

**Graph Engine Service**

# **Developer Guide**

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## **Huawei Technologies Co., Ltd.**

Address: Huawei Industrial Base  
Bantian, Longgang  
Shenzhen 518129  
People's Republic of China

Website: <https://www.huawei.com>

Email: [support@huawei.com](mailto:support@huawei.com)

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# 1 Overview

## Service Overview

Graph Engine Service (GES) facilitates query and analysis of graph-structured data based on various relationships. It is specifically suited for scenarios that require analyzing rich relationship data, including social relationship analysis, recommendations, precision marketing, public opinion and social listening, information communication, and fraud detection.

## Developer Guide Overview

The GES Software Development Kit (SDK) encapsulates RESTful APIs offered by GES, streamlining your development process. You can directly call the APIs provided by the GES SDK to utilize GES functions.

Similar to GES APIs, GES SDKs are classified into management plane SDKs and service plane SDKs. The differences are:

SDK	Open Source (Downloadable Using Maven or Pip)	Generate Code Dynamically Using API Explorer	Supported Languages	Current Version
Management-plane SDK	Yes	Yes	Java, Python, Go, Node.js, and PHP.	v1 and v2
Service-plane SDK	No (can only be downloaded from the <b>Connection Management</b> page of the GES console)	No (see the sample code in the SDK package)	Java and Python, with support for other languages being gradually rolled out in the future.	v1

## Content Navigation

The GES developer guide will assist you in installing and configuring the development environment, as well as conducting secondary development by utilizing the interface functions provided by the GES SDK.

Chapter	Describes
Overview	The concepts of this service and its developer guide.
Using the Management Plane SDK	Common operations using the management-plane GES SDK.
Using the Service Plane SDK	Common operations using the service-plane GES SDK.
Using Cypher JDBC Driver to Access GES	Accessing service-plane graph instances and executing Cypher queries with JDBC.

# 2 Using the Management Plane SDK

## Obtaining SDK Installation Information

1. Access **API Explorer**. In the upper left corner, select **Graph Engine Service** from the drop-down list.
2. Locate an API in the list on the left, click the **Sample Code** tab on the right, and click **View SDK Details**. In this way, you can obtain installation instructions and usage guidelines.

Figure 2-1 Viewing sample code

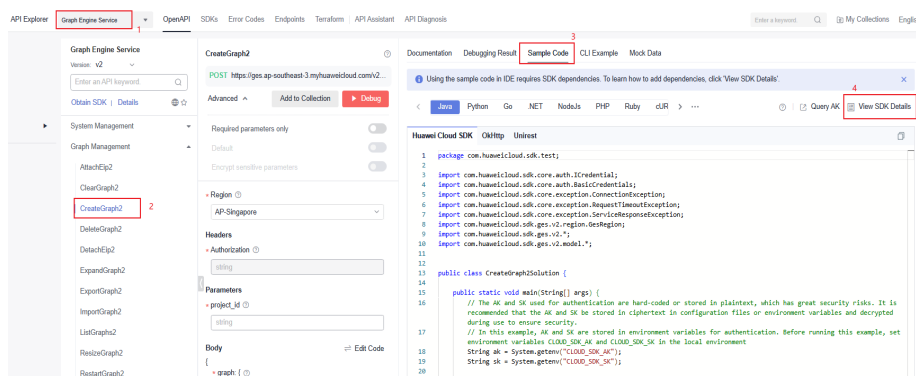
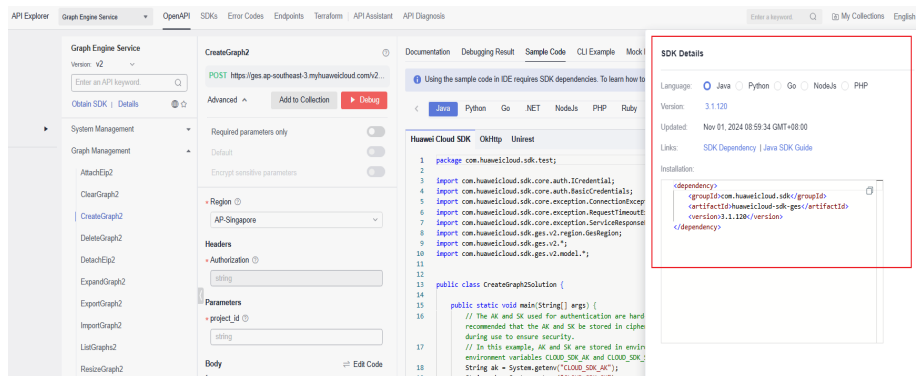


Figure 2-2 SDK information

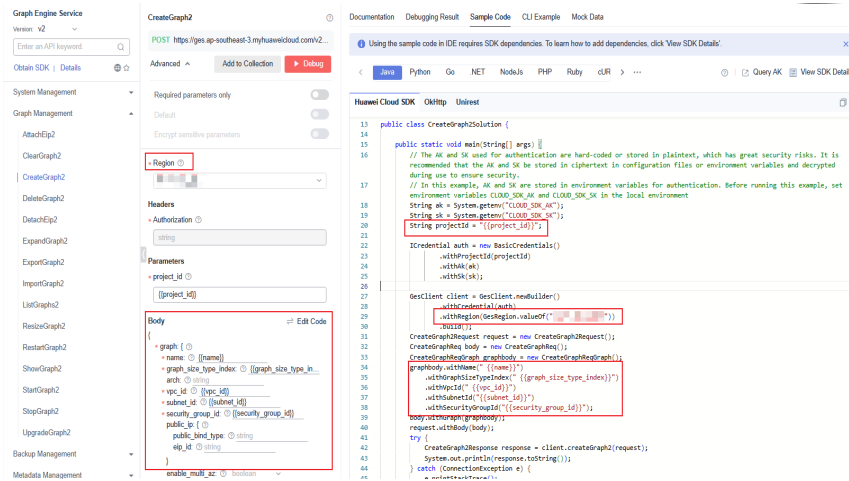




## Generating SDK Sample Code

1. Access [API Explorer](#). In the upper left corner, select **Graph Engine Service** from the drop-down list.
2. Select **v1** or **v2** (recommended) for **Version**. Locate a desired API in the list on the left and set the parameters in the **Region**, **Parameters**, and **Body** areas. The **Sample Code** tab will dynamically generate SDK sample code corresponding to the API.

Figure 2-3 Generating SDK sample code



# 3 Using the Service Plane SDK

## 3.1 Downloading and Installing the SDK

The service plane SDK supports two programming languages: Java and Python. For Java SDK, there are two scenarios:

- Maven source available: A Maven source is configured and can download JAR files from open source repositories.
- Maven source unavailable: There is no Maven source configured or it cannot download JAR files from open source repositories.

### Downloading the SDK

Download the SDK and driver. For details, see [Managing Connections](#) . The SDK package named **huaweicloud-ges-sdk-java-xxx.zip** is obtained.

### Installing the Java SDK When the Maven Source Is Available

1. Extract **huaweicloud-ges-sdk-java-xxx.zip**, go to the **maven-install** directory, and run the **ges-sdk-java-maven-install.bat** or **ges-sdk-java-maven-install.sh** file to install **graph-sdk-xxx.jar** and **cypher-jdbc-driver-xxx.jar** to the local Maven repository.
2. Create a Maven project and add the following dependency to the POM file. Use Maven to download JAR files on which the SDK depends from other open source repositories.

```
<dependency>  
  <groupId>com.huawei.ges.graph</groupId>  
  <artifactId>graph-sdk</artifactId>  
  <version>xxx</version> // Enter the version number of the current service-plane SDK.  
</dependency>
```

### Installing the Java SDK When the Maven Source Is Unavailable

Create a project, extract **huaweicloud-ges-sdk-java-xxx.zip**, and import **graph-sdk-xxx-jar-with-dependencies.jar** in the **jars** directory to the project or import all packages in the **graph-sdk-xxx.jar** and **graph-sdk-lib** directories to the project.

## Installing the Python SDK

Extract **huaweicloud-ges-sdk-java-xxx.zip**, go to the **huaweicloud-ges-sdk-java-xxx** directory, and run the **pip install** command to install the **.whl** file in the **pip\_install** directory. Then, you can use the Python SDK locally.

## 3.2 Obtaining Initialization Parameters

### Authentication Mode

When using the service-plane SDK, you need to prepare the necessary parameters for client initialization in advance. GES offers two authentication modes, and you can choose either one.

- Token-based authentication: Obtain a token authentication request using a username and password.
- AK/SK-based authentication: Requests are authenticated by encrypting the request body using an AK/SK.

AK/SK-based authentication is recommended as it provides higher security.

### Obtaining Initialization Parameters

**Table 3-1** Initialization parameters

Parameter	Mandatory	Description	Source
graphEndPoint	Yes	Graph access address	Log in to the GES console. In the navigation pane on the left, choose <b>Graph Management</b> . The value of this parameter is the <b>Internal Access Address</b> or <b>External Access Address</b> value of the graph you want to access.
graphName	Yes	Graph name	The value of this parameter is the <b>Name/ID</b> value of the graph you want to access on the <b>Graph Management</b> page of the GES console.
ak	No. Mandatory for AK/SK-based authentication.	Access key	1. Log in to the management console. In the upper right corner of the page, hover over the username and choose <b>My Credentials</b> from the drop-down list. The <b>My Credentials</b> page is displayed. 2. In the navigation pane on the left, choose <b>Access Keys</b> .
sk	No. Mandatory for AK/SK-based authentication.	Secret key used together with the access key ID	

Parameter	Mandatory	Description	Source
regionCode	No. Mandatory for AK/SK-based authentication.	Project the graph belongs to	<ol style="list-style-type: none"> <li>1. Log in to the management console. In the upper right corner of the page, hover over the username and choose <b>My Credentials</b> from the drop-down list. The <b>My Credentials</b> page is displayed.</li> <li>2. View the project ID in the project list.</li> </ol>
domainName	No. Mandatory for password-based authentication.	Domain name	IAM account used to log in to the management console
userName	No. Mandatory for password-based authentication.	Username	IAM username used to log in to the management console
password	No. Mandatory for password-based authentication.	Password	Password of the IAM username used to log in to the management console
projectId	No. Mandatory for password-based authentication.	Project the graph belongs to	<ol style="list-style-type: none"> <li>1. Log in to the management console. In the upper right corner of the page, hover over the username and choose <b>My Credentials</b> from the drop-down list. The <b>My Credentials</b> page is displayed.</li> <li>2. View the project ID in the project list.</li> </ol>
iamEndPoint	No. Mandatory for password-based authentication.	Endpoint of the IAM service	You can obtain the region where the service is deployed by referring to <a href="#">Regions and Endpoints</a> .

Parameter	Mandatory	Description	Source
authToken	No. Mandatory for token-based authentication.	User token	You can obtain the token by calling the <a href="#">Obtaining a User Token</a> API.

## 3.3 Java SDK

### 3.3.1 Initializing the Client

#### 3.3.1.1 Authentication Mode

There are three ways to initialize the client based on different authentication methods. You can choose one according to your needs.

#### AK/SK-based Authentication

For how to set **ak**, **sk**, **regionCode**, and **graphEndpoint**, see [Obtaining Initialization Parameters](#).

```
import com.huawei.ges.graph.v1.GESGraphClient; // Memory edition client
import com.huawei.ges.graph.v1.persistence.GESGraphPersistenceClient; // Database edition client
import com.huawei.ges.graph.v1.auth.aksk.GesGraphAkSkCredentials;
import com.huaweicloud.sdk.core.auth.ICredential;
import com.huaweicloud.sdk.core.http.HttpConfig;
import java.util.Arrays;

// Hard-coded or plaintext AK and SK are insecure. So, encrypt your AK and SK and store them in the
// configuration file or environment variables.
// In this example, the AK and SK are stored in environment variables. Before running this example, set
// environment variables HUAWEICLOUD_SDK_AK and HUAWEICLOUD_SDK_SK.
String ak = System.getenv("HUAWEICLOUD_SDK_AK");
String sk = System.getenv("HUAWEICLOUD_SDK_SK");
String regionCode = "";
String graphEndpoint = "";
ICredential auth = new GesGraphAkSkCredentials().withAk(ak).withSk(sk).withRegionCode(regionCode);
HttpConfig httpConfig = HttpConfig.getDefaultHttpConfig();

// Memory edition client
GESGraphClient gesGraphClient =
GESGraphClient.newBuilder().withCredential(auth).withEndpoints(Arrays.asList(graphEndpoint)).withHttpCo
nfig(httpConfig).build();
// Database edition client
GESGraphPersistenceClient gesGraphPersistenceClient =
GESGraphPersistenceClient.newBuilder().withCredential(auth).withEndpoints(Arrays.asList(graphEndpoint)).
withHttpConfig(httpConfig).build();
```

#### Password-based Authentication

For how to set **domainName**, **userName**, **password**, **projectId**, **iamEndPoint**, and **graphEndpoint**, see [Obtaining Initialization Parameters](#).

```
import com.huawei.ges.graph.v1.GESGraphClient; // Memory edition client
import com.huawei.ges.graph.v1.persistence.GESGraphPersistenceClient; // Database edition client
import com.huawei.ges.graph.v1.auth.password.GesGraphPasswordCredentials;
import com.huaweicloud.sdk.core.auth.ICredential;
import com.huaweicloud.sdk.core.http.HttpConfig;
import java.util.Arrays;

// Hard-coded or plaintext password is insecure. So, encrypt your password and store it in the configuration
// file or environment variables.
// In this example, the password is stored in environment variables. Before running this example, set the
// environment variable HUAWEICLOUD_SDK_PWD.
String password = System.getenv("HUAWEICLOUD_SDK_PWD");
String domainName = "";
String userName = "";
String projectId = "";
String iamEndPoint = "";
String graphEndpoint = "";
ICredential auth = new GesGraphPasswordCredentials(userName, domainName, password, projectId,
Arrays.asList(iamEndPoint));
HttpConfig httpConfig = HttpConfig.getDefaultHttpConfig();

// Memory edition client
GESGraphClient gesGraphClient =
GESGraphClient.newBuilder().withCredential(auth).withEndpoints(Arrays.asList(graphEndpoint)).withHttpCo
nfig(httpConfig).build();
// Database edition client
GESGraphPersistenceClient gesGraphPersistenceClient =
GESGraphPersistenceClient.newBuilder().withCredential(auth).withEndpoints(Arrays.asList(graphEndpoint)).
withHttpConfig(httpConfig).build();
```

## Token-based Authentication

For how to set **authToken** and **graphEndpoint**, see [Obtaining Initialization Parameters](#).

```
import com.huawei.ges.graph.v1.GESGraphClient; // Memory edition client
import com.huawei.ges.graph.v1.persistence.GESGraphPersistenceClient; // Database edition client
import com.huawei.ges.graph.v1.auth.token.GesGraphTokenCredentials;
import com.huaweicloud.sdk.core.auth.ICredential;
import com.huaweicloud.sdk.core.http.HttpConfig;
import java.util.Arrays;

String authToken = "";
String graphEndpoint = "";
ICredential auth = new GesGraphTokenCredentials().withXAuthToken(authToken);
HttpConfig httpConfig = HttpConfig.getDefaultHttpConfig();

// Memory edition client
GESGraphClient gesGraphClient =
GESGraphClient.newBuilder().withCredential(auth).withEndpoints(Arrays.asList(graphEndpoint)).withHttpCo
nfig(httpConfig).build();
// Database edition client
GESGraphPersistenceClient gesGraphPersistenceClient =
GESGraphPersistenceClient.newBuilder().withCredential(auth).withEndpoints(Arrays.asList(graphEndpoint)).
withHttpConfig(httpConfig).build();
```

### 3.3.1.2 Client Connection Parameters

After completing the client initialization authentication modes, you can configure HTTP according to your needs.

## Configuring HTTP

You can configure HTTP based on the sample code:

```
import com.huaweicloud.sdk.core.http.HttpConfig;

// Default configuration
HttpConfig config = HttpConfig.getDefaultHttpConfig();

// Timeout configuration: The default connection timeout interval is 60 seconds, which can be changed as
// required.
config.withTimeout(60)

// SSL configuration: Configure whether to skip SSL certificate verification.
config.withIgnoreSSLVerification(true);

// Custom configuration: Customize SSLSocketFactory and TrustManager.
config.withSSLSocketFactory(sslSocketFactory).withX509TrustManager(trustManager);
```

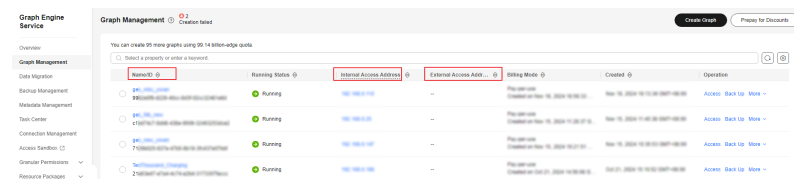
### 3.3.2 Usage Process

Obtain parameters and initialize the client by referring to [Obtaining Initialization Parameters](#). The following uses the memory edition's [Executing a Cypher Query](#) API as an example to demonstrate how to use the Java SDK.

#### Obtaining the Graph Name and Access Address

Log in to the GES console and choose **Graph Management** in the navigation pane on the left. On the displayed page, obtain the graph name (**Name/ID**) and access address (**Internal Access Address/External Access Address**) as needed.

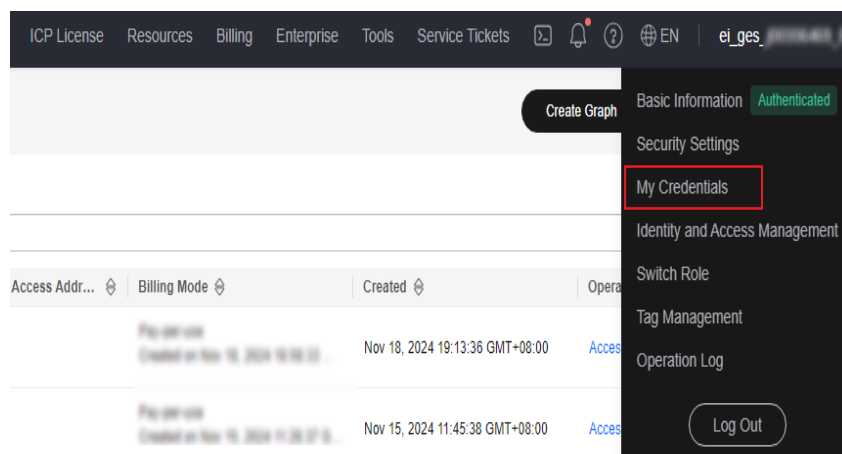
Figure 3-1 Obtaining the graph name and access address



#### Obtaining AK/SK-based Authentication Information

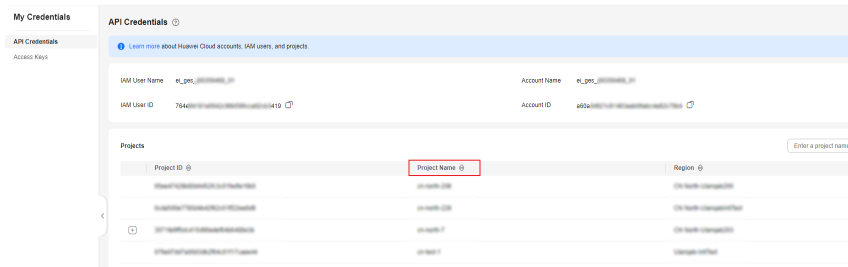
1. Log in to the Huawei Cloud management console, hover over the username in the upper right corner, and choose **My Credentials** from the drop-down list.

Figure 3-2 My Credentials



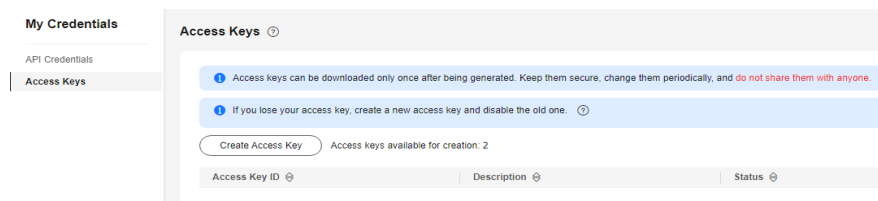
2. On the **API Credentials** page, locate the project to which the graph belongs in the project list.

**Figure 3-3 Project**



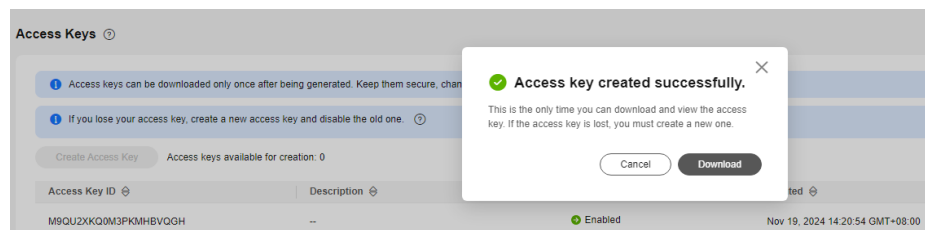
3. In the navigation pane on the left, choose **Access Keys**. On the page that appears, click **Create Access Key**.

**Figure 3-4 Creating an access key**



4. Once the access key is created, click **Download** to obtain the AK, SK, and region code.

**Figure 3-5 Clicking Download**



## Obtaining Token-based Authentication Information

1. Query the IAM endpoint by referring to [Regions and Endpoints](#).

**Figure 3-6 Querying a VPC endpoint**

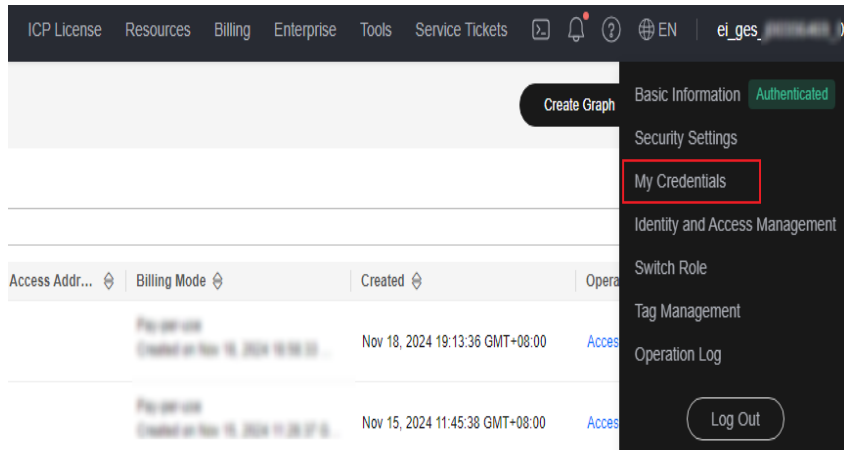
The screenshot shows the 'Regions and Endpoints' page in the Huawei Cloud console. The page title is 'Regions and Endpoints / Identity and Access Management'. There is a search bar for 'Enter a region name or ID'. Below the search bar is a table with columns for 'Region Name', 'Region ID', 'Endpoint', and 'Protocol'. The 'Endpoint' column is highlighted with a red box.

Region Name	Region ID	Endpoint	Protocol
ME-Abu Dhabi-GPS	ae-sd-1	iam-ae-sd-1.myhuaweicloud.com	HTTPS
AF-Johannesburg	af-south-1	iam-af-south-1.myhuaweicloud.com	HTTPS
CN-Hong Kong	ap-southeast-1	iam-ap-southeast-1.myhuaweicloud.com	HTTPS
AP-Bangkok	ap-southeast-2	iam-ap-southeast-2.myhuaweicloud.com	HTTPS
AP-Singapore	ap-southeast-3	iam-ap-southeast-3.myhuaweicloud.com	HTTPS
AP-Jakarta	ap-southeast-4	iam-ap-southeast-4.myhuaweicloud.com	HTTPS
CN-East-Shanghai2	cn-east-2	iam-cn-east-2.myhuaweicloud.com	HTTPS
CN-East-Shanghai1	cn-east-3	iam-cn-east-3.myhuaweicloud.com	HTTPS
CN-North-Beijing1	cn-north-1	iam-cn-north-1.myhuaweicloud.com	HTTPS
CN-North-Beijing2	cn-north-2	iam-cn-north-2.myhuaweicloud.com	HTTPS

2. Log in to the Huawei Cloud management console, hover over the username in the upper right corner, and choose **My Credentials** from the drop-down list.

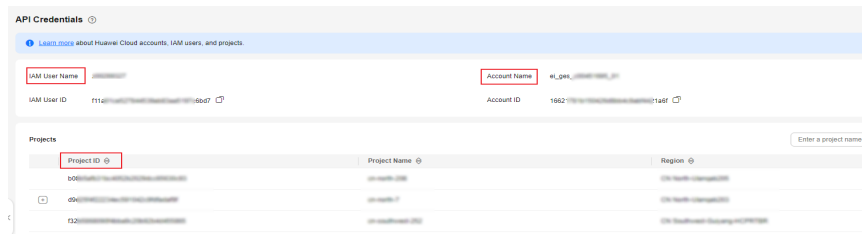


Figure 3-7 My Credentials



3. On the **API Credentials** page, find **IAM User Name** and **Account Name**, as well as **Project ID** in the project list.

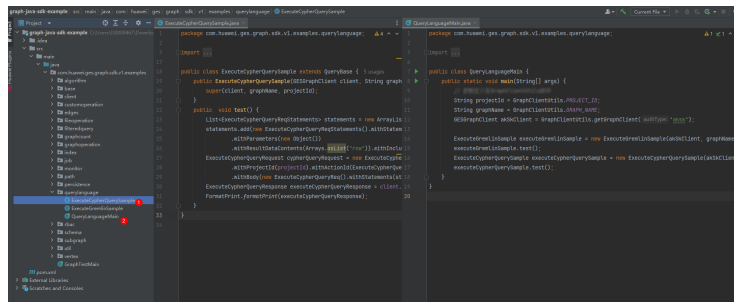
Figure 3-8 Obtaining information



## How to Use Java SDK

1. Extract **huaweicloud-ges-sdk-xxx.zip** and find a Maven project called **graph-java-sdk-example**. This project contains Java SDK sample code for GES APIs, which can be imported into an IDE for debugging by modifying API parameters.  
For detailed information and parameter description of GES APIs, refer to [Service Plane APIs](#). For how to find the corresponding Java SDK sample code file for an API, refer to [Java SDK Sample Reference](#). The sample code file is located in a path that includes a Main file for debugging purposes.
2. Take the "Executing a Cypher Query" API of the memory edition as an example. Find the corresponding Java SDK sample code file in [Java SDK Sample Reference](#). The file is named **ExecuteCypherQuerySample.java**, the file is located in **com.huawei.ges.graph.sdk.v1.examples.querylanguage**. The path also includes a Main file named **QueryLanguageMain.java** for debugging.

Figure 3-9 Java SDK sample code file



3. The parameters for client initialization are defined in the **GraphClientUtils** class. Select an appropriate authentication method and set the parameters.

Figure 3-10 GraphClientUtils class

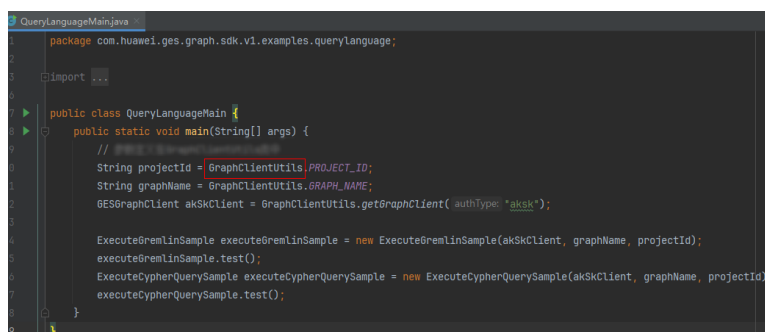
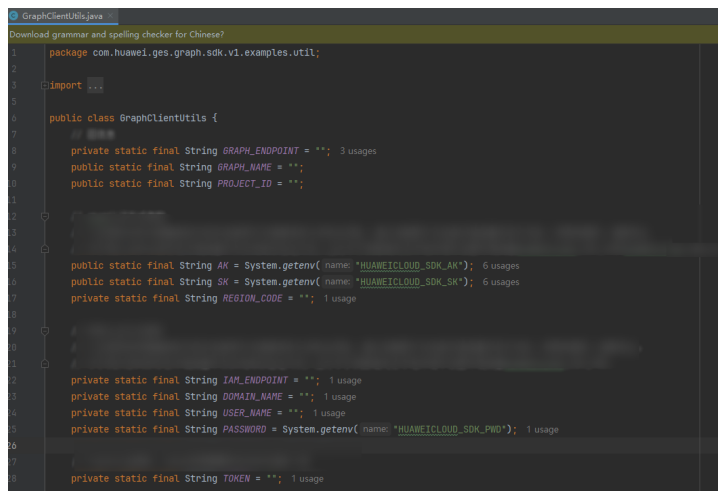
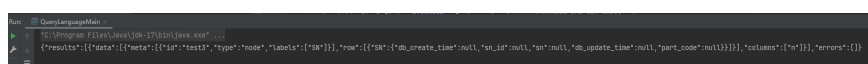


Figure 3-11 Authentication mode parameters



4. The following is an example of the result of executing a Cypher query:

Figure 3-12 Cypher query result



For SDK sample code for more APIs, see [Java SDK Sample Reference](#).

### 3.3.3 Java SDK Sample Reference

### 3.3.3.1 Memory Edition Sample

#### 3.3.3.1.1 Vertex Operations

##### Sample Class

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.vertex	VertexsFilterQuerySample	<a href="#">Querying Vertices Based on Filter Criteria</a>
	QueryVertexsDetailsSample	<a href="#">Querying Vertex Details</a>
	AddVertexSample	<a href="#">Adding a Vertex</a>
	DeleteVertexSample	<a href="#">Deleting a Vertex</a>
	UpdateVertexPropertiesSample	<a href="#">Updating Vertex Properties</a>
	BatchVertexsQuerySample	<a href="#">Batch Querying Vertex Data</a>
	BatchAddVertexsSample	<a href="#">Batch Adding Vertices</a>
	BatchDeleteVertexsSample	<a href="#">Batch Deleting Vertices</a>
	BatchUpdateVertexsPropertiesSample	<a href="#">Batch Updating Vertex Properties</a>
	AddVertexLabelSample	<a href="#">Adding a Vertex Label</a>
	DeleteVertexLabelSample	<a href="#">Deleting a Vertex Label</a>
	ExportFilteredVertexsSample	<a href="#">Exporting Filtered Vertices</a>
	DeleteFilteredVertexsSample	<a href="#">Deleting Filtered Vertices</a>

#### 3.3.3.1.2 Edge Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.edges	EdgesFilterQuerySample	<a href="#">Querying Edges Based on Filter Criteria</a>
	QueryEdgeDetailsSample	<a href="#">Querying Edge Details</a>
	AddEdgeSample	<a href="#">Adding an Edge</a>
	DeleteEdgeSample	<a href="#">Deleting an Edge</a>
	UpdateEdgePropertiesSample	<a href="#">Updating Edge Properties</a>
	BatchEdgesQuerySample	<a href="#">Batch Querying Edge Data</a>

	BatchAddEdgesSample	<a href="#">Batch Adding Edges</a>
	BatchDeleteEdgesSample	<a href="#">Batch Deleting Edges</a>
	BatchUpdateEdgesProperties-Sample	<a href="#">Batch Updating Edge Properties</a>
	ExportFilteredEdgesSample	<a href="#">Exporting Filtered Edges</a>
	DeleteFilteredEdgesSample	<a href="#">Deleting Filtered Edges</a>

### 3.3.3.1.3 Metadata Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.schema	AddLabelSample	<a href="#">Adding a Label</a>
	UpdateLabelSample	<a href="#">Updating a Label</a>
	QueryGraphSchemaDetail-Sample	<a href="#">Querying Metadata Details</a>
	DeleteLabelSample	<a href="#">Deleting a Label</a>
	BatchAddLabelSample	<a href="#">Batch Adding Labels</a>
	BuildSchemaStructureSample	<a href="#">Generating a Schema</a>
	QuerySchemaStructureSample	<a href="#">Querying a Schema</a>

### 3.3.3.1.4 Index Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.index	ListIndicesSample	<a href="#">Querying Indexes</a>
	CreateIndexSample	<a href="#">Creating an Index</a>
	DeleteIndexSample	<a href="#">Deleting an Index</a>

### 3.3.3.1.5 Query Languages

Sample Code File Path	Sample Code File Name	API
-----------------------	-----------------------	-----

com.huawei.ges.graph.sdk.v1.examples.querylanguage	ExecuteGremlinSample	<a href="#">Executing a Gremlin Query</a>
	ExecuteCypherQuerySample	<a href="#">Executing a Cypher Query</a>

### 3.3.3.1.6 Algorithms

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.algorithm	PagerankSample	<a href="#">PageRank</a>
	PersonalrankSample	<a href="#">PersonalRank</a>
	KcoreSample	<a href="#">K-core</a>
	KhopSample	<a href="#">K-Hop</a>
	ShortestPathSample	<a href="#">Shortest Path</a>
	AllShortestPathsSample	<a href="#">All Shortest Paths</a>
	FilteredShortestPathSample	<a href="#">Filtered Shortest Path</a>
	SsspSample	<a href="#">Single Source Shortest Path</a>
	ShortestPathOfVertexSets-Sample	<a href="#">Vertex Set Shortest Path</a>
	NpathsSample	<a href="#">n-Paths</a>
	ClosenessSample	<a href="#">Closeness Centrality</a>
	LabelPropagationSample	<a href="#">LabelPropagation</a>
	LouvainSample	<a href="#">Louvain</a>
	LinkPredictionSample	<a href="#">Link Prediction</a>
	Node2vecSample	<a href="#">Node2vec</a>
	RealtimeRecommendation-Sample	<a href="#">Real-time Recommendation</a>
	CommonNeighborsSample	<a href="#">Common Neighbors</a>
	ConnectedComponentSample	<a href="#">Connected Component</a>
	DegreeCorrelationSample	<a href="#">Degree Correlation</a>
	TriangleCountSample	<a href="#">Triangle Count</a>
ClusterCoefficientSample	<a href="#">Cluster Coefficient</a>	
BetweennessSample	<a href="#">Betweenness Centrality</a>	

	EdgeBetweennessSample	<a href="#">Edge Betweenness Centrality</a>
	OdBetweennessSample	<a href="#">Origin-Destination Betweenness Centrality</a>
	SingleVertexCirclesDetectionSample	<a href="#">Circle Detection with a Single Vertex</a>
	CommonNeighborsOfVertexSetsSample	<a href="#">Common Neighbors of Vertex Sets</a>
	AllShortestPathsOfVertexSetsSample	<a href="#">All Shortest Paths of Vertex Sets</a>
	FilteredCircleDetectionSample	<a href="#">Filtered Circle Detection</a>
	SubgraphMatchingSample	<a href="#">Subgraph Matching</a>
	FilteredAllPairsShortestPathsSample	<a href="#">Filtered All Pairs Shortest Paths</a>
	TopicrankSample	<a href="#">TopicRank</a>
	FilteredNPathsSample	<a href="#">Filtered n-Paths</a>

### 3.3.3.1.7 Path

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.path	ShowPathDetailSample	<a href="#">Querying Path Details</a>

### 3.3.3.1.8 Graph Statistics

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.graphcount	ShowGraphVersionSample	<a href="#">Querying the Version of a Graph</a>
	ShowGraphSummarySample	<a href="#">Querying General Information About a Graph</a>

### 3.3.3.1.9 Graph Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.graphoperation	ImportGraphSample	<a href="#">Importing a Graph</a>
	ExportGraphSample	<a href="#">Exporting a Graph</a>
	ClearGraphSample	<a href="#">Clearing a Graph</a>

### 3.3.3.1.10 Subgraph Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.subgraph	QuerySubgraphSample	<a href="#">Querying a Subgraph</a>
	SubgraphExecuteAlgorithmSample	<a href="#">Executing an Algorithm on a Subgraph</a>

### 3.3.3.1.11 Job Management

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.job	ShowJobSample	<a href="#">Querying the Status of a Job</a>
	DeleteJobSample	<a href="#">Canceling a Job</a>
	ExportJobResultSample	<a href="#">Exporting Job Results to a File</a>
	ListJobsSample	<a href="#">Listing Jobs</a>

### 3.3.3.1.12 Custom Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.customoperation	ExecuteCustomActionSample	<a href="#">Performing a Custom Operation</a>

### 3.3.3.1.13 Filtered-query

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.customoperation	FilteredQuerySample	<a href="#">Filtered-query</a>
	FilteredQueryV2Sample	<a href="#">Filtered-query V2</a>

### 3.3.3.1.14 Updating/Deleting Data by File

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.fileoperation	ImportPropertiesSample	<a href="#">Updating Specified Properties of Vertices and Edges by Importing a File</a>
	DeleteByFileSample	<a href="#">Deleting Vertices and Edges by Reading Files</a>

## 3.3.3.2 Database Edition Sample

### 3.3.3.2.1 Vertex Operations

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testQueryVertexsDetails	<a href="#">Querying Vertex Details</a>
	testBatchVertexsQuery	<a href="#">Batch Querying Vertex Data</a>
	testBatchAddVertexs	<a href="#">Batch Adding Vertices</a>
	testBatchDeleteVertexs	<a href="#">Batch Deleting Vertices</a>
	testBatchUpdateVertexsProperties	<a href="#">Batch Updating Vertex Properties</a>

### 3.3.3.2.2 Edge Operations

Sample Code File Path	Sample Method	API
-----------------------	---------------	-----



com.huawei.ges.graph.sdk.v1.examples.persistence	testQueryEdgeDetails	<a href="#">Querying Edge Details</a>
	testBatchEdgesQuery	<a href="#">Batch Querying Edge Data</a>
	testBatchAddEdges	<a href="#">Batch Adding Edges</a>
	testBatchDeleteEdges	<a href="#">Batch Deleting Edges</a>
	testBatchUpdateEdgesProperties	<a href="#">Batch Updating Edge Properties</a>

### 3.3.3.2.3 Metadata Operations

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testAddLabel	<a href="#">Adding a Label</a>
	testUpdateLabel	<a href="#">Updating a Label</a>
	testQueryGraphSchemaDetail	<a href="#">Querying Metadata Details</a>
	testQueryLabel	<a href="#">Querying Labels</a>

### 3.3.3.2.4 Index Operations

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testListIndices	<a href="#">Querying Indexes</a>
	testCreateIndex	<a href="#">Creating an Index</a>
	testDeleteIndex	<a href="#">Deleting an Index</a>

### 3.3.3.2.5 Algorithms

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testShortestPath	<a href="#">Shortest Path</a>
	testShortestPathOfVertexSets	<a href="#">Vertex Set Shortest Path</a>
	testCommonNeighborsOfVertexSets	<a href="#">Common Neighbors of Vertex Sets</a>

### 3.3.3.2.6 Graph Statistics

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testShowGraphVersion	<a href="#">Querying the Version of a Graph</a>
	testShowGraphSummary	<a href="#">Querying General Information About a Graph</a>

### 3.3.3.2.7 Graph Operations

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testImportGraphPersistence	<a href="#">Importing a Graph</a>
	testClearGraphPersistence	<a href="#">Clearing a Graph</a>

### 3.3.3.2.8 Job Management

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	waitJob	<a href="#">Querying the Status of a Job</a>
	testListJobs	<a href="#">Listing Jobs</a>

## 3.4 Python SDK

### 3.4.1 Initializing the Client

There are three ways to initialize the client based on different authentication methods. You can choose one according to your needs.

During client initialization, you can configure HTTP settings as needed.

#### 3.4.1.1 Authentication Mode

##### AK/SK-based Authentication

For how to set `ak`, `sk`, `regionCode`, and `graphEndpoint`, see [Obtaining Initialization Parameters](#).

```
import os
from gesgraphsdk.v1.asks_credentials import GesGraphAkSkCredentials
```

```
from gesgraphsdk.v1.gesgraph_client import GESGraphClient # Memory edition client
from gesgraphsdk.v1.persistence.gesgraphpersistence_client import GESGraphPersistenceClient # Database
edition client
from huaweicloudsdkcore.http.http_config import HttpConfig

# Hard-coded or plaintext AK and SK are insecure. So, encrypt your AK and SK and store them in the
configuration file or environment variables.
# In this example, the AK and SK are stored in environment variables. Before running this example, set
environment variables HUAWEICLOUD_SDK_AK and HUAWEICLOUD_SDK_SK.
ak = os.getenv("HUAWEICLOUD_SDK_AK")
sk = os.getenv("HUAWEICLOUD_SDK_SK")
region_code = "{regionCode}"
graph_endpoint = "{graphEndpoint}"
auth = GesGraphAkSkCredentials(ak=ak, sk=sk, region_code=region_code)
http_conf = HttpConfig.get_default_config()

# Memory edition client
ges_graph_client =
GESGraphClient.new_builder().with_credentials(auth).with_endpoint(graph_endpoint).with_http_config(http_
conf).build();
# Database edition client
ges_graph_persistence_client =
GESGraphPersistenceClient.new_builder().with_credentials(auth).with_endpoint(graph_endpoint).with_http_c
onfig(http_conf).build();
```

## Password-based Authentication

For how to set **domainName**, **userName**, **password**, **projectId**, **iamEndPoint**, and **graphEndpoint**, see [Obtaining Initialization Parameters](#).

```
import os
from gesgraphsdk.v1.gesgraph_client import GESGraphClient # Memory edition client
from gesgraphsdk.v1.persistence.gesgraphpersistence_client import GESGraphPersistenceClient # Database
edition client
from gesgraphsdk.v1.token_credentials import GesGraphTokenCredentials
from huaweicloudsdkcore.http.http_config import HttpConfig

// Hard-coded or plaintext password is insecure. So, encrypt your password and store it in the configuration
file or environment variables.
// In this example, the password is stored in environment variables. Before running this example, set the
environment variable HUAWEICLOUD_SDK_PWD.
password = os.getenv("HUAWEICLOUD_SDK_PWD")
domain_name = "{domainName}"
user_name = "{userName}"
project_id = "{projectId}"
graph_endpoint = "{graphEndpoint}"
iam_endpoint = "{iamEndPoint}"
auth = GesGraphTokenCredentials(iam_endpoint=iam_endpoint, domain_name=domain_name,
user_name=user_name, password=password, project_id=project_id)
http_conf = HttpConfig.get_default_config()

# Memory edition client
ges_graph_client =
GESGraphClient.new_builder().with_credentials(auth).with_endpoint(graph_endpoint).with_http_config(http_
conf).build()
# Database edition client
ges_graph_persistence_client =
GESGraphPersistenceClient.new_builder().with_credentials(auth).with_endpoint(graph_endpoint).with_http_c
onfig(http_conf).build();
```

## Token-based Authentication

For how to set **authToken** and **graphEndpoint**, see [Obtaining Initialization Parameters](#).

```
from gesgraphsdk.v1.gesgraph_client import GESGraphClient # Memory edition client
from gesgraphsdk.v1.persistence.gesgraphpersistence_client import GESGraphPersistenceClient # Database
edition client
from gesgraphsdk.v1.token_credentials import GesGraphTokenCredentials
from huaweicloudsdkcore.http.http_config import HttpConfig

graph_endpoint = "{graphEndpoint}"
token = "{authToken}"
auth = GesGraphTokenCredentials(token=token)
http_conf = HttpConfig.get_default_config()

# Memory edition client
ges_graph_client =
GESGraphClient.new_builder().with_credentials(auth).with_endpoint(graph_endpoint).with_http_config(http_
conf).build()
# Database edition client
ges_graph_persistence_client
GESGraphPersistenceClient.new_builder().with_credentials(auth).with_endpoint(graph_endpoint).with_http_c
onfig(http_conf).build();
```

### 3.4.1.2 Client Connection Parameters

During client initialization, you can configure HTTP settings as needed.

```
import com.huaweicloud.sdk.core.http.HttpConfig;

# Default configuration
http_config = HttpConfig.get_default_config()

# Timeout configuration
# Set the connection timeout and read timeout to 120 seconds.
http_config.timeout = 120
# Set the connection timeout to 60 seconds and the read timeout to 120 seconds.
http_config.timeout = (60, 120)

# SSL configuration: Configure whether to skip SSL certificate verification.
http_config.ignore_ssl_verification = True

# Configure the server CA certificate so that the SDK can verify the server certificate.
http_config.ssl_ca_cert = '/path/to/certfile'
```

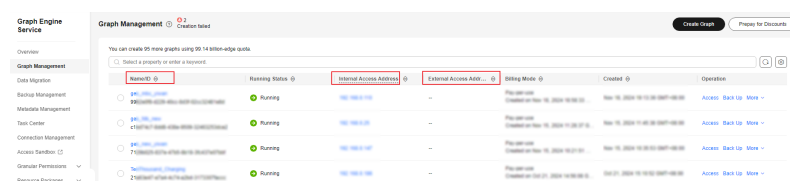
## 3.4.2 Usage Process

Obtain parameters and initialize the client by referring to [Obtaining Initialization Parameters](#). The following uses the memory edition's [Executing a Cypher Query](#) API as an example to demonstrate how to use the Python SDK.

### Obtaining the Graph Name and Access Address

Log in to the GES console and choose **Graph Management** in the navigation pane on the left. On the displayed page, obtain the graph name (**Name/ID**) and access address (**Internal Access Address/External Access Address**) as needed.

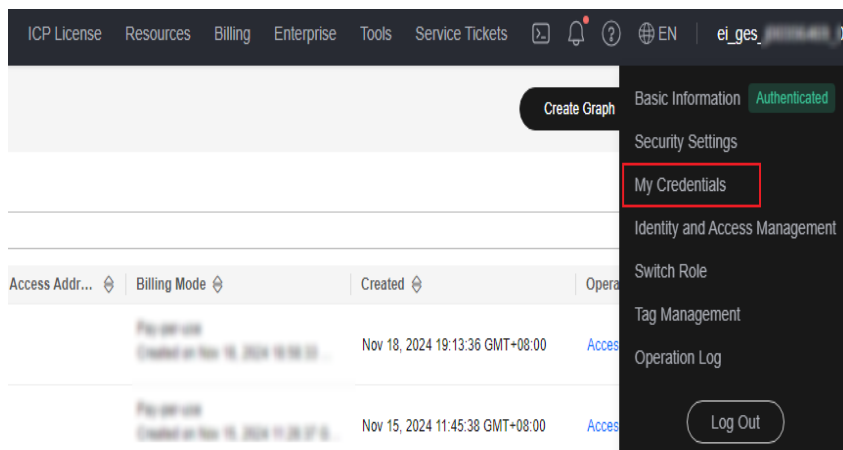
Figure 3-13 Obtaining the graph name and access address



## Obtaining AK/SK-based Authentication Information

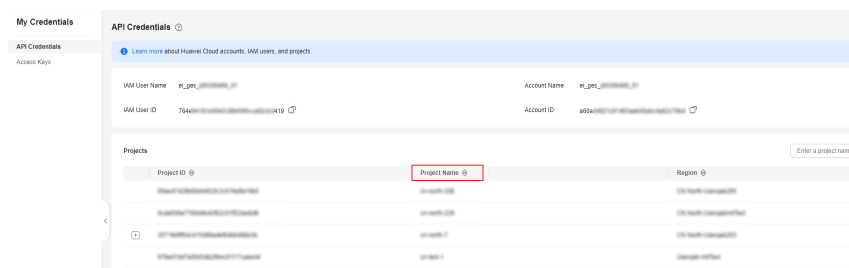
1. Log in to the Huawei Cloud management console, hover over the username in the upper right corner, and choose **My Credentials** from the drop-down list.

**Figure 3-14** My Credentials



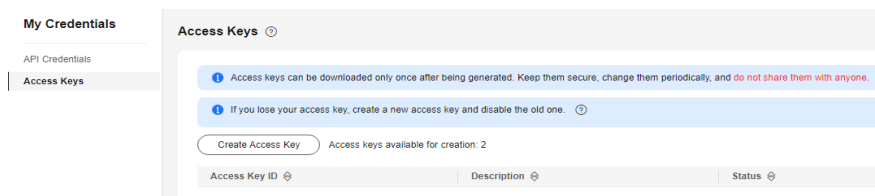
2. On the **API Credentials** page, locate the project to which the graph belongs in the project list.

**Figure 3-15** Project



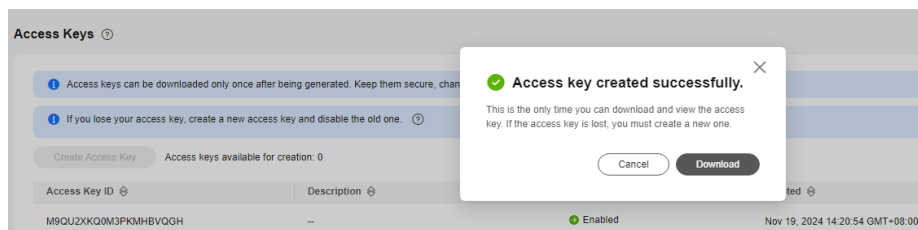
3. In the navigation pane on the left, choose **Access Keys**. On the page that appears, click **Create Access Key**.

**Figure 3-16** Creating an access key



4. Once the access key is created, click **Download** to obtain the AK, SK, and region code.

Figure 3-17 Clicking Download



## Obtaining Token-based Authentication Information

1. Query the IAM endpoint by referring to [Regions and Endpoints](#).

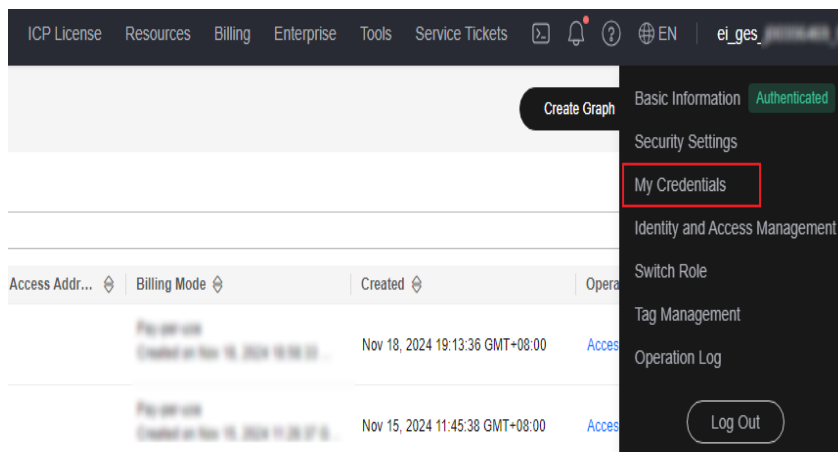
Figure 3-18 Querying a VPC endpoint

Regions and Endpoints / Identity and Access Management

Region Name	Region ID	Endpoint	Protocol
ME-Abu Dhabi-OPS	ae-sd-1	iam-ae-sd-1.myhuaweicloud.com	HTTPS
AF-Johannesburg	af-south-1	iam-af-south-1.myhuaweicloud.com	HTTPS
CN-Hong Kong	ap-southeast-1	iam-ap-southeast-1.myhuaweicloud.com	HTTPS
AP-Bangkok	ap-southeast-2	iam-ap-southeast-2.myhuaweicloud.com	HTTPS
AP-Singapore	ap-southeast-3	iam-ap-southeast-3.myhuaweicloud.com	HTTPS
AP-Jakarta	ap-southeast-4	iam-ap-southeast-4.myhuaweicloud.com	HTTPS
CN-East-Shanghai2	cn-east-2	iam-cn-east-2.myhuaweicloud.com	HTTPS
CN-East-Shanghai1	cn-east-3	iam-cn-east-3.myhuaweicloud.com	HTTPS
CN-North-Beijing1	cn-north-1	iam-cn-north-1.myhuaweicloud.com	HTTPS
CN-North-Beijing2	cn-north-2	iam-cn-north-2.myhuaweicloud.com	HTTPS

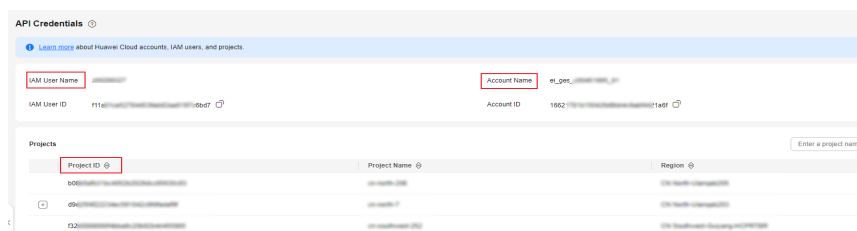
2. Log in to the Huawei Cloud management console, hover over the username in the upper right corner, and choose **My Credentials** from the drop-down list.

Figure 3-19 My Credentials



3. On the **API Credentials** page, find **IAM User Name** and **Account Name**, as well as **Project ID** in the project list.

Figure 3-20 Obtaining information



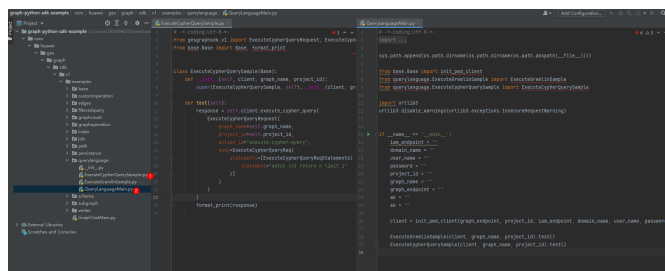
## How to Use the SDK

1. Extract **huaweicloud-ges-sdk-xxx.zip** and find a Python project called **graph-python-sdk-example**. This project contains Python SDK sample code for GES APIs, which can be imported into an IDE for debugging by modifying API parameters.

For detailed information and parameter description of GES APIs, refer to [Service Plane APIs](#). For how to find the corresponding Python SDK sample code file for an API, refer to [Python SDK Sample Reference](#). The sample code file is located in a path that includes a Main file for debugging purposes.

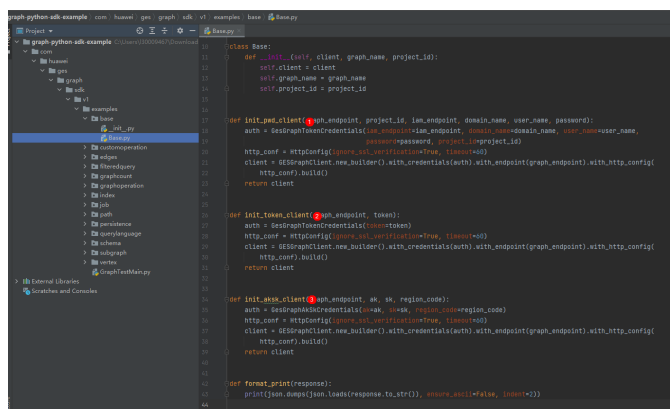
2. Take the "Executing a Cypher Query" API of the memory edition as an example. Find the corresponding Python SDK sample code file in [Python SDK Sample Reference](#). The file is named **ExecuteCypherQuerySample.py**, the file is located in **com.huawei.ges.graph.sdk.v1.examples.querylanguage**. The path also includes a Main file named **QueryLanguageMain.py** for debugging.

Figure 3-21 Python SDK sample code file



3. In the package path **com.huawei.ges.graph.sdk.v1.examples.base**, you can find the **Base.py** file that provides client initialization examples for different authentication modes. Choose the one that suits your needs.

Figure 3-22 Varying authentication modes



4. The following is an example of the result of executing a Cypher query:

**Figure 3-23** Cypher query result

```

"results": [
  {
    "columns": [
      "n"
    ],
    "data": [
      {
        "row": [
          {
            "SN": {
              "db_create_time": null,
              "sn_id": null,
              "sn": null,
              "db_update_time": null,
              "part_code": null
            }
          }
        ]
      }
    ],
    "meta": [
      {
        "id": "test3",

```

For SDK sample code for more APIs, see [Python SDK Sample Reference](#).

### 3.4.3 Python SDK Sample Reference

#### 3.4.3.1 Memory Edition Sample

##### 3.4.3.1.1 Vertex Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.vertex	VertexsFilterQuerySample	<a href="#">Querying Vertices Based on Filter Criteria</a>
	QueryVertexsDetailsSample	<a href="#">Querying Vertex Details</a>
	AddVertexSample	<a href="#">Adding a Vertex</a>
	DeleteVertexSample	<a href="#">Deleting a Vertex</a>
	UpdateVertexPropertiesSample	<a href="#">Updating Vertex Properties</a>
	BatchVertexsQuerySample	<a href="#">Batch Querying Vertex Data</a>
	BatchAddVertexsSample	<a href="#">Batch Adding Vertices</a>
	BatchDeleteVertexsSample	<a href="#">Batch Deleting Vertices</a>
	BatchUpdateVertexsPropertiesSample	<a href="#">Batch Updating Vertex Properties</a>
	AddVertexLabelSample	<a href="#">Adding a Vertex Label</a>
	DeleteVertexLabelSample	<a href="#">Deleting a Vertex Label</a>
	ExportFilteredVertexsSample	<a href="#">Exporting Filtered Vertices</a>



	DeleteFilteredVertexsSample	<a href="#">Deleting Filtered Vertices</a>
--	-----------------------------	--

### 3.4.3.1.2 Edge Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.edges	EdgesFilterQuerySample	<a href="#">Querying Edges Based on Filter Criteria</a>
	QueryEdgeDetailsSample	<a href="#">Querying Edge Details</a>
	AddEdgeSample	<a href="#">Adding an Edge</a>
	DeleteEdgeSample	<a href="#">Deleting an Edge</a>
	UpdateEdgePropertiesSample	<a href="#">Updating Edge Properties</a>
	BatchEdgesQuerySample	<a href="#">Batch Querying Edge Data</a>
	BatchAddEdgesSample	<a href="#">Batch Adding Edges</a>
	BatchDeleteEdgesSample	<a href="#">Batch Deleting Edges</a>
	BatchUpdateEdgesPropertiesSample	<a href="#">Batch Updating Edge Properties</a>
	ExportFilteredEdgesSample	<a href="#">Exporting Filtered Edges</a>
DeleteFilteredEdgesSample	<a href="#">Deleting Filtered Edges</a>	

### 3.4.3.1.3 Metadata Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.schema	AddLabelSample	<a href="#">Adding a Label</a>
	UpdateLabelSample	<a href="#">Updating a Label</a>
	QueryGraphSchemaDetailSample	<a href="#">Querying Metadata Details</a>
	DeleteLabelSample	<a href="#">Deleting a Label</a>
	BatchAddLabelSample	<a href="#">Batch Adding Labels</a>
	BuildSchemaStructureSample	<a href="#">Generating a Schema</a>
	QuerySchemaStructureSample	<a href="#">Querying a Schema</a>

### 3.4.3.1.4 Index Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.index	ListIndicesSample	<a href="#">Querying Indexes</a>
	CreateIndexSample	<a href="#">Creating an Index</a>
	DeleteIndexSample	<a href="#">Deleting an Index</a>

### 3.4.3.1.5 Query Languages

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.querylanguage	ExecuteGremlinSample	<a href="#">Executing a Gremlin Query</a>
	ExecuteCypherQuerySample	<a href="#">Executing a Cypher Query</a>

### 3.4.3.1.6 Path

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.path	ShowPathDetailSample	<a href="#">Querying Path Details</a>

### 3.4.3.1.7 Graph Statistics

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.graphcount	ShowGraphVersionSample	<a href="#">Querying the Version of a Graph</a>
	ShowGraphSummarySample	<a href="#">Querying General Information About a Graph</a>

### 3.4.3.1.8 Graph Operations

Sample Code File Path	Sample Code File Name	API
-----------------------	-----------------------	-----

com.huawei.ges.graph.sdk.v1.examples.graphoperation	ImportGraphSample	<a href="#">Importing a Graph</a>
	ExportGraphSample	<a href="#">Exporting a Graph</a>
	ClearGraphSample	<a href="#">Clearing a Graph</a>

### 3.4.3.1.9 Subgraph Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.subgraph	QuerySubgraphSample	<a href="#">Querying a Subgraph</a>
	SubgraphExecuteAlgorithmSample	<a href="#">Executing an Algorithm on a Subgraph</a>

### 3.4.3.1.10 Job Management

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.job	ShowJobSample	<a href="#">Querying the Status of a Job</a>
	DeleteJobSample	<a href="#">Canceling a Job</a>
	ExportJobResultSample	<a href="#">Exporting Job Results to a File</a>
	ListJobsSample	<a href="#">Listing Jobs</a>

### 3.4.3.1.11 Custom Operations

Sample Code File Path	Sample Code File Name	API
com.huawei.ges.graph.sdk.v1.examples.customoperation	ExecuteCustomActionSample	<a href="#">Performing a Custom Operation</a>

### 3.4.3.1.12 Filtered-query

Sample Code File Path	Sample Code File Name	API
-----------------------	-----------------------	-----

com.huawei.ges.graph.sdk.v1.examples.filteredquery	FilteredQuerySample	<a href="#">Filtered-query</a>
	FilteredQueryV2Sample	<a href="#">Filtered-query V2</a>

### 3.4.3.2 Database Edition Sample

#### 3.4.3.2.1 Vertex Operations

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testQueryVertexsDetails	<a href="#">Querying Vertex Details</a>
	testBatchVertexsQuery	<a href="#">Batch Querying Vertex Data</a>
	testBatchAddVertexs	<a href="#">Batch Adding Vertices</a>
	testBatchDeleteVertexs	<a href="#">Batch Deleting Vertices</a>
	testBatchUpdateVertexsProperties	<a href="#">Batch Updating Vertex Properties</a>

#### 3.4.3.2.2 Edge Operations

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testQueryEdgeDetails	<a href="#">Querying Edge Details</a>
	testBatchEdgesQuery	<a href="#">Batch Querying Edge Data</a>
	testBatchAddEdges	<a href="#">Batch Adding Edges</a>
	testBatchDeleteEdges	<a href="#">Batch Deleting Edges</a>
	testBatchUpdateEdgesProperties	<a href="#">Batch Updating Edge Properties</a>

#### 3.4.3.2.3 Metadata Operations

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testAddLabel	<a href="#">Adding a Label</a>
	testUpdateLabel	<a href="#">Updating a Label</a>

	testQueryGraphSchemaDetail	<a href="#">Querying Metadata Details</a>
	testQueryLabel	<a href="#">Querying Labels</a>

### 3.4.3.2.4 Index Operations

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testListIndices	<a href="#">Querying Indexes</a>
	testCreateIndex	<a href="#">Creating an Index</a>
	testDeleteIndex	<a href="#">Deleting an Index</a>

### 3.4.3.2.5 Algorithms

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testShortestPath	<a href="#">Shortest Path</a>
	testShortestPathOfVertexSets	<a href="#">Vertex Set Shortest Path</a>
	testCommonNeighborsOfVertexSets	<a href="#">Common Neighbors of Vertex Sets</a>

### 3.4.3.2.6 Graph Statistics

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	testShowGraphVersion	<a href="#">Querying the Version of a Graph</a>
	testShowGraphSummary	<a href="#">Querying General Information About a Graph</a>

### 3.4.3.2.7 Graph Operations

Sample Code File Path	Sample Method	API
-----------------------	---------------	-----

com.huawei.ges.graph.sdk.v1.examples.persistence	testImportGraphPersistence	<a href="#">Importing a Graph</a>
	testClearGraphPersistence	<a href="#">Clearing a Graph</a>

### 3.4.3.2.8 Job Management

Sample Code File Path	Sample Method	API
com.huawei.ges.graph.sdk.v1.examples.persistence	waitJob	<a href="#">Querying the Status of a Job</a>
	testListJobs	<a href="#">Listing Jobs</a>

# 4 Using Cypher JDBC Driver to Access GES

## Introduction

The Cypher JDBC Driver is designed for GES. It is developed based on Neo4j JDBC Driver and provides a method of using JDBC to access GES and perform cypher queries.

The driver greatly reduces the CPU and memory usage for returning a large amount of data requested by high-concurrent cypher queries to avoid JVM caching of a complete request body. The driver parses a response body into streaming data instead obtaining an entire body and then parsing it.

## Configuring Dependencies

1. Download the SDK and driver. For details, see [Managing Connections](#) .
2. If the Maven source is available (configured with a Maven source that can download JAR files from an open source repository), decompress **huaweicloud-ges-sdk-java-xxx.zip** and go to the **maven-install** directory. From there, execute either the **ges-sdk-java-maven-install.bat** or **ges-sdk-java-maven-install.sh** file to install **graph-sdk-xxx.jar** and **cypher-jdbc-driver-xxx.jar** to your local Maven repository. This will allow you to configure your POM dependencies and use the Cypher JDBC Driver in your Maven project.

```
<dependency>
  <groupId>com.huawei.ges</groupId>
  <artifactId>cypher-jdbc-driver</artifactId>
  <version>xxx</version> // Enter the version number of the Cypher JDBC driver.
</dependency>
<dependency>
  <groupId>org.neo4j</groupId>
  <artifactId>neo4j-jdbc</artifactId>
  <version>xxx</version>
</dependency>
<dependency>
  <groupId>org.apache.httpcomponents</groupId>
  <artifactId>httpclient</artifactId>
  <version>xxx</version>
</dependency>
```

3. If the Maven source is unavailable (not configured with a Maven source or the Maven source cannot download JAR files from an open source repository), decompress **huaweicloud-ges-sdk-java-xxx.zip** and import the **cypher-jdbc-driver-xxx-with-dependencies.jar** file in the **jars** directory to the project or

import all packages in the **cypher-jdbc-driver-xxx.jar** and **cypher-jdbc-lib** directories to the project.

## Parameter Description

**Table 4-1** JDBC getConnection parameter description

Type	Parameter Description
url	<p>The <b>jdbc:ges:</b> prefix is used to concatenate the URL for the GES Cypher API.</p> <p>On the <b>Connection Management</b> page of the GES console, select the name of the graph you want to access from the <b>Available Instance</b> drop-down list. The URL of the Cypher API is the value of <i>JDBC connection string</i>.</p>
prop	<p><b>Properties</b> object, including configurations required for connecting to GES APIs. For details, see <a href="#">Table 4-2</a>.</p>

**Table 4-2** Properties parameter description

Type	Parameter Description
X-Auth-Token	Token obtained through IAM authentication.
parse-json	<p>Whether data is converted to vertices and edges. The default value is <b>false</b>.</p> <ul style="list-style-type: none"> <li>When set to <b>false</b>, vertices and edges in the Cypher return body are returned in map format.</li> <li>When set to <b>true</b>, vertices and edges are returned in <b>GesElement</b> format.</li> </ul>
deserializer-type	<p>Policy for parsing Cypher statements. The options are <b>lazy</b> and <b>eager</b>, with <b>lazy</b> as the default.</p> <ul style="list-style-type: none"> <li>When set to <b>lazy</b>, Cypher statements are parsed in streaming mode, and the Cypher response body does not reside in memory.</li> <li>When set to <b>eager</b>, the entire JSON file is obtained for parsing.</li> </ul>
limit	<p>Flow rate, with a default value of <b>100000</b>. The kernel returns data to the server-side web application in batches, which are then organized into a stream and sent to the frontend. <b>limit</b> determines the batch size when the kernel returns data to the web application. For the same query, a smaller limit value results in more interactions between the GES kernel and the web application, but the JDBC client receives the first record faster. However, this may increase the overall query time.</p>



## Authentication

GES Cypher JDBC Driver supports two authentication modes: Token-based and AK/SK-based.

1. The following is sample code for token-based authentication:

```
import com.huawei.ges.jdbc.io.model.GesElement;
import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.util.Properties;

public class CypherJDBCClient {

    public static void main(String[] args) throws ClassNotFoundException, IllegalAccessException,
InstantiationException {
        String token = ""; // Call the IAM API to obtain the value.
        String url = ""; // The value is jdbc:ges:JDBC connection string. You can obtain JDBC connection string from the Connection Management page of the GES console.
        Class.forName("com.huawei.ges.jdbc.Driver").newInstance();
        Properties prop = new Properties();
        prop.setProperty("X-Auth-Token", token);
        prop.setProperty("deserializer-type", "lazy");
        prop.setProperty("parse-json", "true");
        prop.setProperty("limit", "10000");
        try (Connection conn = DriverManager.getConnection(url, prop)) {
            String query = "match (m) return m limit 1";
            try (PreparedStatement stmt = conn.prepareStatement(query)) {
                try (ResultSet rs = stmt.executeQuery()) {
                    while (rs.next()) {
                        GesElement.GesVertex vertex = (GesElement.GesVertex) rs.getObject("m");
                        System.out.println(vertex.getId());
                        System.out.println(vertex.getLabels());
                        System.out.println(vertex.getProperties());
                    }
                }
            }
        } catch (SQLException e) {
            System.out.println("Execute SQL query error.");
        }
    }
}
```

2. To authenticate using an AK/SK, you can generate a signature using the methods provided by the GES service-plane SDK. For how to import the dependencies for the service-plane SDK, refer to [Downloading and Installing the SDK](#).

The following is sample code for AK/SK-based authentication. For how to obtain the AK, SK, and region code, see [Obtaining Initialization Parameters](#).

```
import com.huawei.ges.graph.v1.auth.aksk.HttpRestClient;
import com.huawei.ges.jdbc.io.model.GesElement;
import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.util.Map;
import java.util.Properties;

public class CypherJDBCClientByAKSK {

    public static void main(String[] args) throws ClassNotFoundException, IllegalAccessException,
InstantiationException {
        // Hard-coded or plaintext AK and SK are insecure. So, encrypt your AK and SK and store them in
the configuration file or environment variables.
    }
}
```

```
// In this example, the AK and SK are stored in environment variables. Before running this example,
set environment variables HUAWEICLOUD_SDK_AK and HUAWEICLOUD_SDK_SK.
String ak = System.getenv("HUAWEICLOUD_SDK_AK");
String sk = System.getenv("HUAWEICLOUD_SDK_SK");
String regionCode = "";
String url = ""; // The value is jdbc:ges:JDBC connection string. You can obtain JDBC connection
string from the Connection Management page of the GES console.
Map<String, String> iamHeader = RestClient.getIamSignHeaders(ak, sk, regionCode); //
Methods provided by the GES service-plane SDK, which provides guidance on generating signatures.
Class.forName("com.huawei.ges.jdbc.Driver").newInstance();
doCypherQuery(url, iamHeader);
}

public static void doCypherQuery(String url, Map<String, String> iamHeaders) {
    Properties prop = new Properties();
    for (Map.Entry<String, String> pair : iamHeaders.entrySet()) {
        prop.setProperty(pair.getKey(), pair.getValue());
    }
    prop.setProperty("deserializer-type", "lazy");
    prop.setProperty("parse-json", "true");
    prop.setProperty("limit", "10000");
    try (Connection conn = DriverManager.getConnection(url, prop)) {
        String query = "match (m) return m limit 1";
        try (PreparedStatement stmt = conn.prepareStatement(query)) {
            try (ResultSet rs = stmt.executeQuery()) {
                while (rs.next()) {
                    GesElement.GesVertex vertex = (GesElement.GesVertex) rs.getObject("m");
                    System.out.println(vertex.getId());
                    System.out.println(vertex.getLabels());
                    System.out.println(vertex.getProperties());
                }
            }
        }
    } catch (SQLException e) {
        System.out.println("Execute SQL query error.");
    }
}
```