



Magnitude Amazon Simba Athena JDBC Data Connector

Installation and Configuration Guide

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About This Guide

Purpose

The *Magnitude Amazon Simba Athena JDBC Data Connector Installation and Configuration Guide* explains how to install and configure the Magnitude Amazon Simba Athena JDBC Data Connector on all supported platforms. The guide also provides details related to features of the connector.

Audience

The guide is intended for end users of the Simba Amazon Athena JDBC Connector.

Knowledge Prerequisites

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

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

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About the Simba Amazon Athena JDBC Connector

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 Connector

The Simba Amazon Athena JDBC Connector 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.

The Simba Amazon Athena JDBC Connector 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 connector, 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 Amazon Athena JDBC Connector is tested on the following data sources:

- AWS Glue Data Catalog (default)
- Apache Hive metastore

The *Magnitude Amazon Simba Athena JDBC Data 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 Amazon Athena JDBC Connector must have Java Runtime Environment (JRE) 8.0 installed. If you are using the connector with JDBC API version 4.2, then you must use JRE 8.0.

Simba Amazon Athena JDBC Connector Files

The Simba Amazon Athena JDBC Connector is delivered in the ZIP archive `SimbaAthenaJDBC-[Version].zip`, where `[Version]` is the version number of the connector.

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

Installing and Using the Simba Amazon Athena JDBC Connector

To install the Simba Amazon Athena JDBC Connector 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 connector JAR file before you can use the Simba Amazon Athena JDBC Connector.

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

- The list of connector library files (see [Referencing the JDBC Connector Libraries](#) on page 13)
- The `Driver` or `DataSource` class (see [Registering the Connector Class](#) on page 14)
- The connection URL for the connector (see [Building the Connection URL](#) on page 18)

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

- For an example workflow that demonstrates how to use the connector in a JDBC application, see [Example: Using the Connector in SQL Workbench](#) on page 22.
- For code examples that demonstrate how to use the connector in a Java application, see [Examples: Using the Connector in a Java Application](#) on page 29.

Referencing the JDBC Connector Libraries

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

Using the Connector in a JDBC Application

Most JDBC applications provide a set of configuration options for adding a list of connector library files. Use the provided options to include the appropriate fat JAR file

from the ZIP archive as part of the connector configuration in the application. For more information, see the documentation for your JDBC application.

Using the Connector in Java Code

You must include all the connector 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 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/unix/classpath.html>

Registering the Connector Class

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

The following classes are used to connect the Simba Amazon Athena JDBC Connector to the Athena service:

- The `Driver` classes extend `java.sql.Driver`.
- The `DataSource` classes extend `javax.sql.DataSource` and `javax.sql.ConnectionPoolDataSource`.

The connector 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` class to establish a connection for JDBC:

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

```
}
```

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

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

When using the `DataSource` class to connect to Athena, you can call the following methods to configure `DataSource` properties:

Method	Description
<code>setCustomProperty(String key, String value)</code>	<p>Set a property that is not otherwise supported by one of the set/get methods listed in this table.</p> <p>Parameters:</p> <ul style="list-style-type: none"> <code>key</code>: The key name of the property. <code>value</code>: The value that you want to specify for the property. <p>After setting a custom property, you can access it by calling the <code>getCustomProperty()</code> method.</p>

Method	Description
<code>setLogDirectory(String logDirectory)</code>	<p>Set the directory that the connector uses for logging.</p> <p>Parameters:</p> <ul style="list-style-type: none"><code>logDirectory</code>: The directory where you want log files to be saved. <p>This property is equivalent to the connection-level property LogPath on page 119, which can be configured in the connection URL.</p>
<code>setLoginTimeout(int seconds)</code>	<p>Set the amount of time that the connector waits before timing out during login attempts.</p> <p>Parameters:</p> <ul style="list-style-type: none"><code>seconds</code>: The number of seconds to wait before timing out a login attempt. <p>This property is equivalent to the connection-level property ConnectTimeout on page 112, which can be configured in the connection URL.</p>

Method	Description
<code>setLogLevel(String level)</code>	<p>Set the logging level, which specifies the level of detail that the connector includes in log files.</p> <p>Parameters:</p> <ul style="list-style-type: none"><code>level</code>: The logging level to use, indicated by a number ranging from 0 to 6 (inclusive). 0 disables logging, while 6 is the most detailed logging level. <p>This property is equivalent to the connection-level property LogLevel on page 117, which can be configured in the connection URL.</p>
<code>setLogWriter(PrintWriter writer)</code>	<p>Set the writer that the connector uses for logging.</p> <p>Parameters:</p> <ul style="list-style-type: none"><code>writer</code>: The <code>java.io.PrintWriter</code> object to use for writing the log.
<code>setPassword(String pass)</code>	<p>Set the password to use for authenticating the connection. Connections to Athena require a secret key instead of an account password.</p> <p>Parameters:</p> <ul style="list-style-type: none"><code>pass</code>: The secret key provided by your AWS account. <p>This property is equivalent to the connection-level property Password on page 126, which can be configured in the connection URL.</p>

Method	Description
<code>setURL(String url)</code>	<p>Set the connection URL to use for connecting to Athena.</p> <p>Parameters:</p> <ul style="list-style-type: none"><code>url</code>: The connection URL. For more information, see Building the Connection URL on page 18.
<code>setUserID(String id)</code>	<p>Set the user ID to use for authenticating the connection. Connections to Athena require an access key instead of the ID of a user account.</p> <p>Parameters:</p> <ul style="list-style-type: none"><code>id</code>: The access key provided by your AWS account. <p>This property is equivalent to the connection-level property User on page 137, which can be configured in the connection URL.</p>

Building the Connection URL

Use the connection URL to supply connection information to the data store that you are accessing. The following is the format of the connection URL for the Simba Amazon Athena JDBC Connector:

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

The following variables are used in the example connection strings:

- `[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 connector. For a list of the properties available in the connector, see [Connector Configuration Options](#) on page 107.

⚠ Important:

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

Standard Connection String

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

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

For example, to connect to Athena and authenticate the connection using a user name and password, you would use the following connection URL:

```
jdbc:awsathena://AwsRegion=us-west-1;User=FJ4EK9SEO2Kfk;Password=P9PcyQ7prK2LwUMZMpFQ4R+5VE;S3OutputLocation=s3://working/dir;
```

Using an Endpoint URL

The connector supports two types of endpoint URLs: a default endpoint format, and a VPC endpoint format.

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

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

For example, to connect to Athena using a standard endpoint, you would use the following connection URL:

```
jdbc:awsathena://athena.us-east-1.com:443;User=FJ4EK9SEO2Kfk;Password=P9PcyQ7prK2LwUMZMpFQ4R+5VE;S3OutputLocation=s3://working/dir;
```

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

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

For example, to connect to Athena using a VPC endpoint, you would use the following connection URL:

```
jdbc:awsathena://vpce-73hddf25rus619fh62-8wnf52jd-eu-west-  
2a.athena.eu-west-  
2.vpce.amazonaws.com:443;User=FJ4EK9SEO2Kfk;Password=P9PcyQ7p  
rK2LwUMZMpFQ4R+5VE;S3OutputLocation=s3://working/dir;
```

Note:

If the endpoint is specified in the URL, as shown in the examples above, then the `AwsRegion` property should not be used.

Using Endpoint Overrides

The Athena endpoint can also be specified in the `EndpointOverride` connection property.

The following are two possible formats for connection URLs where the endpoint is specified in the `EndpointOverride` connection property. The first uses a default endpoint, while the second uses a VPC endpoint.

Default endpoint:

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

VPC endpoint:

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

Note:

If endpoints are specified in both the URL and the `EndpointOverride` connection property, the endpoint in the connection property takes precedence.

Additionally, if you are using the Athena streaming service, but are not using the default endpoint for this service, you can use the `StreamingEndpointOverride` connection property to specify the necessary endpoint.

The following is the format of a connection URL that uses a VPC endpoint and specifies the `StreamingEndpointOverride` property:

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

Note:

Typically, the `StreamingEndpointOverride` property is not required. If this property is not specified, the connector tries to access the Athena streaming service using port 444 of the specified Athena instance.

Example: Using Workgroups

A workgroup is an Athena feature that enables you to control the data access and costs associated with running queries. For more information, see "Using Workgroups to Control Query Access and Costs" in the *Amazon Athena User Guide*:

<https://docs.aws.amazon.com/athena/latest/ug/manage-queries-control-costs-with-workgroups.html>.

To use a workgroup when connecting to Athena through the Simba Amazon Athena JDBC Connector, write a connection URL that sets the `Workgroup` property to the name of your workgroup. For example, to use a workgroup named `SimbaAdmins`:

```
jdbc:awsathena://AwsRegion=us-west-
1;User=FJ4EK9SE02Kfk;Password=P9PcyQ7prK2LwUMZMpFQ4R+5VE;S3Ou
tputLocation=s3://working/dir;Workgroup=SimbaAdmins;
```

Specifying a workgroup does not change the way that you run SQL statements or make JDBC API calls. The connector passes the workgroup name to Athena, and all workgroup handling takes place in the Athena service instead of in the connector.

Example: Using the Connector in SQL Workbench

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

The following topics are discussed here:

- [Configuring SQL Workbench to Use the Connector](#) on page 22
- [Querying Data with SQL Workbench](#) on page 27
- [Exploring Data with SQL Workbench](#) on page 27

Before You Begin

Before you can use the connector 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 connector 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>.

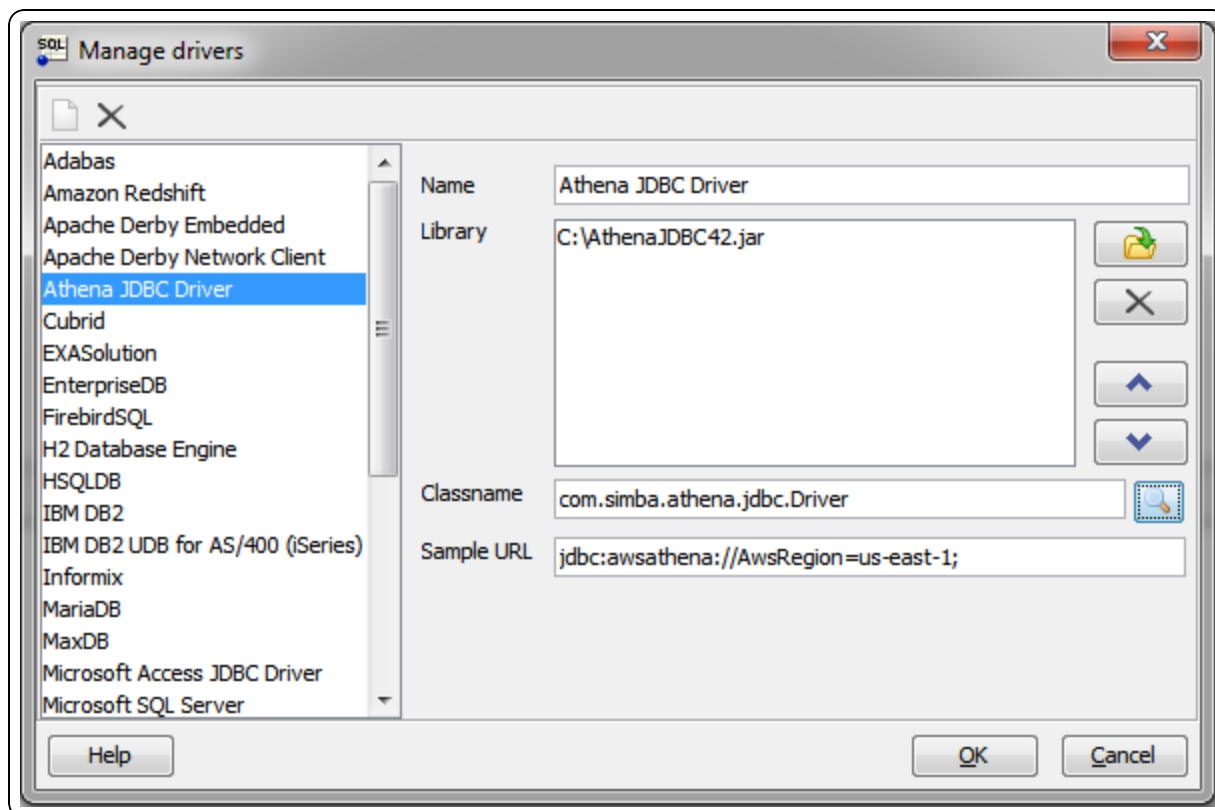
Configuring SQL Workbench to Use the Connector

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

To configure SQL Workbench to use the connector:

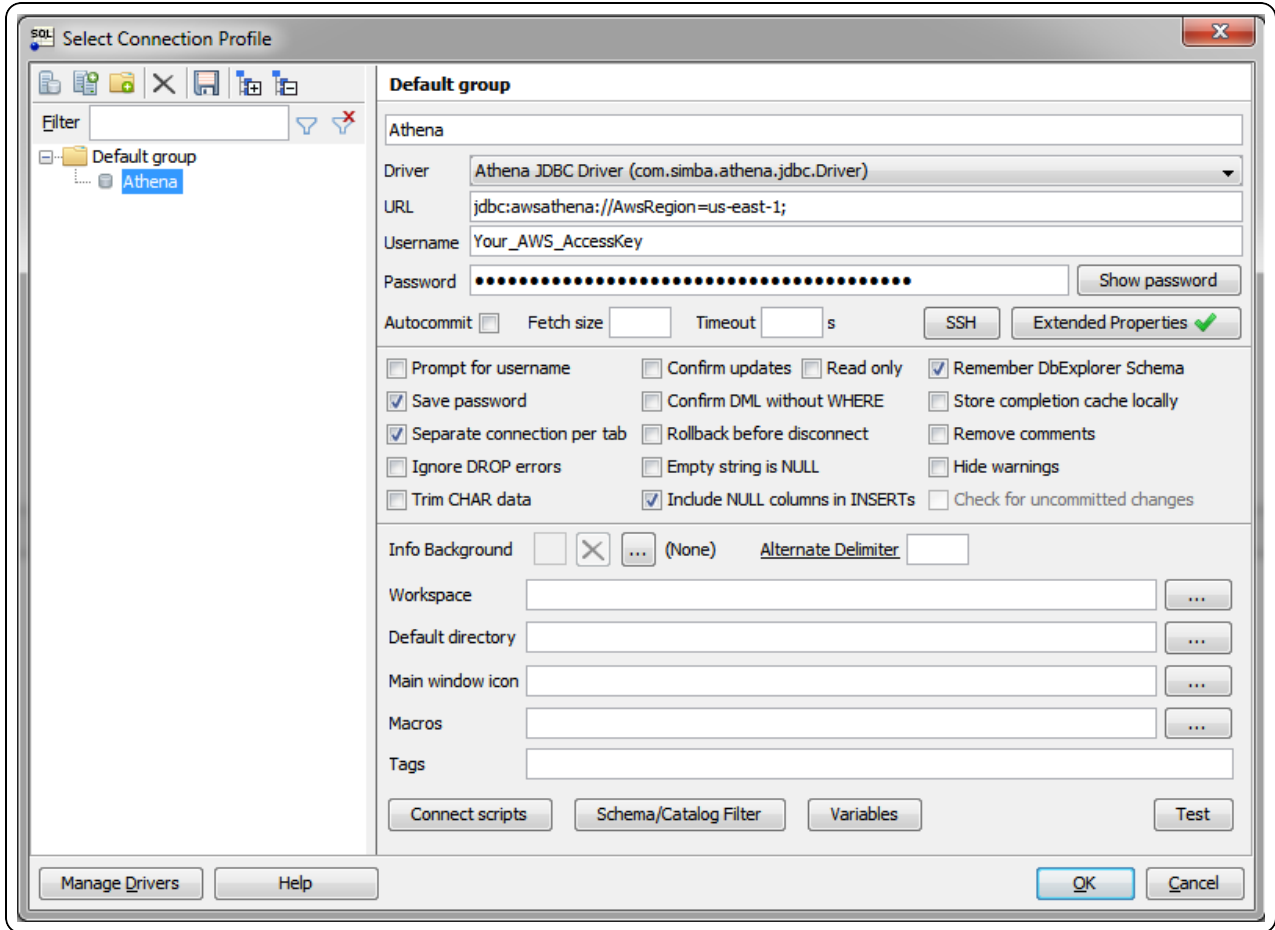
1. In SQL Workbench, select **File > Manage Drivers**.
2. In the Manage Drivers dialog box, specify the following values in the fields:

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



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 connector that you configured in step 2. The connector 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	<p>A connection URL that only specifies the AWS region of the Athena instance that you want to connect to, using the format</p> <pre>jdbc:awsathena://AwsRegion=[Region];.</pre> <p>For example, jdbc:awsathena://AwsRegion=us-east-1;</p> <p>By default, this field is automatically populated with the Sample URL value that you specified for the selected connector.</p>
Username	The access key provided by your AWS account.
Password	The secret key provided by your AWS account.



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 Amazon Athena JDBC Connector 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 connector 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.LazySimpleSer  
De'  
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
```

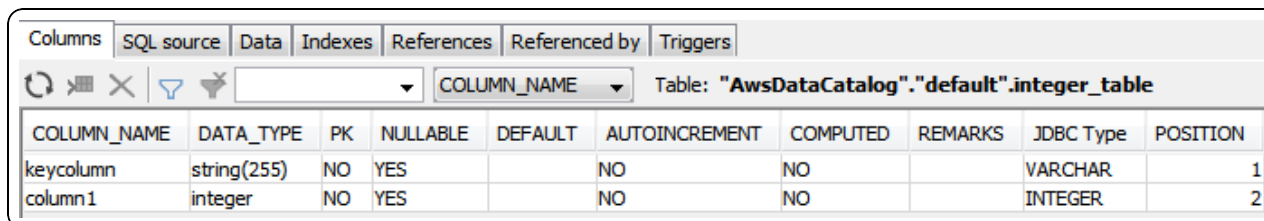
You can now view details about the retrieved data in the Data Explorer tab, as described below.

Exploring Data with SQL Workbench

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

To explore data with SQL Workbench:

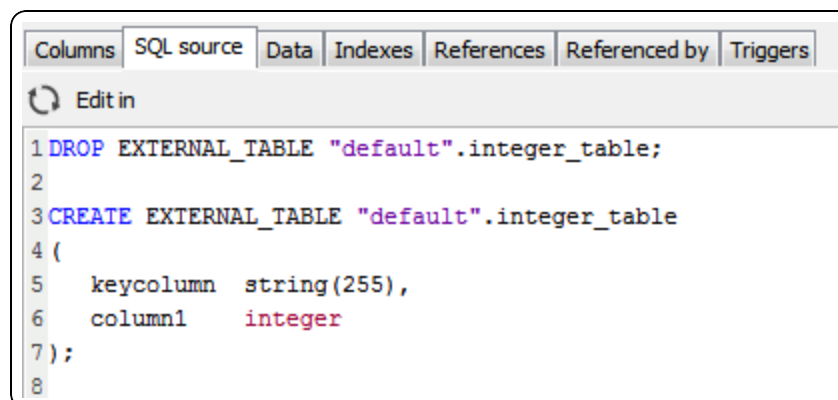
1. Select the **Data Explorer** tab, and then select the default schema (or database).
2. Select the **integer_table** table. SQL Workbench loads the Columns tab, which shows the table schema.



The screenshot shows the 'Columns' tab in SQL Workbench for the table 'AwsDataCatalog"."default".integer_table'. The table has two columns: 'keycolumn' (string(255)) and 'column1' (integer). The table schema is as follows:

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

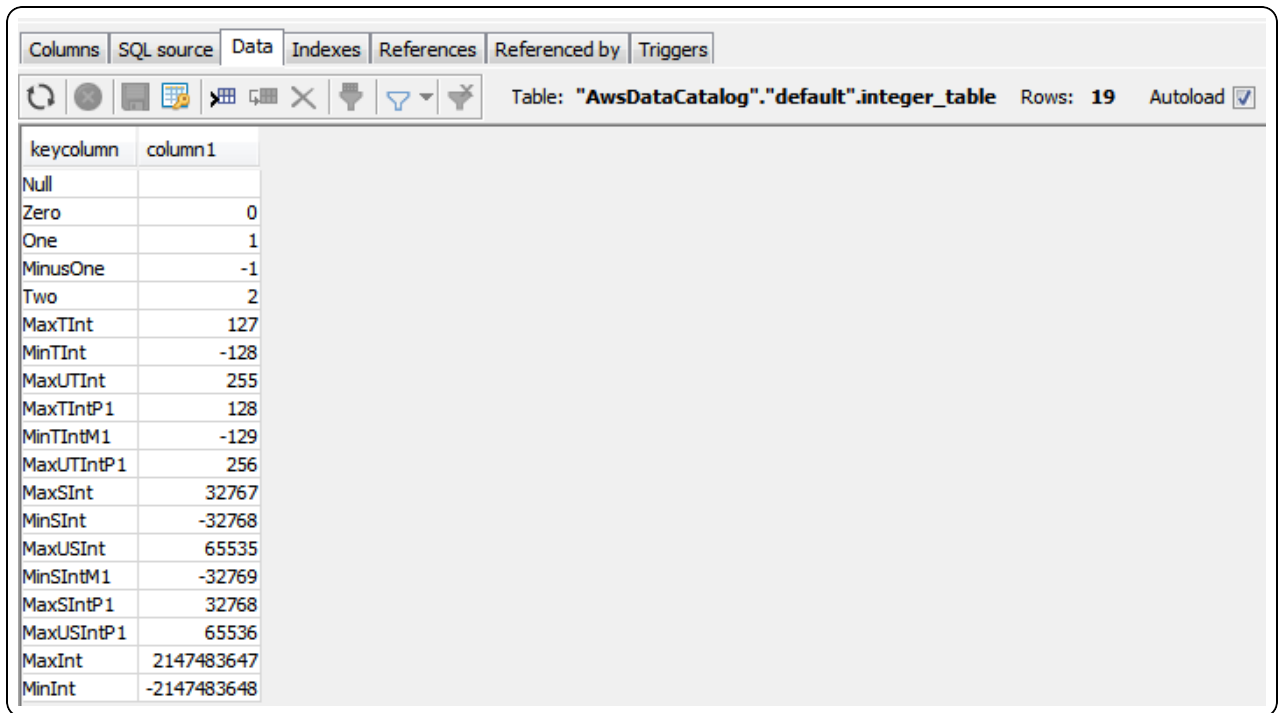
3. Select the other tabs to view more information about the integer_table table. For example:
 - Select the **SQL Source** tab to view the queries that were used to generate the table.



The screenshot shows the 'SQL source' tab in SQL Workbench. The SQL source code is as follows:

```
1 DROP EXTERNAL_TABLE "default".integer_table;
2
3 CREATE EXTERNAL_TABLE "default".integer_table
4 (
5     keycolumn string(255),
6     column1 integer
7 );
8
```

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



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 Amazon Athena JDBC Connector in SQL Workbench.

Examples: Using the Connector in a Java Application

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

- [Example: Creating a Connector on page 29](#)
- [Examples: Using a Credentials Provider on page 30](#)
- [Example: Executing a SELECT Query on page 33](#)
- [Example: Running a CREATE Statement on page 33](#)
- [Example: Listing Tables on page 33](#)

Example: Creating a Connector

This example demonstrates how to create an instance of the Simba Amazon Athena JDBC Connector 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 connector:

- [Example: DefaultAWSCredentialsProviderChain](#) on page 30
- [Example: PropertiesFileCredentialsProvider](#) on page 30
- [Example: InstanceProfileCredentialsProvider](#) on page 31
- [Example: CustomSessionCredentialsProvider](#) on page 31

For more information about configuring the connector to authenticate your connection using a credentials provider, see [Using the AWSCredentialsProvider Interface](#) on page 36.

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.DefaultAWSCredentialsProvide  
rChain");
```

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.PropertiesFileCredentialsPro  
vider");  
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.InstanceProfileCredentialsPr  
ovider");
```

Example: CustomSessionCredentialsProvider

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

The credentials object can use either `BasicSessionCredentials` 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 com.simba.athena.amazonaws.auth.AWSCredentials;
```

```
com.simba.athena.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.simba.athena.amazonaws.custom.athena.jdbc.CustomIAMRoleA
ssumptionSAMLCredentialsProvider"
    // 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: 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.amazonaws.auth.Properti
        esFileCredentialsProvider");
    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 Amazon Athena JDBC Connector to provide your credentials and authenticate the connection using one of the following methods:

- [Using IAM Credentials on page 36](#)
- [Using the AWSCredentialsProvider Interface on page 36](#)
- [Using the Active Directory Federation Services \(AD FS\) Credentials Provider on page 41](#)
- [Using the Azure AD Credentials Provider on page 48](#)
- [Using the Browser Azure AD Credentials Provider on page 53](#)
- [Using the Browser SAML Credentials Provider on page 60](#)
- [Using the Okta Credentials Provider on page 62](#)
- [Using the Ping Credentials Provider on page 68](#)
- [Using the JWT Credentials Provider on page 74](#)
- [Using a Custom Credentials Provider for an Identity Provider on page 76](#)

Using IAM Credentials

You can configure the connector 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 connector 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 connector 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 connector. The shaded AWS SDK is intended to be used internally by the connector, 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 connector 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 38
- [Using PropertiesFileCredentialsProvider](#) on page 38
- [Using InstanceProfileCredentialsProvider](#) on page 39
- [Using a Custom Credentials Provider](#) on page 41

For code examples that demonstrate how to use each type of credentials provider in a Java application, see [Examples: Using the Connector in a Java Application](#) on page 29.

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 30.

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 name 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 30.

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 examples of a few different ways that profiles can be used, see the following:

- [Example: Using a Profile to Provide a Session Token](#) on page 39
- [Example: Using a Profile to Switch Roles](#) on page 40

For a code example that demonstrates how to use the `InstanceProfileCredentialsProvider` in a Java application, see [Example: InstanceProfileCredentialsProvider](#) on page 31.

Example: Using a Profile to Provide a Session Token

This example demonstrates how to authenticate a connection to Athena using a profile that provides a session token. A session token grants temporary access to the Athena service. An access key and secret key must be provided along with the token.

First, define a profile that specifies the access key, secret key, and session token. For example:

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

Then, to connect to Athena using that profile, set the following properties in your connection URL:

- Set the `AwsCredentialsProviderClass` property to `com.simba.athena.amazonaws.auth.profile.ProfileCredentialsProvider`.

- Set the `AwsCredentialsProviderArguments` property to the name of the profile that you want to use. In this case, `simba_session`.

For example:

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

Example: Using a Profile to Switch Roles

You can define a profile that refers to another existing profile, and then include an additional role setting. When you use this profile to authenticate your connection, the connector uses all the settings defined in the referenced profile as well as the role that has been additionally specified. By switching between these profiles, you can alternate between your roles without having to update the profile definition each time.

For an example that demonstrates how to configure profiles this way, see "Example Scenario: Switch to a Production Role" in the AWS Identity and Access Management documentation: https://docs.aws.amazon.com/IAM/latest/UserGuide/id_roles_use_switch-role-cli.html#switch-role-cli-scenario-prod-env.

Based on this AWS example, which involves defining a main profile named `default` and a role switch profile named `prodaccess`, in order to switch roles when using the Simba Amazon Athena JDBC Connector, all you would need to do is update the `AwsCredentialsProviderArguments` setting in your connection URL. For example:

- To use the `ProductionAccessRole` role:

```
jdbc:awsathena://AwsRegion=us-east-1;S3OutputLocation=s3://my-athena-resultbucket/test/;AwsCredentialsProviderClass=com.simba.athena.amazonaws.auth.profile.ProfileCredentialsProvider;AwsCredentialsProviderArguments=prodaccess;
```

- Or, to access Athena without using the `ProductionAccessRole` role:

```
jdbc:awsathena://AwsRegion=us-east-1;S3OutputLocation=s3://my-athena-resultbucket/test/;AwsCredentialsProviderClass=com.simba.athena.amazonaws.auth.profile.Profile
```



```
CredentialsProvider;AwsCredentialsProviderArguments=  
default;
```

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 connector. You must create custom providers before you can use them.

For an example of using a custom credentials provider to obtain credentials from an identity provider, see [Using a Custom Credentials Provider for an Identity Provider](#) on page 76.

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 31.

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 connector JAR files.

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

You can configure the connector to authenticate the connection using the AD FS credentials provider, which obtains credentials from the AD FS identity 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 42.
- 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 45.

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 connector connects to Athena, it retrieves temporary credentials from the AD FS identity provider. If these credentials are associated with an IAM role that has permission to access Athena, the connector 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 connector provides a post-SAML workflow hook. For more information, see [Using the Post-SAML Workflow Hook](#) on page 87.

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
<code>AWSCredentialsProviderClass</code>	
As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code> . If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.	The FQCN that implements the AD FS credentials provider.
<code>IdP_Host</code>	<p>The host name of the AD FS service that you are using to authenticate the connection.</p> <p>The host name cannot include any slashes (/).</p>
<code>IdP_Port</code>	<p>The number of the port that the AD FS service host uses to listen for requests.</p> <p>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.</p>

Property	Value
<code>User</code> As an alternative, you can configure this property using the alias <code>UID</code> .	<p>The user name that you use to access the AD FS server. You can include the domain name using the format <code>[DomainName]\[UserName]</code>.</p> <p>On Windows machines, if you do not provide a user name, the connector attempts to authenticate to the AD FS server using your Windows user name over the NTLM protocol.</p>
<code>Password</code> As an alternative, you can configure this property using the alias <code>PWD</code> .	<p>The password corresponding to your user name that you specified in the <code>User</code> or <code>UID</code> property.</p> <p>On Windows machines, if you do not provide a password, the connector attempts to authenticate to the AD FS server using your Windows password over the NTLM protocol.</p>
<code>preferred_role</code> As an alternative, you can use your own relying party identifier by setting the <code>loginToRP</code> property and overriding the ADFS endpoint URL.	<p>The Amazon Resource Name (ARN) of the role that you want to assume when authenticated through AD FS.</p>

Property	Value
SSL_Insecure	<p>One of the following:</p> <ul style="list-style-type: none"> • <code>false</code> if you want the connector to verify the server certificate. • <code>true</code> if you do not want the connector to verify the server certificate.

SSL_Insecure

If this is not set, the default is `false`.

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;Duration=900;
```

Note:

Optionally, in the `Duration` field, type the duration of the role session in seconds.

When you connect to Athena, the connector retrieves temporary credentials from AD FS. 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 connector can authenticate the connection. For information about how to complete this process, see [Using the Post-SAML Workflow Hook](#) on page 87.

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
<code>AWSCredentialsProviderClass</code>	
As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code> . If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.	The FQCN that implements the AD FS credentials provider.
<code>IdP_Host</code>	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	<p>The number of the port that the AD FS service host uses to listen for requests.</p> <p>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.</p>
User As an alternative, you can configure this property using the alias <code>UID</code> .	<p>The user name that you use to access the AD FS server. You can include the domain name using the format <code>[DomainName]\[UserName]</code>.</p> <p>On Windows machines, if you do not provide a user name, the connector attempts to authenticate to the AD FS server using your Windows user name over the NTLM protocol.</p>
Password As an alternative, you can configure this property using the alias <code>PWD</code> .	<p>The password corresponding to your user name that you specified in the <code>User</code> or <code>UID</code> property.</p> <p>On Windows machines, if you do not provide a password, the connector attempts to authenticate to the AD FS server using your Windows password over the NTLM protocol.</p>
preferred_role	<p>The Amazon Resource Name (ARN) of the role that you want to assume when authenticated through AD FS.</p>

Property	Value
SSL_Insecure	One of the following: <ul style="list-style-type: none">• <code>false</code> if you want the connector to verify the server certificate.• <code>true</code> if you do not want the connector 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 connector 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 AD FS. 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 connector can authenticate the connection. For information about how to complete this process, see below.

Using the Azure AD Credentials Provider

You can configure the connector to authenticate the connection using the Azure AD credentials provider, which obtains credentials from the Azure AD identity 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 Azure AD service. For more information, see [Specifying Azure AD Information in the Connection](#)

[URL](#) on page 49

- Refers to an AWS profile that specifies information about the Azure AD service. For more information, see [Specifying Azure AD Information in an AWS Profile](#) on page 51.

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 connector connects to Athena, it retrieves temporary credentials from the Azure AD identity provider. If these credentials are associated with an IAM role that has permission to access Athena, the connector 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 connector provides a post-SAML workflow hook. For more information, see [Using the Post-SAML Workflow Hook](#) on page 87.

Specifying Azure AD 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 Azure AD service is hosted.

If your connection URL also specifies an AWS profile that contains some Azure AD information, then the settings specified directly in the URL take precedence over the Azure AD 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 Azure AD information in the connection URL:

- In your connection URL, set the following properties:

Property	Value
<code>AWSCredentialsProviderClass</code> As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code> . If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.	The FQCN that implements the Azure AD credentials provider.
<code>User</code> As an alternative, you can configure this property using the alias <code>UID</code> .	The email address that you use to access the Azure AD server.
<code>Password</code> As an alternative, you can configure this property using the alias <code>PWD</code> .	The password corresponding to your email address that you specified in the <code>User</code> or <code>UID</code> property.
<code>tenant_id</code>	The Azure AD-provided unique ID associated with your Athena application.
<code>client_secret</code>	The Client Secret to use when authenticating the connection using the Azure AD service.
<code>client_id</code>	The Client ID to use when authenticating the connection using the Azure AD service.

For example:

```
jdbc:awsathena://AwsRegion=us-east-1;S3OutputLocation=s3://test;AwsCredentialsProviderClass=com.simba.athena.iamsupport.plugin.AzureCredentialsProvider;UID=jsmith@acme.com;PWD=simba12345;tenant_id=xyz;client_id=xyz;client_secret=xyz;Duration=900;
```

Note:

Optionally, in the `Duration` field, type the duration of the role session in seconds.

When you connect to Athena, the connector retrieves temporary credentials from Azure AD. 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 connector can authenticate the connection. For information about how to complete this process, see [Using the Post-SAML Workflow Hook](#) on page 87.

Specifying Azure AD 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 Azure AD service is hosted, and your credentials for accessing the Azure AD 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 Azure AD information is also specified directly in your connection URL, those settings take precedence over the Azure AD 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 Azure AD 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
<p><code>AWSCredentialsProviderClass</code></p> <p>As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code>. If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.</p>	<p>The FQCN that implements the Azure AD credentials provider.</p>
<p><code>User</code></p> <p>As an alternative, you can configure this property using the alias <code>UID</code>.</p>	<p>The email address that you use to access the Azure AD server.</p>
<p><code>Password</code></p> <p>As an alternative, you can configure this property using the alias <code>PWD</code>.</p>	<p>The password corresponding to your email address that you specified in the <code>User</code> or <code>UID</code> property.</p>
<p><code>tenant_id</code></p>	<p>The Azure AD-provided unique ID associated with your Athena application.</p>
<p><code>client_secret</code></p>	<p>The Client Secret to use when authenticating the connection using the Azure AD service.</p>
<p><code>client_id</code></p>	<p>The Client ID to use when authenticating the connection using the Azure AD service.</p>

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

```
[plug-in-creds-azure]
plugin_
name=com.
simba.athena.iamsupport.plugin.AzureCredentialsProvider
uid=jsmith@acme.com
pwd=simba12345
tenant_id=xyz
client_secret=xyz
client_id=xyz
```

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-azure;
```

When you connect to Athena, the connector checks the AWS credentials file for the specified profile, and then uses the Azure AD information given in the profile to retrieve temporary credentials from Azure AD. 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 connector can authenticate the connection. For information about how to complete this process, see below.

Using the Browser Azure AD Credentials Provider

You can configure the connector to authenticate the connection using the Browser Azure AD credentials provider, which obtains credentials from the Browser Azure AD identity 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 Browser Azure AD service. For more information, see [Specifying Browser Azure AD Information in the Connection URL](#) on page 54.
- Refers to an AWS profile that specifies information about the Browser Azure AD service. For more information, see [Specifying Browser Azure AD Information in an AWS Profile](#) on page 57.

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 connector connects to Athena, it retrieves temporary credentials from the Browser Azure AD identity provider. If these credentials are associated with an IAM role that has permission to access Athena, the connector 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 connector provides a post-SAML workflow hook. For more information, see [Using the Post-SAML Workflow Hook](#) on page 87.

Specifying Browser Azure AD 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 Browser Azure AD service is hosted.

If your connection URL also specifies an AWS profile that contains some Browser Azure AD information, then the settings specified directly in the URL take precedence over the Browser Azure AD 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 Browser Azure AD information in the connection URL:

- In your connection URL, set the following properties:

Property	Value
<p><code>AWSCredentialsProviderClass</code></p> <p>As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code>. If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.</p>	<p>The FQCN that implements the Browser Azure AD credentials provider.</p>
<p><code>User</code></p> <p>As an alternative, you can configure this property using the alias <code>UID</code>.</p>	<p>The email address that you use to access the Azure AD server.</p>
<p><code>Password</code></p> <p>As an alternative, you can configure this property using the alias <code>PWD</code>.</p>	<p>The password corresponding to your email address that you specified in the <code>User</code> or <code>UID</code> property.</p>
<p><code>tenant_id</code></p>	<p>The Azure AD-provided unique ID associated with your Athena application.</p>
<p><code>client_secret</code></p>	<p>(Optional) The Client Secret to use when authenticating the connection using the Azure AD service.</p>
<p><code>client_id</code></p>	<p>The Client ID to use when authenticating the connection using the Azure AD service.</p>

Property	Value
<code>idp_response_timeout</code>	The amount of time, in seconds, that the connector waits for the SAML response from the identity provider when using the Azure AD service through a browser plugin.
<code>listen_port</code>	The port that the connector uses to get the SAML response from the identity provider when using the Azure AD service through a browser plugin.

Note:

By default, the connector uses `http://localhost:xyz/athena` as the redirect URI.

For example:

```
jdbc:awsathena://AwsRegion=us-east-1;S3OutputLocation=s3://test;AwsCredentialsProviderClass=com.simba.athena.iamsupport.plugin.BrowserAzureCredentialsProvider;UID=jsmith@acme.com;PWD=simba12345;tenant_id=xyz;client_id=xyz;client_secret=xyz;Duration=900;
```

Note:

Optionally, in the `Duration` field, type the duration of the role session in seconds.

When you connect to Athena, the connector retrieves temporary credentials from Browser Azure AD. 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 connector can authenticate the connection. For information about how to complete this process, see [Using the Post-SAML Workflow Hook](#) on page 87.

Specifying Browser Azure AD 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 Browser Azure AD service is hosted, and your credentials for accessing the Browser Azure AD 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 Browser Azure AD information is also specified directly in your connection URL, those settings take precedence over the Browser Azure AD 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 Browser Azure AD 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
<code>AWSCredentialsProviderClass</code> As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code> . If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.	The FQCN that implements the Browser Azure AD credentials provider.
<code>User</code> As an alternative, you can configure this property using the alias <code>UID</code> .	The email address that you use to access the Azure AD server.
<code>Password</code> As an alternative, you can configure this property using the alias <code>PWD</code> .	The password corresponding to your email address that you specified in the <code>User</code> or <code>UID</code> property.
<code>tenant_id</code>	The Azure AD-provided unique ID associated with your Athena application.
<code>client_secret</code>	The Client Secret to use when authenticating the connection using the Azure AD service.
<code>client_id</code>	The Client ID to use when authenticating the connection using the Azure AD service.
<code>idp_response_timeout</code>	The amount of time, in seconds, that the connector waits for the SAML response from the identity provider when using the Azure AD service through a browser plugin.

Property	Value
<code>listen_port</code>	The port that the connector uses to get the SAML response from the identity provider when using the Azure AD service through a browser plugin.

Note:

By default, the connector uses `http://localhost:xyz/athena` as the redirect URI.

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

```
[plug-in-creds-azure]
plugin_
name=com.
simba.athena.iamsupport.plugin.BrowserAzureCredentials
Provider
uid=jsmith@acme.com
pwd=simba12345
tenant_id=xyz
client_secret=xyz
client_id=xyz
```

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-azure;
```

When you connect to Athena, the connector checks the AWS credentials file for the specified profile, and then uses the Browser Azure AD information given in the profile to retrieve temporary credentials from Browser Azure AD. 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 connector can authenticate the connection. For information about how to complete this process, see below.

Using the Browser SAML Credentials Provider

You can configure the connector to authenticate the connection using the Browser SAML credentials provider, which obtains credentials from the Browser SAML identity provider. To do this, connect to Athena using a connection URL that includes property settings that specify information about the Browser SAML service.

When the connector connects to Athena, it retrieves temporary credentials from the Browser SAML identity provider. If these credentials are associated with an IAM role that has permission to access Athena, the connector 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 connector provides a post-SAML workflow hook. For more information, see [Using the Post-SAML Workflow Hook](#) on page 87.

Specifying Browser SAML 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 Browser SAML service is hosted.

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 Browser SAML information in the connection URL:

- In your connection URL, set the following properties:

Property	Value
<code>AWSCredentialsProviderClass</code>	
As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code> . If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.	The FQCN that implements the Browser SAML credentials provider.

Property	Value
User As an alternative, you can configure this property using the alias <code>UID</code> .	The email address that you use to access the server.
Password As an alternative, you can configure this property using the alias <code>PWD</code> .	The password corresponding to your email address that you specified in the <code>User</code> or <code>UID</code> property.
<code>login_url</code>	The URL for the resource on the identity provider's website when using the SAML services through a browser plugin.
<code>idp_response_timeout</code>	The amount of time, in seconds, that the connector waits for the SAML response from the identity provider when using the service through a browser plugin.
<code>listen_port</code>	The port that the connector uses to get the SAML response from the identity provider when using the service through a browser plugin.

For example:

```
jdbc:awsathena://AwsRegion=us-east-1;S3OutputLocation=s3://test;AwsCredentialsProviderClass=com.simba.athena.iamsupport.plugin.BrowserSamlCredentialsProvider;UID=jsmith@acme.com;PWD=simba12345;login_url=http://localhost:abc/athena;Duration=900;
```

Note:

Optionally, in the `Duration` field, type the duration of the role session in seconds.

When you connect to Athena, the connector retrieves temporary credentials from Browser SAML. 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 connector can authenticate the connection. For information about how to complete this process, see [Using the Post-SAML Workflow Hook](#) on page 87.

Using the Okta Credentials Provider

You can configure the connector to authenticate the connection using the Okta credentials provider, which obtains credentials from the Okta identity 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 Okta service. For more information, see [Specifying Okta Information in the Connection URL](#) on page 63.
- Refers to an AWS profile that specifies information about the Okta service. For more information, see [Specifying Okta Information in an AWS Profile](#) on page 65.

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 connector connects to Athena, it retrieves temporary credentials from the Okta identity provider. If these credentials are associated with an IAM role that has permission to access Athena, the connector 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 connector provides a post-SAML workflow hook. For more information, see [Using the Post-SAML Workflow Hook](#) on page 87.

Specifying Okta Information in the Connection URL

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

If your connection URL also specifies an AWS profile that contains some Okta information, then the settings specified directly in the URL take precedence over the Okta 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 Okta information in the connection URL:

- In your connection URL, set the following properties:

Property	Value
<code>IdP_Host</code>	<p>The host name of the Okta service that you are using to authenticate the connection.</p> <p>The host name cannot include any slashes (/).</p>
<code>AWSCredentialsProviderClass</code>	<p>The FQCN that implements the Okta credentials provider.</p>
<p>As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code>. If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.</p>	
<code>App_ID</code>	<p>The Okta-provided unique ID associated with your Athena application.</p>

Property	Value
<code>App_Name</code>	(Optional) The name of the Okta application that you use to authenticate the connection to Athena.
<code>User</code> As an alternative, you can configure this property using the alias <code>UID</code> .	The email address that you use to access the Okta server.
<code>Password</code> As an alternative, you can configure this property using the alias <code>PWD</code> .	The password corresponding to your user name specified in the <code>User</code> or <code>UID</code> property.
<code>preferred_role</code>	The Amazon Resource Name (ARN) of the role that you want to assume when authenticated through Okta.
<code>SSL_Insecure</code> If this is not set, the default is <code>false</code> .	One of the following: <ul style="list-style-type: none">• <code>false</code> if you want the connector to verify the server certificate.• <code>true</code> if you do not want the connector to verify the server certificate.
<code>okta_mfa_type</code>	The factor type when using Okta MFA authentication, from the following list: <ul style="list-style-type: none">• <code>oktaverifywithtotp</code>• <code>oktaverifywithpush</code>• <code>SmsAuthentication</code>• <code>GoogleAuthenticator</code>

Property	Value
<code>okta_mfa_wait_time</code>	The MFA timeout value, in seconds.
<code>okta_phone_number</code>	The phone number used to receive a one-time password for SMS Authentication.

Example of connection URL with Okta:

```
jdbc:awsathena://AwsRegion=us-east-1;S3OutputLocation=s3://test;AwsCredentialsProviderClass=com.simba.athena.iamsupport.plugin.OktaCredentialsProvider;UID=jsmith@acme.com;PWD=simba12345;idp_host=123456.okta.com;app_id=45L3MDWLKM4EDMWR34M;ssl_insecure=true;
```

Example of connection URL with Okta MFA:

```
jdbc:awsathena://AwsRegion=us-east-1;S3OutputLocation=s3://test;AwsCredentialsProviderClass=com.simba.athena.iamsupport.plugin.OktaCredentialsProvider;UID=jsmith@acme.com;PWD=simba12345;idp_host=123456.okta.com;app_id=45L3MDWLKM4EDMWR34M;ssl_insecure=true;okta_mfa_type=GoogleAuthenticator;
```

When you connect to Athena, the connector retrieves temporary credentials from Okta. 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 connector can authenticate the connection. For information about how to complete this process, see [Using the Post-SAML Workflow Hook](#) on page 87.

Specifying Okta Information in an AWS Profile

In your AWS credentials file, define a profile that specifies information such as the host of the server where the Okta service is hosted, and your credentials for accessing the Okta 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 Okta information is also specified directly in your connection URL, those settings take precedence over the Okta 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 Okta 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
<code>IdP_Host</code>	The host name of the Okta service that you are using to authenticate the connection. The host name cannot include any slashes (/).
<code>AWSCredentialsProviderClass</code>	
As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code> . If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.	The FQCN that implements the Okta credentials provider.

Property	Value
App_ID	The Okta-provided unique ID associated with your Athena application.
App_Name	(Optional) The name of the Okta application that you use to authenticate the connection to Athena .
User	The email address that you use to access the Okta server.
As an alternative, you can configure this property using the alias <code>UID</code> .	
Password	The password corresponding to your user name that you specified in the <code>User</code> or <code>UID</code> property.
As an alternative, you can configure this property using the alias <code>PWD</code> .	
preferred_role	The Amazon Resource Name (ARN) of the role that you want to assume when authenticated through Okta.
SSL_Insecure	One of the following: <ul style="list-style-type: none"> <code>false</code> if you want the connector to verify the server certificate. <code>true</code> if you do not want the connector to verify the server certificate.
If this is not set, the default is <code>false</code> .	

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

```
[plug-in-creds-okta]
plugin_
name=com.simba.athena.iamsupport.plugin.OktaCredentialsPr
ovider
```

```
idp_host=123456.okta.com
app_id=45L3MDWLKM4EDMWR34M
uid=jsmith@acme.com
pwd=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-athena-output-us-east-1/profile=plug-in-creds-okta;ssl_insecure=true;
```

When you connect to Athena, the connector checks the AWS credentials file for the specified profile, and then uses the Okta information given in the profile to retrieve temporary credentials from Okta. 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 connector can authenticate the connection. For information about how to complete this process, see below.

Using the Ping Credentials Provider

You can configure the connector to authenticate the connection using the Ping credentials provider, which obtains credentials from the PingFederate service. To do this, connect to Athena using a connection URL that does either of the following:

- Includes property settings that specify information about the PingFederate service. For more information, see [Specifying Ping Information in the Connection URL](#) on page 69.
- Refers to an AWS profile that specifies information about the PingFederate service. For more information, see [Specifying Ping Information in an AWS Profile](#) on page 71.

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 connector connects to Athena, it retrieves temporary credentials from the Ping identity provider. If these credentials are associated with an IAM role that has

permission to access Athena, the connector 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 connector provides a post-SAML workflow hook. For more information, see [Using the Post-SAML Workflow Hook](#) on page 87.

Specifying Ping Information in the Connection URL

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

If your connection URL also specifies an AWS profile that contains some Ping information, then the settings specified directly in the URL take precedence over the Ping 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 Ping information in the connection URL:

- In your connection URL, set the following properties:

Property	Value
<code>IdP_Host</code>	The host name of the PingFederate service that you are using to authenticate the connection. The host name cannot include any slashes (/).
<code>IdP_Port</code>	The number of the port that the PingFederate service host uses to listen for requests.

Property	Value
<p><code>AWSCredentialsProviderClass</code></p> <p>As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code>. If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.</p>	<p>The FQCN that implements the Ping credentials provider.</p>
<p><code>Partner_SPID</code></p>	<p>The partner SPID (service provider ID) value to use when authenticating the connection using the PingFederate service.</p>
<p><code>User</code></p> <p>As an alternative, you can configure this property using the alias <code>UID</code>.</p>	<p>The name that you use to access the PingFederate server.</p>
<p><code>Password</code></p> <p>As an alternative, you can configure this property using the alias <code>PWD</code>.</p>	<p>The password corresponding to your user name specified in the <code>User</code> or <code>UID</code> property.</p>
<p><code>preferred_role</code></p>	<p>(Optional) The Amazon Resource Name (ARN) of the role that you want to assume when authenticated through PingFederate.</p>
<p><code>SSL_Insecure</code></p> <p>If this is not set, the default is <code>false</code>.</p>	<p>One of the following:</p> <ul style="list-style-type: none"> <code>false</code> if you want the connector to verify the server certificate. <code>true</code> if you do not want the connector to verify the server certificate.

Example of a connection URL with Ping:

```
jdbc:awsathena://AwsRegion=us-east-1;S3OutputLocation=s3://test;AwsCredentialsProviderClass=com.simba.athena.iamsupport.plugin.PingCredentialsProvider;UID=jsmith@acme.com;PWD=simba12345;idp_host=123456.ping.com;idp_port=12345;partner_spid=45L3MDWLKM4EDMWR34M;ssl_insecure=true;
```

When you connect to Athena, the connector retrieves temporary credentials from Ping. 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 connector can authenticate the connection. For information about how to complete this process, see [Using the Post-SAML Workflow Hook](#) on page 87.

Specifying Ping Information in an AWS Profile

In your AWS credentials file, define a profile that specifies information such as the host of the server where the PingFederate service is hosted, and your credentials for accessing the PingFederate 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 Ping information is also specified directly in your connection URL, those settings take precedence over the Ping 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 Ping 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
<code>IdP_Host</code>	The host name of the PingFederate service that you are using to authenticate the connection. The host name cannot include any slashes (/).
<code>IdP_Port</code>	The number of the port that the PingFederate service host uses to listen for requests.
<code>AWSCredentialsProviderClass</code>	The FQCN that implements the Ping credentials provider.
<code>As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code>. If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.</code>	
<code>Partner_SPID</code>	The partner SPID (service provider ID) value to use when authenticating the connection using the PingFederate service.
<code>User</code>	The name that you use to access the PingFederate server.
<code>As an alternative, you can configure this property using the alias <code>UID</code>.</code>	

Property	Value
Password As an alternative, you can configure this property using the alias <code>PWD</code> .	The password corresponding to your user name specified in the <code>User</code> or <code>UID</code> property.
<code>preferred_role</code>	(Optional) The Amazon Resource Name (ARN) of the role that you want to assume when authenticated through PingFederate.
<code>SSL_Insecure</code> If this is not set, the default is <code>false</code> .	One of the following: <ul style="list-style-type: none"> <code>false</code> if you want the connector to verify the server certificate. <code>true</code> if you do not want the connector to verify the server certificate.

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

```
[plug-in-creds-ping]
plugin_
name=com.simba.
athena.iamsupport.plugin.PingCredentialsProvider
idp_host=123456.ping.com
idp_port=12345
partner_spid=45L3MDWLKM4EDMWR34M
uid=jsmith@acme.com
pwd=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-athena-output-us-east-1/;profile=plug-in-creds-ping;ssl_insecure=true;
```

When you connect to Athena, the connector checks the AWS credentials file for the specified profile, and then uses the Ping information given in the profile to retrieve temporary credentials from Ping. 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 connector can authenticate the connection. For information about how to complete this process, see below.

Using the JWT Credentials Provider

You can configure the connector to authenticate the connection using the JSON Web Token (JWT) credentials provider, which obtains credentials from the JWT service. To do this, connect to Athena using a connection URL that includes property settings that specify information about the JWT service.

For more information, see [Specifying JWT Information in the Connection URL](#) on page 74.

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.

When the connector connects to Athena, it retrieves temporary credentials from the JWT identity provider. If these credentials are associated with an IAM role that has permission to access Athena, the connector 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 connector provides a post-SAML workflow hook. For more information, see [Using the Post-SAML Workflow Hook](#) on page 87.

Specifying JWT Information in the Connection URL

In your connection URL, set the following properties:

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 JWT information in the connection URL:

- In your connection URL, set the following properties:

Property	Value
<code>AWSCredentialsProviderClass</code>	
As alternatives, you can configure this property using the aliases <code>aws_credentials_provider_class</code> or <code>plugin_name</code> . If you specify both aliases, the setting associated with <code>aws_credentials_provider_class</code> takes precedence.	The FQCN that implements the Ping credentials provider.
<code>web_identity_tokenn</code>	The OAuth 2.0 access token or OpenID Connect ID token that is provided by the identity provider. Make sure that your application gets this token by authenticating the user who is using your application with a web identity provider.
<code>role_arn</code>	The Amazon Resource Name (ARN) of the role that you want to assume when authenticated through JWT.
<code>role_session_name</code>	AthenaJWT

Example of a connection URL with JWT:

```
jdbc:awsathena:AwsRegion=us-east-2;S3OutputLocation=s3:test-athena-output-us-east-2;/plugin_name=com.simba.athena.iamsupport.plugin.JwtCredentialsProvider;web_identity_
```

```
token=eyJhbGciOiJSUzI1NiIsImtpZCI6ImQ2M2RiZTczYWFkODhjODU0ZGUwZDhkNmMwMTRjMzZkYzI1YzQyOTIiLCJ0eXAiOiJKV1QiLCJ0eXciOiJ0dHRwczovL2FjY291bnRzLmdvb2dsZS5jb20iLCJhenAiOiI5MTUxODE3NTE0NS1hdTRib2I4MmE2M2lidWZqMnBoNjQ0MDDodWE0bDVtdi5hcHBzLmdvb2dsZXVzZXJjb250ZW50LmNvbSIsImF1ZCI6IjpkxNTE4MTc1MTQ1LWF1NGJvYjgyYTYzaWJlZmoycGg2NDQwN2h1YTRsNW12LmFwcHMuz29vZ2xldXNlcmNvbnRlbnQuY29tIiwic3ViIjoimTEwMDU0MjA0OTk2MzAzMDUxMjUxIiwiaWF0IjoiJyZWRzaGlmdHdpcmVwcm90b2NvbEBnbWFpbC5jb20iLCJlbWFpbF92ZXJpZmllZCI6dHJ1ZSwiYXRfaGFzaCI6IkkxhWgQ5UGNlslJpZ3Q5WUZkUktVNHciLCJpYXQiOiJlE2NDc0Mzg3NDUsImV4cCI6MTY0NzQ0MjM0NX0.ku256EbVQMXBWgj8pgca-NIg_xOj1xtzxqyxjQCs-QjkC7mbcfjNBNPUREvJLvfwGnNuW91718Nw_y0iOggVB-NzW4HYpv091zXYpQ9q8IvQmoFkgu78mchLirDD-PyAKXxs-X-HV12UID70Jqib65iig_RqTcupjXPZIU_C5jfk13Pk8ZdIrOVFlXb2Pl7jP8SfbdgpbOnkOPFWAzFwRcAF4OmmHkVc1MJovKp190eft2dcmm6_-oFJU4j4HXPaKoJSp8kGipc92MtoK35oD4etZAb09910N9oEzDZEf2tzcAn-HmDq2-3iOtwconWOYNgxUWZGJuh2qCx4gq1ow;role_arn=arn:aws:iam::187862086336:role/AthenaJWTRoleGoogle;role_session_name=AthenaJWT;
```

When you connect to Athena, the connector retrieves temporary credentials from the JWT. 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 connector can authenticate the connection. For information about how to complete this process, see [Using the Post-SAML Workflow Hook](#) on page 87.

Using a Custom Credentials Provider for an Identity Provider

You can configure the connector to use a custom credentials provider class that obtains credentials from an identity provider. To do this, set the `AwsCredentialsProviderClass` connection property to the FQCN of the credentials provider class, and set the `AwsCredentialsProviderArguments` connection property to a comma-separated list of any String arguments necessary for the constructor of that credentials provider class.

For example, if you are using a credentials provider class named `com.you.credential.provider.SampleSamlCredentialsProvider` and it requires String arguments named `KEY_SAML_ASSERTION` and `CUSTOM_PROVIDER_PERMISSIONS`, you would use the following connection URL to connect to Athena:

```
jdbc:awsathena://AwsRegion=us-east-1;AwsCredentialsProviderClass=com.you.credential.provider.SampleSamlCredentialsProvider;AwsCredentialsProviderArguments=KEY_SAML_ASSERTION,CUSTOM_PROVIDER_PERMISSIONS;
```

Creating a Custom Credentials Provider Class for an Identity Provider

To create a custom credentials provider class for an identity provider, do one of the following:

- Extend the `SamlCredentialsProvider` class provided by the connector to implement the procedures specific to your identity provider. Compared to the other implementations in this list, this one is more closely integrated with the connector implementation, and includes support for the relevant Simba Amazon Athena JDBC Connector connection properties (such as `idp_host`, `idp_port`, `preferred_role`, and `ssl_insecure`). For more information, see [Extending the SamlCredentialsProvider Class for an Identity Provider](#) on page 77.
- Implement the `com.simba.iamsupport.IPlugin` interface to define the methods for working with your identity provider. This implementation requires you to define all the methods for interacting with the identity provider. Additionally, it provides access to the connector's connection properties through the `addParameter()` method. For more information, see [Implementing the com.simba.iamsupport.IPlugin Interface for an Identity Provider](#) on page 85.
- Define a class that extends the `com.simba.athena.amazonaws.auth.AWSCredentialsProvider` class to retrieve your AWS credentials from the provider. This implementation works similarly to the previous one in that it also requires you to define all the methods for interacting with the identity provider. However, this implementation does not support the `addParameter()` method. To pass in the parameters that the class requires, you must use the `AwsCredentialsProviderArguments` connection property instead. For more information, see [Extending the com.simba.athena.amazonaws.auth.AWSCredentialsProvider Class for an Identity Provider](#) on page 87.

Extending the SamlCredentialsProvider Class for an Identity Provider

The Simba Amazon Athena JDBC Connector provides a class named `SamlCredentialsProvider`. You can extend this class to implement the procedures for an identity provider using the SAML standard, so that the connector can authenticate connections using the credentials from the provider.

The exact procedure for implementing these procedures depends on the requirements specific to your identity provider. The following is a high-level overview of what a typical implementation might involve:

1. Import the following libraries from the `com.simba.athena.iamsupport.plugin` package:

- `java.io.IOException`
- `com.simba.athena.iamsupport.plugin.SamlCredentialsProvider`

If your implementation requires the `performPostSAMLAction()` method, then also import the following libraries:

- `com.simba.athena.amazonaws.SdkClientException`
- `com.simba.athena.iamsupport.model.CredentialsHolder`

2. Extend the `SamlCredentialsProvider` class, and include the following in your class definition:

- A definition for each custom connection property that the provider requires.
- A field for specifying the values for these custom connection properties.
- Optionally, a default constructor.
- An override for the `addParameter()` method, to specify if-conditions that check for custom connection properties and implements the necessary behavior. At minimum, this override should include the parent class that provides support for all the connection properties that the Simba Amazon Athena JDBC Connector supports by default.
- An override for the `getSamlAssertion()` method, to return the SAML assertion string from your provider to the connector. This enables the current class implementation to retrieve temporary credentials from the provider.
- A post-SAML workflow hook to exchange any temporary credentials for proper AWS credentials. For more information, see [Using the Post-SAML Workflow Hook](#) on page 87.

The following code sample shows how this might be accomplished:

```
package com.simba.athena.iamsupport.plugin;
import java.io.IOException;
import com.simba.athena.iamsupport.plugin.SamlCredentials
Provider;
/**
 * The following two imports are needed for the
 * performPostSAMLAction() method.
 * They are not needed if your implementation does not
 * require this method.
 */
import com.simba.athena.amazonaws.SdkClientException;
```

```
import com.simba.athena.iamsupport.model.CredentialsHolder;
/**
 * A basic SAML credentials provider class. This class can be
 * changed and implemented to work with any desired SAML
 * service provider.
 */
public class SampleSamlCredentialsProvider extends
SamlCredentialsProvider
{
    /**
     * Here we are defining a new connection
     * property key
     * called "saml_assertion". This property is
     * specific
     * to the SampleSamlCredentialsProvider, and
     * is used
     * to provide some information through the
     * connection
     * URL.
     * <p>
     * For example, when using this credentials
     * provider,
     * you may include the following in the
     * connection URL:
     * <p>
     * <code>
     * jdbc:awsathena://AwsRegion=[Region];
     * S3OutputLocation=[Output];saml_assertion=
     * [Value]
     * </code>
     * <p>
     * If your implementation requires user input
     * through
     * the connection URL, you can define the key
     * name of
     * the property using the following code:
     * <p>
     * <code>
```

```
* public static final String PROPERTY_NAME =
* "key_name";
* </code>
* <p>
* You can add as many new connection
properties as
* needed.
* "key_name" is subject to the following
restrictions:
* <p>
* - The name must be unique. It cannot match
any
* existing connection property key name in
the
* Simba Amazon Athena JDBC Connector. These
key names are
* case-insensitive, so even if the case does
not match
* what is found in the documentation, the key
name is
* not allowed.
* <p>
* - The key name cannot contain any spaces.
* <p>
* - The key name can only contain letters of
the
* alphabet (upper-case and lower-case) or
* underscores (_).
*
*/

public static final String KEY_SAML_ASSERTION =
"saml_assertion";
/**
* This field stores the value given with the
* associated connection property key.
* <p>
```



```
* If you add more connection property keys,  
then you  
* must define additional fields to hold those  
values.  
*/  
  
private String samlAssertion;  
/**  
* Optional default constructor.  
*/  
public SampleSamlCredentialsProvider()  
{  
}  
/**  
  
* This method is used to get the values  
associated  
* with different connection string  
properties.  
* <p>  
* We override it in this custom credentials  
provider  
* to add a check for any additional  
connection  
* properties that were added, which are not  
included  
* in the existing Athena JDBC connector. It  
allows us  
* to store these values using the appropriate  
fields  
* as mentioned above.  
* <p>  
* For any new connection property keys added  
to this  
* class, add an if-condition to check if the  
current  
* key matches the connection property key. If  
so,
```

```
* store the value associated with the key in
the
* appropriate field.
* <p>
* If no new connection property keys are
required, you
* may leave the implementation blank and
simply return
* a call to the parent class implementation.
* <p>
* See the example below.
*
* @param key A string representing the
connection
* property key.
* @param value The value associated with the
* connection property key.
*/

@Override
public void addParameter(String key, String value)
{
    // The parent class takes care of setting up
    all the
    // connection properties that are mentioned
    in the
    // Simba Amazon Athena JDBC Connector
    documentation.
    super.addParameter(key, value);

    // Add if-condition checks for any connection
    // properties which are specific to your
    // implementation of this custom SAML
    credentials
    // provider.
    if (KEY_SAML_ASSERTION.equalsIgnoreCase(key))
    {
```

```
        samlAssertion = value;
    }
}
/**
 * This method needs to return the SAML
 * assertion
 * string returned by the specific SAML
 * provider
 * being used for this implementation. The
 * exact
 * instructions for getting this string vary
 * depending on the specific SAML provider you
 * are using.
 * <p>
 * This is used by the SamlCredentialsProvider
 * parent
 * class to get the temporary credentials.
 *
 * @return The SAML assertion string.
 * @throws IOException
 */
@Override
protected String getSamlAssertion() throws
IOException
{
    /*
     * If you wish to make a connection property
     * required,
     * you can check that the associated field has
     * been
     * populated, and if not, throw an
     * IOException.
     * if (StringUtils.isNullOrEmpty
     * (samlAssertion))
     * {
```

```
* throw new IOException("Missing required
property: " + KEY_SAML_ASSERTION);
* }
*/
return samlAssertion;

}

/**
 * This method is used to perform custom
actions after
 * temporary credentials become available.
 * This method is only needed if your
authentication
 * workflow requires an additional step to
turn
 * temporary credentials into AWS credentials.
 *
 * The inputs are the temporary credentials
returned by
 * the provider, and a SAML assertion that
determines
 * how these credentials are exchanged for AWS
 * credentials.
 *
 * @param username The user name.
 * @param samlAssertion The SAML assertion.
 * @param credentials The temporary
credentials from
 * the assumeRoleWithSAML request.
 *
 * @return The updated or new credentials from
the
 * post-SAML authentication action.
 * If null is returned, this indicates that no
 * post-SAML authentication action was
performed and the
 * existing credentials should not be updated.
```

```

        *
        * @throws SdkClientException The exception
        that
        * occurred.
        */

    protected CredentialsHolder performPostSAMLAction(

        String username,
        String samlAssertion,
        CredentialsHolder credentials) throws
        SdkClientException

    {
        return null;
    }
}

```

Implementing the `com.simba.iamsupport.IPlugin` Interface for an Identity Provider

You can define a custom class that implements the `com.simba.iamsupport.IPlugin` interface to define the methods for working with an identity provider.

The exact procedure for doing this depends on the specific requirements for your identity provider. In general, you need to define all the methods for interacting with the identity provider. You also have the option of using the `addParameter()` method to define custom connection properties.

The following example shows how to use `addParameter()`:

```

/**
 * This method is used to get the values associated
 * with
 * different connection string properties.
 * <p>
 * We override it in this custom credentials provider
 * to
 * add a check for any additional connection
 * properties
 * that were added, which are not included in the
 * existing

```

```
* Athena JDBC connector. It allows us to store these
values
* using the appropriate fields as mentioned above.
* <p>
* For any new connection property keys added to this
* class, add an if-condition to check for the
following:
* if the current key matches the connection property
key,
* store the value associated with the key in the
* appropriate field.
* <p>
* If no new connection property keys are required,
you
* may leave the implementation blank and simply
return
* a call to the parent class implementation.
* <p>
* See the example below.
*
* @param key A string representing the connection
* property key.
* @param value The value associated with the
connection
* property key.
*/
```

```
@Override
public void addParameter(String key, String value)
{
    // The parent class takes care of setting up all the
    // connection properties that are mentioned in the
    Athena
    // JDBC connector documentation.
    super.addParameter(key, value);

    // Add if-condition checks for any connection
    properties
    // which are specific to your implementation of this
    // custom SAML credentials provider.
```

```
if (KEY_SAML_ASSERTION.equalsIgnoreCase(key))
{
    samlAssertion = value;
}
}
```

Extending the `com.simba.athena.amazonaws.auth.AWSCredentialsProvider` Class for an Identity Provider

You can extend the `com.simba.athena.amazonaws.auth.AWSCredentialsProvider` class to retrieve AWS credentials from an identity provider.

The exact procedure for doing this depends on the specific requirements for your identity provider. In general, you need to define all the methods for interacting with the identity provider.

Be aware that you cannot use `addParameter()` to define custom connection properties. Instead, you must use the `AWSCredentialsProviderArguments` connection property to pass in all the parameters that this class requires. For more information about this property, see [AwsCredentialsProviderClass](#) on page 109.

For an example of a class that extends the `com.simba.athena.amazonaws.auth.AWSCredentialsProvider` class and uses the `AwsCredentialsProviderArguments` to pass in parameters, see [Example: CustomSessionCredentialsProvider](#) on page 31.

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 connector 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 Credentials Provider that uses the Post-SAML Workflow Hook](#) on page 90.

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 connector 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 Credentials Provider that uses the Post-SAML Workflow Hook

The following Java example implements the AD FS Lambda credentials provider with the post-SAML workflow hook. The AWS Lambda service exchanges the temporary credentials for AWS credentials, which are returned to the connector 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 cre-
dentials.
     *         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 temporary 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 temporary 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 connector: ===
//
// 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 Amazon Athena JDBC Connector 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
<code>SSE_S3</code>	The connector uses server-side encryption with an Amazon S3-managed key.
<code>SSE_KMS</code>	The connector uses server-side encryption with an AWS KMS-managed key.
<code>CSE_KMS</code>	The connector 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 connector to connect through a proxy server instead of connecting directly to the Athena service. When connecting through a proxy server, the connector supports basic authentication and NTLM authentication.

You provide the configuration information to the connector in the connection URL. For more information about the syntax of the connection URL, see [Building the Connection URL](#) on page 18.

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 138.

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 connector 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 connector.

Important:

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

The settings for logging apply to every connection that uses the Simba Amazon Athena JDBC Connector, so make sure to disable the feature after you are done using it.

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 Amazon Athena JDBC Connector, in order from least verbose to most verbose.

LogLevel Value	Description
0	Disable all logging.
1	Log severe error events that lead the connector to abort.
2	Log error events that might allow the connector 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 connector.
5	Log detailed information that is useful for debugging the connector.
6	Log all connector activity.

Note:

If `UseAwsLogger` is set to 1, the connector 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 Amazon Athena JDBC Connector produces the following log files in the location specified in the `LogPath` property:

- An `AthenaJDBC_driver.log` file that logs connector 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 connector activity that is specific to the connection.

If the `LogPath` value is invalid, then the connector 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 how long the connector waits for connections to respond, and how often 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 connector should wait when establishing a connection before timing out the connection.
2. Set the `MaxErrorRetry` property to the maximum number of times that the connector 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=1jt9P
cyq8pr3lvu143pfl4r86;S3OutputLocation=SSE_
S3;ConnectionTimeout=90;MaxErrorRetry=10;
```

Features

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

- [Catalog and Schema Support](#) on page 100
- [File Formats](#) on page 100
- [Fetch Size](#) on page 101
- [Query Execution Polling](#) on page 101
- [Data Types](#) on page 102
- [Query ID Retrieval](#) on page 104
- [Integration with AWS Glue](#) on page 105
- [Security and Authentication](#) on page 105

Catalog and Schema Support

The Simba Amazon Athena JDBC Connector provides access to all the catalogs and databases that are available on the Athena server, ensuring compatibility with standard BI tools.

Amazon Athena provides catalogs that enable you to access the data source that is being queried. These catalogs contain databases, which correspond to JDBC schemas, and each database contains data that has been organized into tables.

By default, if your query statement does not specify a catalog, the connector queries the data under the catalog named `AwsDataCatalog`. You can use the `Catalog` connection property to specify a different default catalog for your queries. For more information, see [Catalog](#) on page 111.

File Formats

The Simba Amazon Athena JDBC Connector 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 Amazon Athena JDBC Connector 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 Amazon Athena JDBC Connector limits the value to 1000. When the result set streaming API is used, the connector 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 131.

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 connector quickly.

Query Execution Polling

When a query is run, the connector polls the Athena server for the query results until they are returned. The connector starts by polling the server frequently, and then increasing the interval of time between polls (decreasing the polling rate) as the query continues to run. You can configure the polling rate of the connector by setting the following properties:

- [MinQueryExecutionPollingInterval](#) on page 123
- [MaxQueryExecutionPollingInterval](#) on page 120
- [QueryExecutionPollingIntervalMultiplier](#) on page 130

The connector starts by polling the server every minimum interval, which is the number of milliseconds specified in `MinQueryExecutionPollingInterval`. The connector then increases the polling interval using the multiplier specified in `QueryExecutionPollingIntervalMultiplier` until the interval specified in `MaxQueryExecutionPollingInterval` is reached. The connector then continues to poll the server using this maximum interval until the query results are returned.

For example, the connector uses the following default settings for query execution polling:

- `MinQueryExecutionPollingInterval=5`
- `MaxQueryExecutionPollingInterval=1800000`
- `QueryExecutionPollingIntervalMultiplier=2`

Using these settings, the connector polls the server 5ms after the query begins to run, and then doubles the interval between polls after each subsequent poll. In other words, the connector polls the server at these intervals: 5ms after the query starts to run, 10ms after the first poll, 20ms after the second poll, and so on until the 1800000ms polling interval is reached. The connector then continues to poll the server every 1800000ms until the query results are returned.

Data Types

The Simba Amazon Athena JDBC Connector 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 136)	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 <div style="border: 1px solid #ccc; padding: 10px; margin-top: 10px;"> <p>Note:</p> <p>Although Athena reports integer data as type INT, the connector reports integer data as type INTEGER to ensure compatibility with standard BI tools. For more information, see Integer Support on page 103.</p> </div>	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 connector 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>.

Query ID Retrieval

To support the retrieval of query IDs from the Athena server, the connector provides an interface called `com.interfaces.core.IStatementQueryInfoProvider`. This interface provides the following functions:

- `public String getPreparedQueryId();`

This function gets the ID of the query used when the statement was prepared. It returns the prepared query ID if available, or a null value if the ID is unavailable.

- `public String getQueryId();`

This function gets the ID of the executed query. It returns the query ID if available, or a null value if the ID is unavailable.

The statement class used by the connector implements this interface, so these functions can be accessed if you unwrap the Java Statement object to this interface.

The following example shows how a `Statement` object might be used:

```
// Import the IStatementQueryInfoProvider interface
// Create the connection as normal
Statement stmt = conn.createStatement();
ResultSet result = stmt.executeQuery("SELECT * FROM
sen.integer_table");
String queryId = stmt.unwrap
(IStatementQueryInfoProvider.class).getQueryId(); // Get
query id after a statement has been executed.
```

The following example shows how a `PreparedStatement` object might be used:


```
// Import the IStatementQueryInfoProvider interface
// Create the connection as normal
PreparedStatement prepStmt = conn.prepareStatement("SELECT *
FROM sen.integer_table");
String prepQueryId = prepStmt.unwrap
(IStatementQueryInfoProvider.class).getPreparedQueryId();
prepStmt.execute();
String queryId = prepStmt.unwrap
(IStatementQueryInfoProvider.class).getQueryId();
```

Integration with AWS Glue

Support for AWS Glue is integrated into Simba Amazon Athena JDBC Connector. 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 connector 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.

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 Amazon Athena JDBC Connector 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 connector 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 36.

Additionally, the connector 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 connector supports industry-standard versions of TLS/SSL.

The SSL version that the connector 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 connector and the server, which is determined at connection time.

For query results, the Simba Amazon Athena JDBC Connector 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 connector, see [Configuring Query Result Encryption](#) on page 93.

Connector Configuration Options

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

You can set configuration properties using the connection URL. For more information, see [Building the Connection URL](#) on page 18.

Note:

Property values are case-sensitive.

App_ID

Default Value	Data Type	Required
None	String	Yes, if authenticating through the Okta service.

Description

The Okta-provided unique ID associated with your Athena application.

App_Name

Default Value	Data Type	Required
None	String	No

Description

The name of the Okta application that you use to authenticate the connection to Athena.

ApplicationName

Default Value	Data Type	Required
None	String	No

Description

This property is used to obtain the name of the application that is used by Athena.

AwsCredentialsProviderArguments

Default Value	Data Type	Required
None	String	Yes, if <code>User</code> and <code>Password</code> are not provided, and if <code>AwsCredentialsProviderClass</code> 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 connector 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 36.

AwsCredentialsProviderClass

Default Value	Data Type	Required
None	String	Yes, if <code>User</code> and <code>Password</code> are not provided, or if you are authenticating through AD FS, Okta, PingFederate, or JWT.

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 AD FS, Okta, PingFederate, or JWT, then set this property to the FQCN of the appropriate 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 connector 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 connector. The shaded AWS SDK is intended to be used internally by the connector, and might not be optimal for other use cases.

AwsRegion

Default Value	Data Type	Required
None	String	Yes, if an endpoint is not provided in the connection URL.

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.

For example, for the following endpoint URLs:

- `athena.[Region].amazonaws.com:443`
- `[vpce-specific-url].athena.[Region].vpce.amazonaws.com:443`

The connector parses the region from the endpoint and uses it to connect to Athena and AWS Glue services. Do not use the `AwsRegion` property if the endpoint is present in the connection string, because the `AwsRegion` value takes precedence over the region parsed from the endpoint.

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.

Catalog

Default Value	Data Type	Required
AwsDataCatalog	String	No

Description

The default Athena catalog that you want to use for query execution. If your query statement does not specify a catalog, the connector queries the data under the catalog that is specified in this property.

client_id

Default Value	Data Type	Required
None	String	Yes, if authenticating through the Azure AD service.

Description

The Client ID to use when authenticating the connection using the Azure AD service.

client_secret

Default Value	Data Type	Required
None	String	Yes, if authenticating through the Azure AD service.

Description

The Client Secret to use when authenticating the connection using the Azure AD service.

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 connector verifies the connection by sending a “SELECT 1” query when establishing a connection with Athena.

- 1: The connector verifies connection by sending a simple “SELECT 1” query to Athena.
- 0: The connector does not send any query to Athena to verify the connection.

Important:

Setting the value to 0 means that connector 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 connector.

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 connector waits when establishing a connection before timing out the connection.

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

Important:

Setting this property to 0 is not recommended.

Duration

Default Value	Data Type	Required
3600	Integer	No

Description

The amount of time, in seconds, that the role session lasts. The range can be 900 to 43200 seconds.

enableResultReuseByAge

Default Value	Data Type	Required
0	Integer	No

Description

This property specifies whether the connector reuses the query results for the same type of query.

- 1: The connector reuses the previous query results.
- 0: The connector does not reuse the previous query results.

EndpointOverride

Default Value	Data Type	Required
None	String	No

Description

The endpoint for the Athena instance that you want the connector to connect to. If you specify `AwsRegion` and connect to the default Athena instance, then you do not need to specify the endpoint.

The endpoint can also be specified directly in the connection URL. If endpoints are specified in both the connection URL and this property, the endpoint specified in this property takes precedence.

If you specify an override endpoint that does not follow the default endpoint format or the VPC endpoint format, the connector cannot parse it for the region. In this case corresponding region must be defined in the `AwsRegion` property.

For more information about endpoint overrides, see [Building the Connection URL](#) on page 18.

GlueEndpointOverride

Default Value	Data Type	Required
<code>GlueEndpointOverride</code>	String	Yes, if you are not using the default Athena endpoint, and want to retrieve metadata from the Glue service.

Description

The endpoint to be used for make AWS glue API calls. This property should not contain the prefix `http://` or `https://`.

IdP_Host

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

Description

The host name of the AD FS, Okta, or PingFederate 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
None	String	No

Description

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

The port number to specify may differ depending on the AD FS or PingFederate 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.

idp_response_timeout

Default Value	Data Type	Required
120	Integer	No

Description

The amount of time, in seconds, that the connector waits for the SAML response from the identity provider when using the Azure AD service through a browser plugin.

LakeFormationEnabled

Default Value	Data Type	Required
false	String	No

Description

This property specifies whether the connector retrieves SAML credentials using Lake Formation service.

- `true`: The connector retrieves SAML credentials using Lake Formation service.
- `false`: The connector retrieves SAML credentials using STS service.

LfEndpointOverride

Default Value	Data Type	Required
None	String	No

Description

The endpoint for the Lake Formation service when using the `assumeDecoratedRoleWithSamI` API to retrieve temporary credentials.

For more information about endpoint overrides, see [Building the Connection URL](#) on page 18.

listen_port

Default Value	Data Type	Required
7890	Integer	No

Description

The port that the connector uses to get the SAML response from the identity provider when using the Azure AD service through a browser plugin.

login_url

Default Value	Data Type	Required
None	String	Yes, if authenticating with the SAML services through a browser plugin.

Description

The URL for the resource on the identity provider's website when using the SAML services through a browser plugin.

loginToRP

Default Value	Data Type	Required
<code>urn:amazon:webservices</code>	String	No

Description

The relying party identifier to use by Athena when authenticating using the AD FS .

Note:

This is an optional parameter. If the parameter is not provided in the connection string, then the default value is used by the connector.

LogLevel

Default Value	Data Type	Required
0	Integer	No

Description

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

Important:

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

The settings for logging apply to every connection that uses the Simba Amazon Athena JDBC Connector, so make sure to disable the feature after you are done using it.

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 connector to abort.
- 2: Enable logging on the ERROR level, which logs error events that might still allow the connector 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 connector.
- 5: Enable logging on the DEBUG level, which logs detailed information that is useful for debugging the connector.
- 6: Enable logging on the TRACE level, which logs all connector activity.

Note:

If `UseAwsLogger` is set to 1, the connector also logs information from AWS API calls. See [UseAwsLogger](#) on page 136.

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

- An `AthenaJDBC_driver.log` file that logs connector 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 connector activity that is specific to the connection.

If the `LogPath` value is invalid, then the connector 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 connector saves log files when logging is enabled.

Note:

To make sure that the connection URL is compatible with all JDBC applications, it is recommended that you escape the backslashes (\) in your file path by typing another backslash.

MapAllViewTypeToView

Default Value	Data Type	Required
0	Integer	No

Description

This property specifies whether the connector returns all table types that contain the word VIEW as views.

- 1: The connector returns all table types that contain the word VIEW as views.
- 0: The connector returns all table types as specified.

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 connector 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
1800000	Integer	No

Description

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

`MinQueryExecutionPollingInterval`.

For detailed information about the query execution polling feature, see [Query Execution Polling](#) on page 101.

maxResultReuseAgeInMinutes

Default Value	Data Type	Required
60	Integer	No

Description

This property specifies whether the connector considers the age in minutes of previous query result for reuse. The range can be 0 to 10080 minutes.

MaxRowsToFetchForStream

Default Value	Data Type	Required
10000000	Long Integer	No.

Description

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

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 connector 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`: At connection time connector automatically determines whether to use AWS Glue or Query to retrieve metadata for the specified Athena region. If AWS Glue is supported in the region and Athena has been upgraded to use AWS Glue, the connector uses AWS Glue to retrieve the metadata. If AWS Glue is not supported in the region or Athena hasn't been upgraded to use AWS Glue, the

connector queries Athena to retrieve the metadata.

- **Glue:** The connector uses AWS Glue to retrieve the metadata regardless of whether AWS Glue is supported or used in the region.
- **ProxyAPI:** The connector uses Athena's proxy API. This is used to query external catalogs.
- **Query:** The connector uses Query to retrieve 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 connector may attempt to use AWS Glue in a region where AWS Glue is not supported or used.

MinQueryExecutionPollingInterval

Default Value	Data Type	Required
5	Integer	No

Description

The minimum amount of time, in milliseconds, that the connector waits between attempts when polling the Athena server for query results. You must specify a value that is greater than 0 but less than the value specified in `MaxQueryExecutionPollingInterval`.

For detailed information about the query execution polling feature, see [Query Execution Polling](#) on page 101.

NonProxyHosts

Default Value	Data Type	Required
None	String	No

Description

A list of hosts that the connector 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.*
```

okta_mfa_type

Default Value	Data Type	Required
None	String	Yes, if MFA is required for Okta Authentication.

Description

The factor type when using Okta MFA authentication, from the following list:

- `oktaverifywithtotp`:

If the user has already enrolled with Okta MFA TOTP factor, the user must enter the password in the dialog box before querying the data store.

If the user has not previously enrolled with Okta MFA TOTP factor, the user must use the Okta Verify app to scan the QR code displayed on the browser. Then, the user must enter the password from the app in the dialog box to activate their device.

- `oktaverifywithpush`:

If the user has already enrolled with Okta MFA push factor, a push notification is sent to the user's device. Once the push notification is approved, the user can query the data store.

If the user has not previously enrolled with Okta MFA push factor, the user must use the Okta Verify app to scan the QR code displayed on the browser.

- `SmsAuthentication`:

If the user has already enrolled with SMS Authentication, the user must enter the password sent to their mobile number in the dialog box before querying the data store.

If the user has not previously enrolled with SMS Authentication, the user must enter the password sent to their mobile number in the dialog box to register the device.

- `GoogleAuthenticator`:

If the user has already enrolled with Okta MFA Google Authenticator, the user must enter the password in the dialog box before querying the data store.

If the user has not previously enrolled with Okta MFA Google Authenticator, the user must use the Google Authenticator app to scan the QR code displayed on the browser. Then, the user must enter the password from the app in the dialog box to activate their device.

okta_mfa_wait_time

Default Value	Data Type	Required
60	Integer	No

Description

The MFA timeout value, in seconds.

Note:

If the value is less than 20 seconds, the connector returns an error.

okta_phone_number

Default Value	Data Type	Required
None	String	Yes, if the Okta MFA type is SMS Authentication.

Description

The phone number used to receive a one-time password for SMS Authentication.

Note:

Okta only supports a US or Canadian number. If a number is not preceded with the country code +1, is automatically added.

Partner_SPID

Default Value	Data Type	Required
None	String	No

Description

The partner SPID (service provider ID) value to use when authenticating the connection using the PingFederate service.

Password

Default Value	Data Type	Required
None	String	Yes, if using any of the following for authentication: <ul style="list-style-type: none"> • IAM credentials • AD FS • Azure AD • Browser Azure AD • Okta • PingFederate

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 connector attempts to authenticate to the AD FS server using your Windows password over the NTLM protocol.

If you are authenticating through the Azure AD or Browser Azure AD credentials provider, then set this property to the password that you use to access the Azure AD server.

If you are authenticating through the Okta credentials provider, then set this property to the password that you use to access the Okta server.

If you are authenticating through the Ping credentials provider, then set this property to the password that you use to access the PingFederate server.

PreemptiveBasicProxyAuth

Default Value	Data Type	Required
0	Integer	No

Description

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

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

preferred_role

Default Value	Data Type	Required
None.		
However, by default, the connector 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, Okta, or PingFederate.

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 connector to authenticate through AD FS, you can use this property to specify a profile that contains the required AD FS service information.

The connector 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.

QueryExecutionPollingIntervalMultiplier

Default Value	Data Type	Required
2	Integer	No

Description

The multiplier by which the connector increases the amount of time between polls, when polling the Athena server for query results. You cannot specify a value that is less than 2.

For detailed information about the query execution polling feature, see [Query Execution Polling](#) on page 101.

role_arn

Default Value	Data Type	Required
None	String	Yes, if authenticating through the JWT service.

Description

The Amazon Resource Name (ARN) of the role that you want to assume when authenticating through JWT.

role_session_name

Default Value	Data Type	Required
None	String	Yes, if authenticating through the JWT service.

Description

The name of the session when authenticating through JWT.

Set this property to `AthenaJWT`.

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 connector quickly.

See [UseResultsetStreaming](#) on page 138 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 connector uses to encrypt your query results before storing them on Amazon S3.

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

Note:

If this value is not set, the connector 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, if the Workgroup property specifies a workgroup that is not configured with an output location.

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 connector waits for data to be transferred over an established, open connection before timing out the connection.

A value of 0 indicates that the connector 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 or the Okta service should be verified.

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

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

StreamingEndpointOverride

Default Value	Data Type	Required
None	String	No

Description

The endpoint for the Athena streaming service corresponding to the specified Athena instance. If this property is not set and `UseResultsetStreaming` is set to 1, the connector tries to connect to port 444 of the Athena instance endpoint specified in the connection string.

StringColumnLength

Default Value	Data Type	Required
255	Integer	No

Description

The maximum data length for STRING columns.

StsEndpointOverride

Default Value	Data Type	Required
None	String	No

Description

The endpoint for the STS service when using the `assumeRoleWithSaml` API to retrieve temporary credentials.

For more information about endpoint overrides, see [Building the Connection URL](#) on page 18.

tenant_id

Default Value	Data Type	Required
None	String	Yes, if authenticating through the Azure AD service.

Description

The Azure AD-provided unique ID associated with your Athena application.

UseArraySupport

Default Value	Data Type	Required
1	Integer	No

Description

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

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

The connector 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 connector records the log output from any AWS API calls. For information about logging, see [Configuring Logging](#) on page 97.

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

UseProxyforIdP

Default Value	Data Type	Required
False	String	No

Description

This property specifies whether the connector accesses the AD FS or Okta service through an HTTP proxy.

- `True`: The connector accesses the AD FS or Okta service through a proxy server based on the information provided in the Proxy Host, Proxy Port, Proxy Username, and Proxy Password fields or the `ProxyHost`, `ProxyPort`, `ProxyUID`, and `ProxyPWD` keys.
- `False`: The connector accesses the AD FS or Okta service directly.

User

Default Value	Data Type	Required
None	String	<p>Yes, if using any of the following for authentication:</p> <ul style="list-style-type: none"> • IAM credentials • AD FS • Azure AD • Browser Azure AD • Okta • PingFederate

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 connector attempts to authenticate to the AD FS server using your Windows user name over the NTLM protocol.

If you are authenticating through the Azure AD or Browser Azure AD credentials provider, then set this property to the email address that you use to access the Azure AD server.

If you are authenticating through the Okta credentials provider, then set this property to the email address that you use to access the Okta server.

If you are authenticating through the Ping credentials provider, then set this property to the user name that you use to access the PingFederate server.

UseResultsetStreaming

Default Value	Data Type	Required
1	Integer	No

Description

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

- 1: The connector uses the result set streaming API.
- 0: The connector 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.

web_identity_token

Default Value	Data Type	Required
None	String	Yes, if authenticating through the JWT service.

Description

The OAuth 2.0 access token or OpenID Connect ID token that is provided by the identity provider. Make sure that your application gets this token by authenticating the user who is using your application with a web identity provider.

Workgroup

Default Value	Data Type	Required
<code>primary</code>	String	No

Description

The workgroup you want your application to use when connecting.

Appendix: Migrating to Later Connector Versions

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

The following sections list differences between connectors 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 Connector Class Name

The connectors use different class names.

Version 1.x	Version 2.x
<code>com.simba.athena.amazonaws.athena.jdbc.c.AthenaDriver</code>	<code>com.simba.athena.jdbc.Driver</code>

If you are using the following line in your code to explicitly load the connector class in your source code:

```
Class.forName
```

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

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 connectors 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
```

Connector Configuration Options

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

Version 1.x Option	Version 2.x Option	Possible Values
<code>log_path</code>	<code>LogPath</code>	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 connectors return different metadata 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	
	Metadata	Value	Metadata	Value
REMARKS COLUMN_DEF IS_NULLABLE SCOPE_CATALOG SCOPE_SCHEMA SCOPE_TABLE	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
	Metadata	Value	Metadata	Value
	Type Name	smallint	Type Name	INTEGER
SOURCE_DATA_TYPE	Type ID	5	Type ID	4
	Display Size	6	Display Size	11
	Precision	5	Precision	10
	Scale	0	Scale	0
	Metadata	Value	Metadata	Value
	Type Name	smallint	Type Name	INTEGER

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

Column Name	Version 1.x		Version 2.x	
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 connectors 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 connector 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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