

## Integrating Data

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# Configure data engineering Spark to use with COD

You can configure Spark in your Data Engineering cluster to interact with the Cloudera Operational Database (COD). You can use this integration to READ and WRITE to COD from Spark on CDE (Cloudera Data Engineering) using the spark-hbase connector.

## About this task

If you want to leverage Phoenix instead of HBase, see *COD-CDE using Phoenix*.

## Before you begin

- COD is already provisioned and the database is created. For ore information, see *Onboarding COD users*.  
For this example, let us assume *test-cod* as the database name.
- CDE is already provisioned and the virtual cluster is already created. For more information, see *Cloudera Data Engineering service*.

## Procedure

### 1. Download the COD client configurations.

For the Spark in CDE to connect to COD, it requires the hbase-site.xml configuration of the COD cluster. Refer to the following steps.

- a) Go to the COD UI and click on the *test-cod* database.
- b) Go to the **Connect HBase** tab of the COD database, and copy the command under the HBase Client Configuration URL field.

```
curl -f -o "hbase-config.zip" -u "<YOUR WORKLOAD USERNAME>" "https://cod--4wfxojpfxmwg-gateway.XXXXXXXXXX.cloudera.site/clouderamanager/api/v41/clusters/cod--4wfxojpfxmwg/services/hbase/clientConfig"
```

- Ensure to provide the workload password for the curl command.
- Explore the downloaded zip file to obtain the hbase-site.xml file.

### 2. Create the HBase table.

Create a new HBase table inside the COD database using the Hue link.

- a) Go to the COD UI and click on the *test-cod* database.
- b) Click on the Hue link under the SQL EDITOR field.
- c) On the Hue UI, click the HBase menu item on the left navigation panel. Click New Table.
- d) Choose a table name and column families, and click on the Submit button. For example, let us consider the table name *testtable* and a single column family *testcf*.

**3. Configure the job using CDE CLI.**

- a) Configure CDE CLI to point to the virtual cluster created in the previous step. For more details, see *Configuring the CLI client*.
- b) Create resources using the following command.

```
cde resource create --name cod-spark-resource
```

- c) Upload hbase-site.xml.

```
cde resource upload --name cod-spark-resource --local-path /your/path/to/hbase-site.xml --resource-path conf/hbase-site.xml
```

- d) Upload the demo app jar that was built earlier.

```
cde resource upload --name cod-spark-resource --local-path /path/to/your/spark-hbase-project.jar --resource-path spark-hbase-project.jar
```

- e) Create the CDE job using a JSON definition.

```
{
  "mounts": [
    {
      "resourceName": "cod-spark-resource"
    }
  ],
  "name": "my-cod-spark-job",
  "spark": {
    "className": "<YOUR MAIN CLASS>",
    "conf": {
      "spark.executor.extraClassPath": "/app/mount/conf",
      "spark.driver.extraClassPath": "/app/mount/conf"
    },
    "args": [ "<YOUR ARGS IF ANY>" ],
    "driverCores": 1,
    "driverMemory": "1g",
    "executorCores": 1,
    "executorMemory": "1g",
    "file": "spark-hbase-project.jar",
    "pyFiles": [],
    "files": [ "conf/hbase-site.xml" ],
    "numExecutors": 4
  }
}
```

- f) Import the job using the following command, assuming that the above JSON is saved as *my-job-definition.json*.

```
cde job import --file my-job-definition.json
```

**What to do next**

The `spark.driver.extraClassPath` and `spark.executor.extraClassPath` inside the job definition points to the same path which is used to upload the `hbase-site.xml` into the CDE resource.

This way the `hbase-site.xml` is automatically loaded from the classpath and you do not need to refer to it explicitly in your Spark code. You can define as follows.

```
val conf = HBaseConfiguration.create()
val hbaseContext = new HBaseContext(spark.sparkContext, conf)
```

**Related Information**[COD-CDE using Phoenix](#)[Onboarding COD users](#)[Cloudera Data Engineering service](#)[Configuring the CLI client](#)

## Configure Data Engineering Data Hub to use with COD

You can configure Hive in your Data Engineering Data Hub cluster to interact with the CDP Operational Database (COD). You can use this integration to create and modify HBase tables using Hive. You can also READ and WRITE to existing HBase tables.

**Before you begin**

Ensure that you have a COD database instance and a Data Engineering template-based Data Hub cluster in the same CDP environment.

**Procedure**

1. Create a Data Engineering Datahub cluster in the same CDP environment on which your COD database is launched.
2. Download the HBase client configuration zip archive file from the COD client connectivity page. For more information see *Client connectivity information*. Then, extract hbase-site.xml from the zip file.
3. On each node in the Data Engineering Data Hub cluster that runs HiveServer2, run the `mkdir /etc/hbase/cod-conf` command, and copy the hbase-site.xml file from Step 2 into /etc/hbase/cod-conf folder.  
Do not copy all the files from client configuration zip archive. Only copy the hbase-site.xml file.
  - a) Get the value of `ssl.client.truststore.password` from the Data Engineering DataHub cluster master `ssl-client.xml` file (/etc/hadoop/conf.cloudera.hdfs/ssl-client.xml) and update the password for `hbase.zookeeper.property.ssl.trustStore.password` property in the copied hbase-site.xml file.
  - b) Create a symbolic link between /opt/cloudera/parcels/CDH/lib/hbase/conf and /etc/hbase/cod-conf in the Data Engineering Datahub cluster using the following command.  

```
sudo ln -s /etc/hbase/cod-conf /opt/cloudera/parcels/CDH/lib/hbase/conf
```
4. In Cloudera Manager for the Data Engineering Data Hub cluster, in the Hive-on-Tez service, set the HiveServer2 Environment Advanced Configuration Snippet(hive\_hs2\_env\_safety\_valve): HADOOP\_CLASSPATH to /etc/hbase/cod-conf.
  - a) Click Save Configurations.
  - b) Restart the Hive-on-Tez service.
5. Go to the Ranger service in the Data Lake.
  - a) Find HBase Ranger policy `cod_[***COD DATABASE NAME***]_hbase`. For example, if your COD database name is CODDB, you must modify the Ranger policy `cod_CODDB_hbase`.
  - b) Add the user hive to the existing policy. For example, all - table, column-family, column.
  - c) Wait for a few minutes because Ranger policy sync is not immediate to all resources.
6. Interact with Hive using the hive command from a node in the Data Engineering Data Hub.

```
$ hive
hive> create table test(key int, value string) stored by 'org.apache.hadoop.hive.hbase.HBaseStorageHandler' with serdeproperties ("hbase.columns.mapping" = ":key,f1:val");
hive> insert into test values(1, 'a');
hive> select * from test;
```

7. Validate data is present in HBase as well. You can also run this from the Data Engineering Data Hub node: the hbase executable is present to invoke. Otherwise, set up the HBase client tarball from COD client connectivity.

```
$ HBASE_CONF_DIR=/etc/hbase/cod-conf hbase shell
hbase> scan 'test'
```

### Related Information

[Client connectivity information](#)

## Running Phoenix and HBase Spark Applications using CDE

Cloudera Data Engineering (CDE) supports running Spark applications in the CDP public cloud. You can use CDE to run Phoenix and HBase Spark applications against COD.

### Before you begin

- Set your CDP workload password. For more information, see *Setting the workload password*.
- Synchronize users from the User Management Service in the CDP Control Plane into the environment in which your COD database is running.
- Ensure CDE service is enabled and a virtual cluster is created in the Data Engineering Experience. For more information, see *Creating virtual clusters* and *Enabling a Cloudera Data Engineering service*.

### Procedure

1. Set HBase and Phoenix versions in your Maven project.

- a) Use the `describe-client-connectivity` command for the HBase and Phoenix version information. The following code snippet shows fetching the database connectivity information and parsing the required HBase and Phoenix information to build your application.

```
echo "HBase version"
cdp opdb describe-client-connectivity --database-name my-database --environment-name my-env | jq ".connectors[] | select(.name == \"hbase\") | .version"
echo "Phoenix Connector Version"
cdp opdb describe-client-connectivity --database-name my-database --environment-name my-env | jq ".connectors[] | select(.name == \"phoenix-thick-jdbc\") | .version"
```

```
HBase Version
2.4.6.7.2.14.0-133
Phoenix Spark Version
"6.0.0.7.2.14.0-133"
```

- b) Update the HBase and Phoenix connector versions in our Maven project or configuration.

```
<properties>
...
  <phoenix.connector.version>6.0.0.7.2.14.0-133</phoenix.connector.version>
  <hbase.version>2.4.6.7.2.14.0-133</hbase.version>
...
</properties>
```

## 2. Download hbase-site.xml and hbase-omid-client-config.yml configuration files.

- a) Use the describe-client-connectivity command to determine the client configuration URL.

```
cdp opdb describe-client-connectivity --database-name spark-connector --
environment-name cod-7213 | jq ".connectors[] | select(.name == \"hbase\
\") | .configuration.clientConfigurationDetails[] | select(.name == \"HBA
SE\") | .url "
```

```
"https://cod--XXXXXX-gateway0..xcu2-8y8x.dev.cldr.work/clouderamanager/a
pi/v41/clusters/XXXXX/services/hbase/clientConfig"
```

- b) Use the URL gathered from the previous command and run the curl command to download the HBase configurations.

```
curl -f -o "hbase-config.zip" -u "<csso_user>" "https://cod--XXXXXX-gate
way0.cod-7213...xcu2-8y8x.dev.cldr.work/clouderamanager/api/v41/clust
er/s/cod--XXXXX/services/hbase/clientConfig"
```

- c) Unzip hbase-config.zip and copy the hbase-site.xml and hbase-omid-client-config.yml to src/main/resources path in the Maven project.

```
unzip hbase-conf.zip
cp hbase-conf/hbase-site.xml <path to src/main/resources>
cp hbase-conf/hbase-omid-client-config.yml <path to src/main/resources>
```

## 3. Build the project.

```
$ mvn package
```

## 4. Create a CDE job.

- a) Configure CDE CLI to point to the virtual cluster. For more information, see *Downloading the Cloudera Data Engineering command line interface*.
- b) Create a resource using the following command.

```
cde resource create --name phoenix-spark-app-resource
```

- c) Upload the required jars which you downloaded while building the project.

```
cde resource upload --name spark-app-resource --local-path ./target/conn
ector-libs/hbase-shaded-mapreduce-2.4.6.7.2.14.0-133.jar --resource-path
hbase-shaded-mapreduce-2.4.6.7.2.14.0-133.jar
cde resource upload --name spark-app-resource --local-path ./target/c
onnector-libs/opentelemetry-api-0.12.0.jar --resource-path opentelemetry
-api-0.12.0.jar
cde resource upload --name spark-app-resource --local-path ./target/conn
ector-libs/opentelemetry-context-0.12.0.jar --resource-path opentele metr
y-context-0.12.0.jar
cde resource upload --name spark-app-resource --local-path ./target/con
nector-libs/phoenix5-spark-shaded-6.0.0.7.2.14.0-133.jar --resource-path
phoenix5-spark-shaded-6.0.0.7.2.14.0-133.jar
```

- d) Upload the Spark application app jar that you had built earlier.

```
cde resource upload --name spark-app-resource --local-path ./target/phoe
nix-spark-transactions-0.1.0.jar --resource-path phoenix-spark-transacti
ons-0.1.0.jar
```

- e) Replace HBase, Phoenix, and Phoenix Spark connector versions in the spark-job.json as shown in the following sample and create a CDE job using the following JSON and import commands.

```
{
```



```

    "mounts": [
      {
        "resourceName": "phoenix-spark-app-resource"
      }
    ],
    "name": "phoenix-spark-app",
    "spark": {
      "className": "com.cloudera.cod.examples.spark.SparkApp",
      "args": [
        "{{ phoenix_jdbc_url }}"
      ],
      "driverCores": 1,
      "driverMemory": "1g",
      "executorCores": 1,
      "executorMemory": "1g",
      "file": "phoenix-spark-transactions-0.1.0.jar",
      "pyFiles": [

      ],
      "files": [
        "hbase-shaded-mapreduce-2.4.6.7.2.14.0-133.jar",
        "opentelemetry-api-0.12.0.jar",
        "opentelemetry-context-0.12.0.jar",
        "phoenix5-spark-shaded-6.0.0.7.2.14.0-133.jar",
      ],
      "numExecutors": 4
    }
  }
}
cde job import --file spark-job.json

```

## 5. Run the project.

- a) Use the describe-client-connectivity command to determine the base JDBC URL to pass.

```

cde opdb describe-client-connectivity --database-name my-database --environment-name my-env | jq ".connectors[] | select(.name == \"phoenix-thick-jdbc\") | .configuration.jdbcUrl"

```

- b) Run the job by passing the JDBC URL obtained from the previous command, as an argument to the job.

```

cde job run --name phoenix-spark-app --variable phoenix_jdbc_url=<phoenix_jdbc_url>

```

## Related Information

[Enabling a Cloudera Data Engineering service](#)

[Setting the workload password](#)

[Creating virtual clusters](#)

[Downloading the Cloudera Data Engineering command line interface](#)