + name);
         }
         rs.close();
         conn.close();
      } catch (Exception ex) {
         ex.printStackTrace();
      } finally {
         try {
            if (statement != null)
               statement.close();
         } catch (Exception ex) {

         }
         try {
            if (conn != null)
               conn.close();
         } catch (Exception ex) {

            ex.printStackTrace();
         }
      }
      System.out.println("Finished connectivity test.");
   }
}
```

Configuring Authentication

To access data from Athena, you must authenticate the connection. You can configure the Simba Athena JDBC Driver to provide your credentials and authenticate the connection using one of the following methods:

- Using IAM Credentials on page 28
- Using the AWSCredentialsProvider Interface on page 28
- Using the Active Directory Federation Services (AD FS) Credentials Provider on page 31

Using IAM Credentials

You can configure the driver to authenticate the connection using an access key and a secret key that are specified directly in the connection information.

To configure authentication using IAM credentials:

1. Set the `User` property to the access key provided by your AWS account.
2. Set the `Password` property to the secret key provided by your AWS account.

Using the AWSCredentialsProvider Interface

You can configure the driver to authenticate the connection using a class that implements the AWSCredentialsProvider interface. For detailed information about this interface, see the Amazon AWS documentation for Interface AWSCredentialsProvider: http://docs.aws.amazon.com/AWSJavaSDK/latest/javadoc/com/amazonaws/auth/AWSCredentialsProvider.html.

To configure authentication using the AWSCredentialsProvider interface:

1. Set the `AwsCredentialsProviderClass` property to a fully qualified class name that implements the AWSCredentialsProvider interface. This class can be an implementation from the AWS SDK, or a custom implementation.

   Note:

   The AWS SDK is shaded and packaged in the driver JAR file. However, if your project has its own AWS SDK dependency, it is recommended that you use that class implementation instead of the one that is shaded in the driver. The shaded AWS SDK is intended to be used internally by the driver, and might not be optimal for other use cases.

2. If necessary, set the `AwsCredentialsProviderArguments` property to a comma-separated list of String arguments for the constructor of the AwsCredentialsProviderClass.

   Be aware of the following restrictions:

   - The driver only supports String arguments for the constructor parameters.
   - Multiple arguments must be separated by a comma (`,`).
   - Surrounding spaces are not included in the parsed arguments.
   - To escape a single character, use a backslash (`\`) before that character. To indicate a backslash in an argument, use two backslashes (`\\`).
   - To escape all commas in an argument, enclose the argument in quotation marks (`"`). To indicate a quotation mark in a quoted argument, use a backslash (`\`) before that quotation mark.

For more detailed instructions about how to configure authentication using various implementations of the AWSCredentialsProvider interface, see the following:

- Using DefaultAWSCredentialsProviderChain on page 29
- Using PropertiesFileCredentialsProvider on page 30
- Using InstanceProfileCredentialsProvider on page 30
- Using a Custom Credentials Provider on page 31

For code examples that demonstrate how to use each type of credentials provider in a Java application, see Examples: Using the Driver in a Java Application on page 21.

Using DefaultAWSCredentialsProviderChain

To configure authentication using DefaultAWSCredentialsProviderChain:

1. Set the `AwsCredentialsProviderClass` property to `com.simba.athena.amazonaws.auth.DefaultAWSCredentialsProviderChain`.
2. Do not set the `AwsCredentialsProviderArguments` property.

   The arguments are taken from one of the locations in the default credentials provider chain. For detailed information about configuring default credentials, see "Using the Default Credential Provider Chain" in the *AWS SDK for Java Developer Guide*: http://docs.aws.amazon.com/sdk-for-java/v1/developer-guide/credentials.html#credentials-default.

For a code example that demonstrates how to use the DefaultAWSCredentialsProviderChain in a Java application, see Example: DefaultAWSCredentialsProviderChain on page 22.

Using PropertiesFileCredentialsProvider

To configure authentication using PropertiesFileCredentialsProvider:

1. Create a text file called `athenaCredentials.props`. This file should contain the following text:

   ```
   accessKey = [AccessKey]
   secretKey = [SecretKey]
   ```

   The variables are defined as follows:

   - *[AccessKey]* is the access key provided by your AWS account.
   - *[SecretKey]* is the secret key provided by your AWS account.
2. Set the `AwsCredentialsProviderClass` property to `com.simba.athena.amazonaws.auth.PropertiesFileCredentialsProvider`.
3. Set the `AwsCredentialsProviderArguments` property to the full path and filename of the `athenaCredentials.props` file. For example, `"/Users/skroob/athenaCredentials.props"`.

For a code example that demonstrates how to use the PropertiesFileCredentialsProvider in a Java application, see Example: PropertiesFileCredentialsProvider on page 22.

Using InstanceProfileCredentialsProvider

To configure authentication using InstanceProfileCredentialsProvider:

1. Set the `AwsCredentialsProviderClass` property to `com.simba.athena.amazonaws.auth.InstanceProfileCredentialsProvider`.
2. Do not set the `AwsCredentialsProviderArguments` property.

   The arguments are provided by the EC2 instance profile for the instance on which you are running your application. For more detailed information about configuring InstanceProfileCredentialsProvider, see "IAM Roles for Amazon EC2" in the *Amazon Elastic Compute Cloud User Guide for Linux Instances*: http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/iam-roles-for-amazon-ec2.html.

For a code example that demonstrates how to use the InstanceProfileCredentialsProvider in a Java application, see Example: InstanceProfileCredentialsProvider on page 23.

Using a Custom Credentials Provider

This example shows a custom credentials provider, CustomSessionsCredentialsProvider, that uses an access and secret key in addition to a session token. CustomSessionsCredentialsProvider is shown for example only and is not included in the driver. You must create custom providers before you can use them.

To configure authentication using a custom credentials provider:

1. Create a credentials provider called CustomSessionsCredentialsProvider that uses an access key, secret key, and session token for authentication.
2. In the connection URL, set the `AwsCredentialsProviderClass` property to `com.example.CustomSessionCredentialsProvider`.
3. Set the `AwsCredentialsProviderArguments` property to `"My_Access_Key, My_Secret_Key, My_Token"`.
4. Generate My_Access_Key, My_Secret_Key and My_Token using AWS Security Token Service. For detailed instructions, see "Temporary Security Credentials" in the *AWS Identity and Access Management User Guide*: http://docs.aws.amazon.com/IAM/latest/UserGuide/id_credentials_temp.html.

For code examples that demonstrate how to create and use the CustomSessionCredentialsProvider in a Java application, see Example: CustomSessionCredentialsProvider on page 23.

To use a custom credential provider in an application that has a graphical user interface (GUI), start by exporting the implementation as a JAR file. Then, using the options in the application, include that JAR file along with the driver JAR files.

Using the Active Directory Federation Services (AD FS) Credentials Provider

You can configure the driver to authenticate the connection using credentials obtained from the AD FS credentials provider. To do this, connect to Athena using a connection URL that does either of the following:

- Includes property settings that specify information about the AD FS service. For more information, see Specifying AD FS Information in the Connection URL on page 32.
- Refers to an AWS profile that specifies information about the AD FS service. For more information, see Specifying AD FS Information in an AWS Profile on page 34.

! Important:

- If any information is included in both places, the information specified directly in the connection URL takes precedence over the information in the profile.
- If the connection URL refers to an AWS profile, then the `AWSCredentialsProviderClass` property must be specified in the profile instead of the connection URL.

When the driver connects to Athena, it retrieves temporary credentials from the AD FS credentials provider. If these credentials are associated with an IAM role that has permission to access Athena, the driver immediately uses these credentials to authenticate the connection to Athena. Otherwise, you must exchange the temporary credentials for more specialized AWS credentials, which can then be used to authenticate the connection. For post-SAML workflows such as exchanging temporary credentials for specialized ones, the driver provides a post-SAML workflow hook. For more information, see Using the Post-SAML Workflow Hook on page 37.

Specifying AD FS Information in the Connection URL

In your connection URL, set properties to specify information such as the host and port of the server where the AD FS service is hosted.

If your connection URL also specifies an AWS profile that contains some AD FS information, then the settings specified directly in the URL take precedence over the AD FS information in the profile, and the `AWSCredentialsProviderClass` property must be specified in the profile instead of the connection URL.

Note:

Some properties can be set through aliases, as described below. If you specify both a property name and its alias, the setting associated with the property name takes precedence.

To specify AD FS information in the connection URL:

➤ In your connection URL, set the following properties:

Property	Value
`AWSCredentialsProviderClass` As alternatives, you can configure this property using the aliases `aws_credentials_provider_class` or `plugin_name`. If you specify both aliases, the setting assocaited with `aws_credentials_provider_class` takes precedence.	The FQCN that implements the AD FS credentials provider.
`IdP_Host`	The host name of the AD FS service that you are using to authenticate the connection. The host name cannot include any slashes (`/`).
`IdP_Port`	The number of the port that the AD FS service host uses to listen for requests. The exact port number that you need to specify may differ depending on the AD FS server configuration. If you are not sure which port to specify, contact your system administrator.
`User` As an alternative, you can configure this property using the alias `UID`.	The user name that you use to access the AD FS server. You can include the domain name using the format *`[DomainName]\[UserName]`*. On Windows machines, if you do not provide a user name, the driver attempts to authenticate to the AD FS server using your Windows user name over the NTLM protocol.

Property	Value
`Password` As an alternative, you can configure this property using the alias `PWD`.	The password corresponding to your user name that you specified in the `User` or `UID` property. On Windows machines, if you do not provide a password, the driver attempts to authenticate to the AD FS server using your Windows password over the NTLM protocol.
`preferred_role`	The Amazon Resource Name (ARN) of the role that you want to assume when authenticated through AD FS.
`SSL_Insecure`	One of the following: • `false` if you want the driver to verify the server certificate. • `true` if you do not want the driver to verify the server certificate.

For example:

```
jdbc:awsathena://AwsRegion=us-east-1;S3OutputLocation=
s3://test;AwsCredentialsProviderClass=com.simba.athena.
iamsupport.plugin.AdfsCredentialsProvider;idp_host=
example.adfs.server;idp_port=443;User=HOME\jsmith;
Password=simba12345;preferred_role=
arn:aws:iam::123456789123:role/JSMITH;ssl_insecure=true;
```

When you connect to Athena, the driver retrieves temporary credentials from the AD FS provider. If these credentials are not associated with an IAM role that has permission to access Athena, then you must exchange them for more specialized AWS credentials before the driver can authenticate the connection. For infomation about how to complete this process, see Using the Post-SAML Workflow Hook on page 37.

Specifying AD FS Information in an AWS Profile

In your AWS credentials file, define a profile that specifies information such as the host and port of the server where the AD FS service is hosted, and your credentials for accessing the AD FS service. Then, in your connection URL, set the `profile` property to the name of that profile.

By default, the AWS credentials file is located in `~/.aws/credentials`. You can change this default behavior by setting the AWS_CREDENTIAL_PROFILES_FILE environment variable to the full path and name of a different credentials file. For more information about profiles, see "Working with AWS Credentials" in the *AWS SDK for Java Developer Guide*: https://docs.aws.amazon.com/sdk-for-java/v1/developer-guide/credentials.html.

If any AD FS information is also specified directly in your connection URL, those settings take precedence over the AD FS information in the profile.

Note:

Some properties can be set through aliases, as described below. If you specify both a property name and its alias, the setting associated with the property name takes precedence.

To specify AD FS information in an AWS profile:

1. In your AWS credentials file, define a profile that specifies the following property settings. Start by providing the name of the profile in brackets (`[ ]`), and then specify each property on separate lines.

Property	Value
`AWSCredentialsProviderClass` As alternatives, you can configure this property using the aliases `aws_credentials_provider_class` or `plugin_name`. If you specify both aliases, the setting assocaited with `aws_credentials_provider_class` takes precedence.	The FQCN that implements the AD FS credentials provider.
`IdP_Host`	The host name of the AD FS service that you are using to authenticate the connection. The host name cannot include any slashes (`/`).

Property	Value
`IdP_Port`	The number of the port that the AD FS service host uses to listen for requests. You can specify any port that is available on your AD FS server. If you are not sure which port to specify, contact your system administrator.
`User` As an alternative, you can configure this property using the alias `UID`.	The user name that you use to access the AD FS server. You can include the domain name using the format *`[DomainName]\[UserName]`*. On Windows machines, if you do not provide a user name, the driver attempts to authenticate to the AD FS server using your Windows user name over the NTLM protocol.
`Password` As an alternative, you can configure this property using the alias `PWD`.	The password corresponding to your user name that you specified in the `User` or `UID` property. On Windows machines, if you do not provide a password, the driver attempts to authenticate to the AD FS server using your Windows password over the NTLM protocol.
`preferred_role`	The Amazon Resource Name (ARN) of the role that you want to assume when authenticated through AD FS.

Property	Value
`SSL_Insecure`	One of the following: • `false` if you want the driver to verify the server certificate. • `true` if you do not want the driver to verify the server certificate.

For example, the following is an AWS profile named `plug-in-creds-lambda` that specifies all the required AD FS service information:

```
[plug-in-creds-lambda]
plugin_name=com.providers.AdfsLambdaCredentialProvider
idp_host=example.adfs.server
idp_port=443
preferred_role=arn:aws:iam::123456789123:role/JSMITH
user=HOME\jsmith
password=simba12345
```

2. In your connection URL, set the `profile` property to the name of the profile.

   For example:

```
jdbc:awsathena://AwsRegion=us-east-1;S3OutputLocation=
s3://test;profile=plug-in-creds-lambda;
```

When you connect to Athena, the driver checks the AWS credentials file for the specified profile, and then uses the AD FS information given in the profile to retrieve temporary credentials from the AD FS provider. If these credentials are not associated with an IAM role that has permission to access Athena, then you must exchange them for more specialized AWS credentials before the driver can authenticate the connection. For infomation about how to complete this process, see below.

Using the Post-SAML Workflow Hook

In some cases, after retrieving credentials through a SAML workflow, you may need to modify the credentials before they can actually be used to authenticate your connection to Athena. For example, if you retrieve temporary credentials from an AD FS provider, and these credentials are not associated with an IAM role that has permission to access Athena, you must exchange them for more specialized AWS credentials before you can authenticate the connection. The driver provides a post-SAML workflow hook that enables you to go through such processes.

To exchange the temporary credentials from AD FS for more specialized AWS credentials, do the following:

1. Extend the default AD FS credentials provider class. The FQCN of this class is:

   ```
   com.simba.athena.iamsupport.plugin.AdfsCredentialsProvider
   ```

2. Override the `performPostSAMLAction()` method with the post-SAML workflow hook. For details, see below.

Note:

For a complete implementation example, see Example: Implementing a Custom Credential Provider that uses the Post-SAML Workflow Hook on page 40.

To override the `performPostSAMLAction()` method, use a post-SAML workflow hook that includes your AD FS user name, the temporary credentials returned by the AD FS service, and a SAML assertion that determines how these credentials are exchanged for AWS credentials.

The function signature of the hook is as follows:

```
/**
 * Perform custom actions after the temporary credentials
 * are available.
 *
 * @param username             Your AD FS user name.
 * @param samlAssertion        The Base64-encoded SAML
 *                             assertion.
 * @param credentials          The temporary credentials from
 *                             the AssumeRoleWithSAML request.
 *
 * @return                     The CredentialsHolder wrapper
 *                             object containing the AWS
 *                             credentials.
 */
@Override
   protected CredentialsHolder performPostSAMLAction(
      String username,
      String samlAssertion,
      CredentialsHolder credentials) throws
      SdkClientException
```

! Important:

It is recommended that you specify `@Override`, as this enables the build to return an error if a class mismatch occurs.

This implementation causes the following to occur:

1. The AD FS credentials provider class obtains the following:
   - The SAML assertion from the AD FS provider.
   - The temporary credentials with the `AssumeRoleWithSAML` API from STS.
2. The specified AD FS user name, SAML assertion, and temporary credentials are passed into the `performPostSAMLAction()` method.
3. The method returns a `CredentialsHolder` wrapper object containing your AWS credentials for authenticating your connection to Athena.

   Note:

   If the method returns NULL, this indicates that your credentials were not exchanged. This can occur if you pass in credentials that do not need to be exchanged and can be used immediately for authentication. If NULL is being returned unexpectedly, make sure that the post-SAML workflow hook is implemented properly and that the correct parameter values are being passed in.
4. The driver authenticates the connection to Athena using the credentials returned by the implementation.

The FQCN of the `CredentialsHolder` is:

```
com.simba.athena.iamsupport.model.CredentialsHolder
```

The `CredentialsHolder` can optionally include an expiration date for the returned credentials. If the expiration date is not included, then the function signature is as follows:

```
/**
 * Creates a new instance of the CredentialsHolder.
 *
 * @param credentials       The AWS credentials.
 *
 * @return                  The CredentialsHolder.
 */
public static CredentialsHolder newInstance(AWSCredentials
credentials)
```

If the expiration date is included, then the function signature is as follows:

```
/**
 * Creates a new instance of the CredentialsHolder.
 *
 * @param credentials        The AWS credentials.
 * @param expiration         The expiration date.
 *
 * @return                   The CredentialsHolder.
 */
public static CredentialsHolder newInstance(AWSCredentials
credentials, Date expiration)
```

Example: Implementing a Custom Credential Provider that uses the Post-SAML Workflow Hook

The following Java example implements the AD FS Lambda credential provider with the post-SAML workflow hook. The AWS Lambda service exchanges the temporary credentials for AWS credentials, which are returned to the driver and are then used to access Athena.

```
import com.simba.athena.iamsupport.model.CredentialsHolder;
import com.simba.athena.iamsupport.plugin.AdfsCredentialsProvider;

/**
 * The ADFS Lambda Credential Provider.
 */
public class AdfsLambdaCredentialProvider extends AdfsCredentialsProvider
{
    /**
     * Perform custom actions after temporary credentials are available.
     *
     * @param username          Your AD FS user name.
     * @param samlAssertion     The Base64-encoded SAML assertion.
     * @param credentials       The temporary credentials from the assumeRoleWithSAML
     *                          request.
     *
     * @return The CredentialsHolder wrapper object that holds the new credentials.
     *         Returning null if no post-SAML action is performed.
     */
    @Override
    protected CredentialsHolder performPostSAMLAction(
        String username,
        String samlAssertion,
        CredentialsHolder credentials) throws SdkClientException
    {
        // Perform post-SAML work flow here.
        //
        //
        // AWSLambda client;
        try
        {
            // === Example:===
            // === Temporary Credentials from ADFS to BasicSessionCredentials: ===
            //
            AWSCredentials cred = new BasicSessionCredentials(
                credentials.getAccessKeyId(),
                credentials.getSecretAccessKey(),
                credentials.getSessionToken());

            // === Example===
            // === Example of a custom credentials provider communicating against a
            // === Lambda server with the temporaray credentials acquired from STS
            // === through the AD FS workflow. Then, it calls AthenaIAMRoleTest, a
            // === custom Lambda function implemented on the AWS Lambda service,
            // === using the tempoaray credentials to acquire a new set of
            // === credentials from the Lambda function. Finally, it returns the new
            // === credentials wrapped with CredentialsHolder class back to the
            // === AdfsCredentialsProvider to consume.
            //
            // // Building a lambda client.
            // AWSCredentialsProvider basic = new AWSStaticCredentialsProvider(cred);
            // AWSLambdaClientBuilder builder = AWSLambdaClientBuilder
            //    .standard()
            //    .withRegion(Regions.US_EAST_1)
            //    .withCredentials(basic);

            // client = builder.build();
            //
            // Result result;
            //
            // // Serialize a payload object and send it to the Lambda function
            // // AthenaIAMRoleTest.
            // Payload p = new Payload(username, samlAssertion, true);
            // String payload = s_objectMapper.writeValueAsString(p);
            // System.out.println("PAYLOAD -> " + payload);
            // InvokeRequest invReq = new InvokeRequest()
            //    .withFunctionName("AthenaIAMRoleTest")
            //    .withPayload(payload)
            //    .withRequestCredentialsProvider(basic);
            //
            // InvokeResult fnret = client.invoke(invReq);
            // String err = fnret.getFunctionError();
            // if (err != null)
            // {
            //     System.err.println("ERROR -> " + err);
            //  // Then we should throw an exception.
            // }
            // else
            // {
            //  // Process new credentials/roles returned by the Lambda function.
            //     ByteBuffer bb = fnret.getPayload();
            //     String data = CHARSET.decode(bb).toString();
            //     System.out.println("DATA -> " + data);
            //     JsonNode actualObj = s_objectMapper.readTree(data);
            //     result = new Result(actualObj);
            //     return CredentialsHolder.newInstance(result.getCredentials());
            // }


            // === Return the new credentials back to the driver: ===
            //
            // return CredentialsHolder.newInstance(
            //     new BasicAWSCredentials(
            //     newAccessKey,
            //     newSecretKey));
            //
            //
            // === Or, if the new credentials have expiration information ===
            // === Creates a new instance of the CredentialsHolder. ===
            // === @param credentials    The AWSCredentials. ===
            // === @param expiration     The credential expiration date. ===
            // === @return               The CredentialsHolder. ===
            //
            // return CredentialsHolder.newInstance(
            //    <AWSCredentials> credentials,
            //    <Date> expiration);
        }
        catch (SdkClientException e)
        {
            // === Exception handling. ===
        }
    }
}
```

Configuring Query Result Encryption

You can configure the Simba Athena JDBC Driver to encrypt your query results using any of the encryption protocols that Athena supports.

To configure query result encryption:

1. Set the `S3OutputEncOption` property to one of the following values.

Option Name	Description
SSE_S3	The driver uses server-side encryption with an Amazon S3-managed key.
SSE_KMS	The driver uses server-side encryption with an AWS KMS-managed key.
CSE_KMS	The driver uses client-side encryption with an AWS KMS-managed key.

   For detailed information about these encryption options, see "Configuring Encryption Options" in the *Amazon Athena User Guide*: http://docs.aws.amazon.com/athena/latest/ug/encryption.html.

2. If you specified `SSE_KMS` or `CSE_KMS` in the previous step, then set the `S3OutputEncKMSKey` property to the KMS key ARN or ID to use for encrypting data.

Configuring Proxy Connections

You can configure the driver to connect through a proxy server instead of connecting directly to the Athena service. When connecting through a proxy server, the driver supports basic authentication and NTLM authentication.

! Important:

If you are connecting to Athena through a proxy server, make sure that the proxy server does not block port 444. The result set streaming API uses port 444 on the Athena server for outbound communications. For more information, see UseResultsetStreaming on page 73.

To configure a proxy connection:

1. Set the `ProxyHost` property to the IP address or host name of your proxy server.
2. Set the `ProxyPort` property to the number of the TCP port that the proxy server uses to listen for client connections.
3. Optionally, to connect to certain hosts directly even when a proxy connection has been configured, set the `NonProxyHosts` property to a list of the hosts that you want to connect to directly.

   When specifying multiple hosts, each host must be separated by a pipe (`|`). You can specify patterns using asterisks (`*`) as wildcard characters. For example:

   ```
   NonProxyHosts=123.255.321.255|*.localhost|176.255.16.*
   ```
4. If the proxy server requires authentication, do the following:
   a. Set the `ProxyUID` property to your user name for accessing the server.
   b. Set the `ProxyPWD` property to your password for accessing the server.
   c. To configure the driver to use the NTLM protocol, do the following:
      i. Set the `ProxyDomain` property to the Windows domain name of the server.
      ii. Set the `ProxyWorkstation` property to the Windows workstation name of the server.
   d. To pre-emptively authenticate against the proxy server using basic authentication, set the `PreemptiveBasicProxyAuth` property to `1`.

If the proxy server is configured to intercept SSL-encrypted connections, then in addition to setting the connection properties described above, you must also create a keystore containing the root certificate from the proxy server.

To create a keystore for SSL interception:

1. From the proxy server, export the root certificate as a `.cer` file.
2. On your client machine, use the Java Keytool to create a keystore containing the exported root certificate:
   a. In a command-line interface, type the following command, and then press **ENTER**:

      ```
      [JDKInstallDir]\bin\keytool.exe -import -file
      [RootCertPath] -keystore [KeystorePath] -alias proxy
      ```

      Where:

      - *[JDKInstallDir]* is the full path to the directory where the Java Development Kit is installed.
      - *[RootCertPath]* is the full path and name of the root certificate file that was exported from the proxy server.
      - *[KeystorePath]* is the full path and name of the keystore that you want to create.

      For example:

      ```
      C:\Program Files\Java\jdk1.8.0\bin\keytool.exe -
      import -file
      C:\Users\jsmith\Documents\Athena\ProxyRoot.cer -
      keystore C:\Users\jsmith\AthenaKeystores -alias
      proxy
      ```

   b. When you are prompted to provide a password, type a password for restricting access to the keystore and then press **ENTER**.
   c. When you are prompted to confirm your choices, type **y** and then press **ENTER**.
3. Set the following Java system properties:

   ```
   javax.net.ssl.trustStore = [KeystorePath]
   ```

   ```
   javax.net.ssl.trustStorePassword = [KeystorePassword]
   ```

   Where:

   - *[KeystorePath]* is the full path and name of the keystore containing the exported root certificate.
   - *[KeystorePassword]* is the password for accessing the keystore.

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.

In the connection URL, set the `LogLevel` key to enable logging at the desired level of detail. The following table lists the logging levels provided by the Simba Athena JDBC Driver, 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.

Note:

If `UseAwsLogger` is set to `1`, the driver also logs information from AWS API calls.

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 path 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:awsathena://AwsRegion=us-east-
1;User=ABCABCABC123ABCABC45;Password=bCD+E1f2Gxhi3J4klmN
/OP5QrSTuvwXYzabcdEF;S3OutputLocation=s3://test-athena-
results/;LogLevel=3;LogPath=C:\\temp
```

3. Optionally, to include information about AWS API calls in the log, set `UseAwsLogger` to `1`.
4. To make sure that the new settings take effect, restart your JDBC application and reconnect to the server.

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

- An `AthenaJDBC_driver.log` file that logs driver activity that is not specific to a connection.
- An `AthenaJDBC_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. Set the `LogLevel` property to `0`.
2. To make sure that the new setting takes effect, restart your JDBC application and reconnect to the server.

Configuring Connection Timeouts and Retries

You can configure the driver to wait for connections to respond and when to reattempt establishing a connection, to help automate the connection process.

To configure a connection with timeout and retries:

1. Set the `ConnectionTimeout` property to amount of time, in seconds, that the driver should wait when establishing a connection before timing out the connection.
2. Set the `MaxErrorRetry` property to the maximum number of times that the driver resubmits a failed request that can be retried, such as a 5xx error from the Athena server.

Example: Connection URL with basic proxy connection properties defined:

```
jdbc:awsathena://AwsRegion=NA;User=1jt9Pcyq8pr3lvu143pfl4r86
;Password=1jt9Pcyq8pr3lvu143pfl4r86;S3OutputLocation=SSE_
S3;ConnectionTimeout=90;MaxErrorRetry=10;
```

Features

More information is provided on the following features of the Simba Athena JDBC Driver:

Catalog and Schema Support

The Simba Athena JDBC Driver supports both catalogs and schemas to make it easy for the driver to work with various JDBC applications. Amazon Athena organizes tables into schemas/databases, and lists them under the default catalog named AwsDataCatalog. The data catalog can either be managed by Athena, or by AWS Glue in regions and clusters where AWS Glue has been implemented. In either case, the catalog name is AwsDataCatalog. The driver provides access to all of the schemas/databases that are listed under this catalog, ensuring compatibility with standard BI tools.

File Formats

The Simba Athena JDBC Driver supports all the file formats that Athena supports, which include the following:

- Avro
- Comma-Separated Values (CSV)
- JavaScript Object Notation (JSON)
- Optimized Row Columnar (ORC)
- Parquet

Fetch Size

The Simba Athena JDBC Driver supports a maximum fetch size of 1000 rows. This is consistent with the maximum fetch size that is supported by the Athena service when the result set streaming API is not used (`UseResultsetStreaming=0`).

If you use the `setFetchSize()` method from the `Statement` class to set a fetch size greater than 1000 without using the result set streaming API, the Simba Athena

JDBC Driver limits the value to 1000. When the result set streaming API is used, the driver does not impose a maximum limit on the fetch size.

If the `setFetchSize()` method is not called on the Statement object, the default fetch size is 0. In this case the fetch size is set using the `RowsToFetchPerBlock` configuration option. For more information see RowsToFetchPerBlock on page 68.

Note:

While setting a large fetch size value when using the result set streaming API can give you better fetch performance, it can also result in higher memory usage. This can be mitigated if the JDBC application can retrieve the result set from the driver quickly.

Data Types

The Simba Athena JDBC Driver supports many common data formats, converting between Athena, JDBC, and Java data types.

The following table lists the supported data type mappings.

Athena Type	JDBC Type	Java Type
ARRAY	ARRAY or VARCHAR (See UseArraySupport on page 72)	java.sql.Array of strings or string
BIGINT	BIGINT	long
BINARY	VARBINARY	byte[]
BOOLEAN	BOOLEAN	boolean
CHAR	CHAR	string
DATE	DATE	java.sql.Date
DECIMAL (p, s)	DECIMAL	java.math.BigDecimal
DOUBLE	DOUBLE	double
FLOAT	REAL	float

Athena Type	JDBC Type	Java Type
INTEGER **Note:** Although Athena reports integer data as type INT, the driver reports integer data as type INTEGER to ensure compatibility with standard BI tools. For more information, see Integer Support on page 51.	INTEGER	int
MAP	VARCHAR	String
SMALLINT	SMALLINT	short
STRING	VARCHAR	String
STRUCT	VARCHAR	String
TIMESTAMP	TIMESTAMP	java.sql.Timestamp
TINYINT	TINYINT	byte
VARCHAR	VARCHAR	String

Integer Support

Athena combines two different implementations of the integer data type:

- In Data Definition Language (DDL) queries, Athena uses the INT data type from Apache Hive.
- In all other queries, Athena uses the INTEGER data type from Presto.

To support the CAST queries that are used in many BI tools, the driver reports integer data as type INTEGER even though Athena reports the data as type INT.

Be aware that, when executing DDL queries, you must specify integer data using INT as the data type.

Note:

Athena supports some but not all DDL statements. For a list of the supported DDL statements, see "SQL and HiveQL Reference" in the *Amazon Athena API Reference*: http://docs.aws.amazon.com/athena/latest/ug/language-reference.html.

Integration with AWS Glue

Support for AWS Glue is integrated into Simba Athena JDBC Driver. AWS Glue is a fully managed ETL (extract, transform, and load) service that makes it simple and cost-effective to categorize your data, clean it, enrich it, and move it reliably between various data stores.

For optimal detection of AWS Glue, the IAM user for the driver requires permissions for the `glue:GetCatalogImportStatus` API in its policy. The default AWS Managed Athena policy, `AmazonAthenaFullAccess`, does not grant access to this API by default. Refer to your Amazon Web Services documentation for information on how to grant API access in the policy settings. Without the proper permission to this API, the driver falls back to the legacy detection logic at connection time, which may impact driver performance.

For a full description of AWS Glue, see https://docs.aws.amazon.com/glue/latest/dg/what-is-glue.html.

For more information about AWS Glue integration, see https://docs.aws.amazon.com/en_us/athena/latest/ug/glue-athena.html.

Security and Authentication

To protect data from unauthorized access, Athena requires all connections to be authenticated using an access key and a secret key, and uses the SSL protocol that is implemented in Amazon Web Services. The Simba Athena JDBC Driver protects your data by providing support for these authentication protocols and further obscuring data from unwanted access by providing encryption options for your query results.

The driver provides mechanisms that enable you to authenticate your connection using either an AWS access key and secret key, or a class that implements the AWSCredentialsProvider interface. For detailed configuration instructions, see Configuring Authentication on page 28.

Additionally, the driver automatically applies SSL encryption to all connections. SSL encryption protects data and credentials when they are transferred over the network, and provides stronger security than authentication alone.

Note:

In this documentation, "SSL" indicates both TLS (Transport Layer Security) and SSL (Secure Sockets Layer). The driver supports industry-standard versions of TLS/SSL.

The SSL version that the driver supports depends on the JVM version that you are using. For information about the SSL versions that are supported by each version of Java, see "Diagnosing TLS, SSL, and HTTPS" on the Java Platform Group Product Management Blog: https://blogs.oracle.com/java-platform-group/entry/diagnosing_tls_ssl_and_https.

Note:

The SSL version used for the connection is the highest version that is supported by both the driver and the server, which is determined at connection time.

For query results, the Simba Athena JDBC Driver supports all the encryption options that Athena supports. For detailed information about the supported encryption options, see "Configuring Encryption Options" in the *Amazon Athena User Guide*: http://docs.aws.amazon.com/athena/latest/ug/encryption.html. For information about configuring encryption in the driver, see Configuring Query Result Encryption on page 43.

Driver Configuration Options

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

You can set configuration properties using the connection URL. For more information, see Building the Connection URL on page 14.

Note:

Property values are case-sensitive.

AwsCredentialsProviderArguments

Default Value	Data Type	Required
None	String	Yes, if `User` and `Password` are not provided, and if `AwsCredentialsProviderClass` does not have a default constructor.

Description

Note:

As an alternative, you can configure this property using the alias `aws_credentials_provider_arguments`. If you specify both the property name and the alias for the same connection, the setting associated with the property name (`AwsCredentialsProviderArguments`) takes precedence.

A comma-separated list of String arguments for the constructor of the AwsCredentialsProviderClass.

Be aware of the following restrictions:

- The driver only supports String arguments for the constructor parameters.
- Multiple arguments must be separated by a comma (`,`).
- Surrounding spaces are not included in the parsed arguments.
- To escape a single character, use a backslash (`\`) before that character. To indicate a backslash in an argument, use two backslashes (`\\`).

- To escape all commas in an argument, enclose the argument in quotation marks (`"`). To indicate a quotation mark in a quoted argument, use a backslash (`\`) before that quotation mark.

For detailed instructions on configuring authentication using the AWSCredentialsProvider interface, see Using the AWSCredentialsProvider Interface on page 28.

AwsCredentialsProviderClass

Default Value	Data Type	Required
None	String	Yes, if `User` and `Password` are not provided, or if you are authenticating through AD FS.

Description

Note:

- As alternatives, you can configure this property using the aliases `aws_credentials_provider_class` or `plugin_name`. If you specify the property name and an alias for the same connection, the setting associated with the property name (`AwsCredentialsProviderArguments`) takes precedence. If you specify both aliases, the setting associated with `aws_credentials_provider_class` takes precedence.
- If the `Profile` property is set, then you must specify `AwsCredentialsProviderArguments` (or its aliases) in the profile instead of the connection URL.

This property is used differently, depending on your authentication configuration:

- If you are authenticating through the AD FS credentials provider, then set this property to the FQCN of the AD FS credentials provider. You can set this property in the connection URL or in an AWS profile.
- If you are authenticating through a class that implements the AWSCredentialsProvider interface, then set this property to the FQCN of the AWSCredentialsProvider interface.

Note:

The AWS SDK is shaded and packaged in the driver JAR file. However, if your project has its own AWS SDK dependency, it is recommended that you use that class implementation instead of the one that is shaded in the driver. The shaded AWS SDK is intended to be used internally by the driver, and might not be optimal for other use cases.

AwsRegion

Default Value	Data Type	Required
None	String	Yes

Description

The AWS region of the Athena and AWS Glue instance that you want to connect to.

The region can also be taken from the endpoint provided in the connection string `jdbc:awsathena://athena.[Region].amazonaws.com:443;`. The region will be parsed out of this endpoint and used for connecting to Athena and AWS Glue services. If both are present in the connection string the `AWSRegion` takes precedence.

For a list of valid regions, see the "Athena" section in the *AWS Regions and Endpoints* documentation: http://docs.aws.amazon.com/general/latest/gr/rande.html#athena.

BinaryColumnLength

Default Value	Data Type	Required
`32767`	Integer	No

Description

The maximum data length for BINARY columns.

ComplexTypeColumnLength

Default Value	Data Type	Required
`65535`	Integer	No

Description

The maximum data length for ARRAY, MAP, and STRUCT columns.

ConnectionTest

Default Value	Data Type	Required
`1`	Integer	No

Description

This property determines whether the driver verifies the connection by sending a "SELECT 1" query when establishing a connection with Athena.

- `1`: The driver verifies connection by sending a simple "SELECT 1" query to Athena.
- `0`: The driver does not send any query to Athena to verify the connection.

! Important:

Setting the value to `0` means that driver does not verify the connection. The connection string may contain unverified configuration values, such as incorrect authentication information, which will not be discovered at connection time. This can result in errors when the application attempts to execute a query or any other JDBC API calls using the driver.

ConnectTimeout

Default Value	Data Type	Required
`10`	Integer	No

Description

Note:

As an alternative, you can configure this property using the alias `connection_timeout`. If this alias is used, the amount of time is measured in milliseconds.

If you specify both the property name and the alias for the same connection, the setting associated with the property name (`ConnectTimeout`) takes precedence.

The amount of time, in seconds, that the driver waits when establishing a connection before timing out the connection.

A value of `0` indicates that the driver never times out the connection.

Important:

Setting this property to `0` is not recommended.

IdP_Host

Default Value	Data Type	Required
None	String	Yes, if authenticating through AD FS.

Description

The host name of the AD FS service that you use to authenticate the connection. The host name cannot include any slashes (`/`).

You can set this property in the connection URL or in an AWS profile.

IdP_Port

Default Value	Data Type	Required
`443`	String	No

Description

The number of the port that the AD FS service host uses to listen for requests.

The port number to specify may differ depending on the AD FS server configuration. If you are not sure which port to specify, contact your system administrator.

You can set this property in the connection URL or in an AWS profile.

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.

Note:

If `UseAwsLogger` is set to `1`, the driver also logs information from AWS API calls. See UseAwsLogger on page 72.

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

- An `AthenaJDBC_driver.log` file that logs driver activity that is not specific to a connection.
- An `AthenaJDBC_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.

MaxCatalogNameLength

Default Value	Data Type	Required
`0`	Integer	No

Description

The maximum number of characters that catalog names can contain.

To indicate that there is no maximum length or that the length is unknown, set this option to `0`.

MaxColumnNameLength

Default Value	Data Type	Required
`0`	Integer	No

Description

The maximum number of characters that column names can contain.

To indicate that there is no maximum length or that the length is unknown, set this option to `0`.

MaxErrorRetry

Default Value	Data Type	Required
`10`	Integer	No

Description

Note:

As an alternative, you can configure this property using the alias `max_error_retries`. If you specify both the property name and the alias for the same connection, the setting associated with the property name (`MaxErrorRetry`) takes precedence.

The maximum number of times that the driver resubmits a failed request that can be retried, such as a 5xx error from the Athena server.

This value must be a positive integer.

MaxQueryExecutionPollingInterval

Default Value	Data Type	Required
`100`	Integer	No

Description

The maximum amount of time, in milliseconds, that the driver waits between attempts when polling the Athena server for query results. You cannot specify an interval that is less than 5ms.

The driver polls the server 5ms after query execution begins, and exponentially increases the polling interval to the amount of time specified by this property. For example, if `MaxQueryExecutionPollingInterval` is set to `2000`, the driver polls the server at these intervals: 5ms after query execution has begun, 100ms after the first poll, and then 2000ms after the second poll. The driver then continues to poll the server every 2000ms until the query results are returned.

MaxSchemaNameLength

Default Value	Data Type	Required
`256`	Integer	No

Description

The maximum number of characters that schema names can contain.

To indicate that there is no maximum length or that the length is unknown, set this option to `0`.

MaxStreamErrorRetry

Default Value	Data Type	Required
`5`	Integer	No

Description

The maximum number of attempts the driver makes to fetch a chunk from the streaming API.

This value must be a positive integer.

MaxTableNameLength

Default Value	Data Type	Required
`0`	Integer	No

Description

The maximum number of characters that table names can contain.

To indicate that there is no maximum length or that the length is unknown, set this option to `0`.

MetadataRetrievalMethod

Default Value	Data Type	Required
`Auto`	String	No

Description

This property determines how the metadata would be retrieved from Athena for different JDBC API calls like `getTables`, `getColumns`. Following are the valid values:

- `Auto`: During connection time driver will automatically determine whether to use AWS Glue or Query to get metadata for the specified Athena region. If AWS Glue is supported in the region and Athena has been upgraded to use AWS Glue, driver will use AWS Glue to get the metadata. If AWS Glue is not supported in the region or Athena hasn’t been upgraded to use AWS Glue, driver will query Athena to get the metadata.
- `Glue`: Driver will use AWS Glue to get the metadata regardless of whether AWS Glue is supported or used in the region.
- `Query`: Driver will use Query to get the metadata regardless of whether AWS Glue is supported or used in that region.

! Important:

Changing the default value for this configuration option may lead to unwanted behavior. For example, the driver may attempt to use AWS Glue in a region where AWS Glue is not supported or used.

NonProxyHosts

Default Value	Data Type	Required
None	String	No

Description

A list of hosts that the driver can access without connecting through the proxy server, when a proxy connection is enabled.

When specifying multiple hosts, each host must be separated by a vertical bar (`|`). You can specify patterns using asterisks (`*`) as wildcard characters. For example:

```
NonProxyHosts=123.255.321.255|*.localhost|176.255.16.*
```

Password

Default Value	Data Type	Required
None	String	Yes, if using IAM credentials or the AD FS provider for authentication.

Description

Note:

As an alternative, you can configure this property using the alias `PWD`. If you specify both the property name and the alias for the same connection, the setting associated with the property name (`Password`) takes precedence.

If you are using IAM credentials for authentication, then set this property to the secret key provided by your AWS account.

If you are authenticating through the AD FS credentials provider, then set this property to the password that you use to access the AD FS server. You can set this property in the connection URL or in an AWS profile. On Windows machines, if you do not provide a password, the driver attempts to authenticate to the AD FS server using your Windows password over the NTLM protocol.

PreemptiveBasicProxyAuth

Default Value	Data Type	Required
`0`	Integer	No

Description

This property specifies whether the driver pre-emptively authenticates against the proxy server using basic authentication, when a proxy connection is enabled.

- `1`: The driver pre-emptively authenticates the connection using basic authentication.
- `0`: The driver does not pre-emptively authenticate the connection using basic authentication.

preferred_role

Default Value	Data Type	Required
None. However, by default, the driver assumes the first role from the list returned in the SAML response from the identity provider.	String	No

Description

The Amazon Resource Name (ARN) of the role that you want to assume when authenticated through AD FS.

You can set this property in the connection URL or in an AWS profile.

Profile

Default Value	Data Type	Required
None	String	No

Description

The name of the AWS profile to use, containing any additional connection properties not specified in the connection URL. For example, when configuring the driver to authenticate through AD FS, you can use this property to specify a profile that contains the required AD FS service information.

The driver checks the AWS credentials file for the specified profile. The default location for this file is `~/.aws/credentials`. You can change this default behavior by setting the AWS_CREDENTIAL_PROFILES_FILE environment variable to the full path and name of a different credentials file.

For more information about profiles, see "Working with AWS Credentials" in the *AWS SDK for Java Developer Guide*: https://docs.aws.amazon.com/sdk-for-java/v1/developer-guide/credentials.html.

ProxyDomain

Default Value	Data Type	Required
None	String	No

Description

The Windows domain name of the server that you want to authenticate through, when authenticating a proxy connection using the NTLM protocol.

ProxyHost

Default Value	Data Type	Required
None	String	No

Description

The IP address or host name of your proxy server.

ProxyPort

Default Value	Data Type	Required
None	Integer	No

Description

The listening port of your proxy server.

ProxyPWD

Default Value	Data Type	Required
None	String	Yes, if connecting through a proxy server that requires authentication.

Description

The password that you use to access the proxy server.

ProxyUID

Default Value	Data Type	Required
None	String	Yes, if connecting through a proxy server that requires authentication.

Description

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

ProxyWorkstation

Default Value	Data Type	Required
None	String	No

Description

The Windows workstation name of the server that you want to authenticate through, when authenticating a proxy connection using the NTLM protocol.

RowsToFetchPerBlock

Default Value	Data Type	Required
`10000` for result set streaming, `1000` for pagination	Integer	No

Description

The maximum number of rows to fetch per stream if using the result set streaming API. The maximum number of rows to fetch per page if using pagination.

Note:

While setting this option with a large value when using the result set streaming API can give you better fetch performance, it can also result in higher memory usage. This can be mitigated if the JDBC application can retrieve the result set from the driver quickly.

See UseResultsetStreaming on page 73 for details.

S3OutputEncKMSKey

Default Value	Data Type	Required
None	String	Yes, if using SSE_KMS or CSE_KMS encryption.

Description

Note:

As an alternative, you can configure this property using the alias `query_results_aws_kms_key`. If you specify both the property name and the alias for the same connection, the setting associated with the property name (`S3OutputEncKMSKey`) takes precedence.

The KMS key ARN or ID to use when encrypting query results using SSE_KMS or CSE_KMS encryption.

For detailed information about the supported encryption options, see "Configuring Encryption Options" in the *Amazon Athena User Guide*: http://docs.aws.amazon.com/athena/latest/ug/encryption.html.

S3OutputEncOption

Default Value	Data Type	Required
None	String	No

Description

Note:

As an alternative, you can configure this property using the alias `query_results_encryption_option`. If you specify both the property name and the alias for the same connection, the setting associated with the property name (`S3OutputEncOption`) takes precedence.

The encryption protocol that the driver uses to encrypt your query results before storing them on Amazon S3.

- `SSE_S3`: The driver uses server-side encryption with an Amazon S3-managed key.
- `SSE_KMS`: The driver uses server-side encryption with an AWS KMS-managed key.
- `CSE_KMS`: The driver uses client-side encryption with an AWS KMS-managed key.

Note:

If this value is not set, the driver does not encrypt the query results before storing them on Amazon S3.

For detailed information about these encryption options, see "Configuring Encryption Options" in the *Amazon Athena User Guide*: http://docs.aws.amazon.com/athena/latest/ug/encryption.html.

S3OutputLocation

Default Value	Data Type	Required
None	String	Yes

Description

Note:

As an alternative, you can configure this property using the alias `s3_staging_dir`. If you specify both the property name and the alias for the same connection, the setting associated with the property name (`S3OutputLocation`) takes precedence.

The path of the Amazon S3 location where you want to store query results, prefixed by `s3://`.

For example, to store Athena query results in a folder named "test-folder-1" inside an S3 bucket named "query-results-bucket", you would set this property to `s3://query-results-bucket/test-folder-1`.

Schema

Default Value	Data Type	Required
`default`	String	No

Description

The name of the database schema to use when a schema is not explicitly specified in a query. You can still issue queries on other schemas by explicitly specifying the schema in the query.

SocketTimeout

Default Value	Data Type	Required
`50`	Integer	No

Description

Note:

As an alternative, you can configure this property using the alias `socket_timeout`. If this alias is used, the amount of time is measured in milliseconds.

If you specify both the property name and the alias for the same connection, the setting associated with the property name (`SocketTimeout`) takes precedence.

The amount of time, in seconds, that the driver waits for data to be transferred over an established, open connection before timing out the connection.

A value of `0` indicates that the driver never times out the connection.

! Important:

Setting this property to `0` is not recommended.

SSL_Insecure

Default Value	Data Type	Required
`false`	String	No

Description

This property indicates whether the server certificate of the AD FS host should be verified.

- `true`: The driver does not check the authenticity of the server certificate.
- `false`: The driver checks the authenticity of the server certificate.

You can set this property in the connection URL or in an AWS profile.

StringColumnLength

Default Value	Data Type	Required
`255`	Integer	No

Description

The maximum data length for STRING columns.

UseArraySupport

Default Value	Data Type	Required
`1`	Integer	No

Description

This property specifies whether the driver supports getting the ResultSet data as an array.

- `1`: The driver returns ResultSet data as an array.
- `0`: The driver returns ResultSet as VARCHAR.

The driver makes the following assumptions when returning the ResultSet as an array:

- The array columns are always of type `Array<String>`.
- The array column data in the result set start and end with bracket characters (`[` and `]`), and the array elements are delimited by commas (`,`).
  This means that multidimensional arrays or array elements that contain commas in their values are not parsed correctly.

UseAwsLogger

Default Value	Data Type	Required
`0`	Integer	No

Description

This property specifies whether the driver records the log output from any AWS API calls. For information about logging, see Configuring Logging on page 46.

- `1`: If logging is enabled, the driver records the log outputs from any AWS API calls in the driver log file.
- `0`: The driver does not log AWS API calls.

User

Default Value	Data Type	Required
None	String	Yes, if using IAM credentials or the AD FS provider for authentication.

Description

Note:

As an alternative, you can configure this property using the alias `UID`. If you specify both the property name and the alias for the same connection, the setting associated with the property name (`User`) takes precedence.

If you are using IAM credentials for authentication, then set this property to the access key provided by your AWS account.

If you are authenticating through the AD FS credentials provider, then set this property to the user name that you use to access the AD FS server. You can include the domain name using the format *`[DomainName]`*`\`*`[UserName]`*. You can set this property in the connection URL or in an AWS profile. On Windows machines, if you do not provide a user name, the driver attempts to authenticate to the AD FS server using your Windows user name over the NTLM protocol.

UseResultsetStreaming

Default Value	Data Type	Required
`1`	Integer	No

Description

This property specifies whether the driver uses the AWS result set streaming API for result set fetching.

- `1`: The driver uses the result set streaming API.
- `0`: The driver uses pagination logic for result set fetching.

! **Important:**

If you are connecting to Athena through a proxy server, make sure that the proxy server does not block port 444. The result set streaming API uses port 444 on the Athena server for outbound communications.

Workgroup

Default Value	Data Type	Required
`Primary`	String	No

Description

The workgroup you want your application to use when connecting.

Appendix: Migrating to Later Driver Versions

This appendix contains information to help you successfully migrate from the 1.x and 2.x versions of the driver to the latest versions of the driver.

The following sections list differences between drivers that may disrupt workflows when you migrate, and provides recommendations on how to recreate those workflows for a successful migration.

Upgrading From 1.x to 2.0.x

JDBC Driver Class Name

The drivers use different class names.

Version 1.x	Version 2.x
`com.amazonaws.athena.jdbc.AthenaDriver`	`com.simba.athena.jdbc.Driver`

If you are using the following line in your code to explicitly load the driver class in your source code:
`Class.forName("com.amazonaws.athena.jdbc.AthenaDriver");`,
then you will need to change it to:
`Class.forName("com.simba.athena.jdbc.Driver");`

Connection URL

Specifying the Host and Port

The 2.x version provides an alternative way to specify the AWS region.

1.x Version	2.x Version

`jdbc:awsathena://athena.{REGION}.amazonaws.com:443`
 	
Where `{REGION}` is a region identifier, such as `us-west-2`
	`jdbc:awsathena://athena.{REGION}.amazonaws.com:443`
	Or
	`jdbc:awsathena://AwsRegion={REGION}`
	
	Where `{REGION}` is a region identifier, such as `us-west-2`. If `{REGION}` is specified using both endpoint URL and `AwsRegion`, the value specified in `AwsRegion` takes precedence.

Changes are not required in this case, but be aware the 2.x version provides an alternative way to specify the AWS region in the connection URL.

Connection String Attributes Separator

The drivers use different attribute separators in their connection URLs.

1.x Version	2.x Version
`&` and `?`	`;`

The following is an example connection URL using the 1.x version syntax:

```
jdbc:awsathena://athena.us-west-1.amazonaws.com:443?s3_
staging_dir=s3://query-resultsbucket/folder/&query_results_
encryption_option=SSE_S3
```

The following shows the equivalent URL constructed using the 2.x version syntax:

```
jdbc:awsathena://athena.us-west-1.amazonaws.com:443;s3_
staging_dir=s3://query-resultsbucket/folder/;query_results_
encryption_option=SSE_S3
```

Driver Configuration Options

There are some differences in the supported connection properties for the drivers.

Version 1.x Option	Version 2.x Option	Possible Values
`log_path`	`LogPath`	No difference.

Version 1.x Option	Version 2.x Option	Possible Values	
`log_level`	`LogLevel`	**1.x**	**2.x**
		OFF	0
		FATAL	1
		ERROR	2
		WARNING	3
		INFO	4
		DEBUG	5
		TRACE	6
`retry_base_delay`	Not configurable.		
`retry_max_backoff_time`	Not configurable.		

The following is an example connection URL for enabling logging using the syntax for version 1.x:

```
jdbc:awsathena://athena.us-west-1.amazonaws.com:443?s3_
staging_dir=s3://query-resultsbucket/folder/&log_
level=TRACE&log_path=/tmp
```

The following is the equivalent connection URL using the syntax for version 2.x:

```
jdbc:awsathena://athena.us-west-1.amazonaws.com:443;s3_
staging_dir=s3://query-
resultsbucket/folder/;LogLevel=6;LogPath=/tmp
```

ResultSetMetaData Differences for API Calls

The drivers return different matadata for the following API calls.

getCatalogs

Column Name	Version 1.x		Version 2.x	
`TABLE_CAT`	**Metadata**	**Value**	**Metadata**	**Value**
	Type Name	varchar	Type Name	VARCHAR
	Type ID	-16	Type ID	12
	Display Size	1073741824	Display Size	128
	Precision	1073741824	Precision	128
	Scale	0	Scale	0

getColumns

Column Name	Version 1.x		Version 2.x	
`TABLE_CAT` `TABLE_SCHEM` `TABLE_NAME` `COLUMN_NAME` `TYPE_NAME` `IS_AUTOINCREMENT` `IS_GENERATEDCOLUMN`	**Metadata**	**Value**	**Metadata**	**Value**
	Type Name	varchar	Type Name	VARCHAR
	Type ID	-16	Type ID	12
	Display Size	1073741824	Display Size	128
	Precision	1073741824	Precision	128
	Scale	0	Scale	0

Column Name	Version 1.x		Version 2.x	

`REMARKS`
`COLUMN_DEF`
`IS_NULLABLE`
`SCOPE_CATALOG`
`SCOPE_SCHEMA`
`SCOPE_TABLE`
	Metadata	**Value**	**Metadata**	**Value**

	Type Name	varchar	Type Name	VARCHAR
	Type ID	-16	Type ID	12
	Display Size	1073741824	Display Size	254
	Precision	1073741824	Precision	254
	Scale	0	Scale	0
`SOURCE_DATA_TYPE`	**Metadata**	**Value**	**Metadata**	**Value**
	Type Name	smallint	Type Name	INGEGER
	Type ID	5	Type ID	4
	Display Size	6	Display Size	11
	Precision	5	Precision	10
	Scale	0	Scale	0

getSchemas

Column Name	Version 1.x		Version 2.x	
`TABLE_SCHEM` `TABLE_CATALOG`	**Metadata**	**Value**	**Metadata**	**Value**
	Type Name	varchar	Type Name	VARCHAR
	Type ID	-16	Type ID	12
	Display Size	1073741824	Display Size	128
	Precision	1073741824	Precision	128
	Scale	0	Scale	0

getTables

Column Name	Version 1.x		Version 2.x	
TABLE_CAT TABLE_SCHEM TABLE_NAME TABLE_TYPE TYPE_CAT TYPE_SCHEM TYPE_NAME SELF_REFERENCING_ COL_NAME REF_GENERATION	**Metadata**	**Value**	**Metadata**	**Value**
	Type Name	varchar	Type Name	VARCHAR
	Type ID	-16	Type ID	12
	Display Size	1073741824	Display Size	128
	Precision	1073741824	Precision	128
	Scale	0	Scale	0
REMARKS	**Metadata**	**Value**	**Metadata**	**Value**
	Type Name	varchar	Type Name	VARCHAR
	Type ID	-16	Type ID	12
	Display Size	1073741824	Display Size	254
	Precision	1073741824	Precision	254
	Scale	0	Scale	0

Data Type for TIME Literal in Query Result

For a query such as `SELECT TIME '12:00:00'`, the drivers use different data types in the query result set for the TIME literal column.

Version 1.x	Version 2.x
`TIME`	`VARCHAR`

Upgrading from 2.0.2 to 2.0.5 or later

Result Set Streaming Support

Starting with version 2.0.5, the driver uses the result set streaming API to improve the performance in fetching query results. To take advantage of this feature, you must do the following:

- Include and allow the `athena:GetQueryResultsStream` action in your IAM policy statement. For details on managing Athena IAM policies, see https://docs.aws.amazon.com/athena/latest/ug/access.html.
- If you are connecting to Athena through a proxy server, make sure that the proxy server does not block port 444. The result set streaming API uses port 444 on the Athena server for outbound communications.

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