Oracle Financial Services Crime and Compliance Studio

Installation Guide

Release 8.0.8.2.0

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OFS Crime and Compliance Studio Kubernetes Installation Guide

Document Control

Version Number	Revision Date	Change Log
1.3	August 2022	Updated with note information for CDH in the following sections: • Hardware and Software Requirements (Big Data) • Download the Big Data Files (Additional Jars) • Appendix C – Additional Jars – PGX • Appendix D – Additional Jars – Batch Service Updated with correct reference topics in Configure the Extract Transfer and Load (ETL) Process section. Updated SQL statements in Cleanup for Upgrade section.
1.2	January 2021	Added the following sections: • Loading Analysis Data to Elastic Search • Integration with MMG • Placing the Files for MMG • Integration with MMG (SAML) • SSO Token Generation • Add Synonyms and Keyword files in Elastic Search • Generate Studio Server SSL Configuration Mandatory File • Configuring Infer and Training API • Create the Hive Schema Updated the following sections: • Cleanup for Upgrade • Configure the Extract Transfer and Load (ETL) Process for the config.sh file. • Place Files in Wallet • Generate the Key Store File for Secure Batch Service • Spark Interpreter with remote spark cluster • Deploy FCC Studio on the K8s Cluster
1.1	November 2020	Added the following sections: • Appendix C – Additional Jars – PGX for PGX. • Appendix D – Additional Jars – Batch Service for Batch Services. • Cleanup for Upgrade for upgrade scenarios. Updated the following sections: • Place Files in the Installation Directories • Configure the Spark Interpreter • Verify the Installation
1.0	September 2020	Revamp

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1 Preface

This section provides information about the Oracle Financial Services (OFS) Crime and Compliance Studio (FCC Studio) Installation and Configuration Guide with kubernetes deployment.

1.1 Audience

OFS FCC Studio Installation and Configuration Guide is intended for System Engineers who are responsible for installing and maintaining the application.

This document assumes that you have experience in installing Enterprise components and basic knowledge about the following:

- UNIX commands
- Database concepts
- Big Data concepts
- Kubernetes
- Docker

1.2 Access to Oracle Support

OFS FCC Studio Installation and Configuration Guide is intended for System Engineers who are responsible for installing and maintaining the application.

Oracle customers have access to electronic support through My Oracle Support. For information, visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info.

Or visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs if you are hearing-impaired.

1.3 Related Documents

We strive to keep this and all other related documents updated regularly; visit the OHC Documentation Library to download the latest version available there. The list of related documents is provided here.

- *Oracle Financial Services Crime and Compliance Studio Installation Guide*
- *Oracle Financial Services Crime and Compliance Studio Administration Guide*
- *Oracle Financial Services Crime and Compliance Studio User Guide*
- *Oracle Financial Services Crime and Compliance Studio Data Model Guides*
- *Oracle Financial Services Crime and Compliance Studio Release Notes and Readme*

1.4 Conventions

The following text conventions are used in this document.

Table 1: Document Conventions

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, file names, text that appears on the screen, or text that you enter.
Hyperlink	Hyperlink type indicates the links to external websites, internal document links to sections.

1.5 Abbreviations

The following table lists the abbreviations used in this document.

Table 2: Abbreviations

Abbreviation	Meaning
OFS	Oracle Financial Services
FCC Studio	Financial Crime and Compliance Studio
OFSAA	Oracle Financial Services Analytical Application
K8s	Kubernetes
BD	Behavior Detection
FCDM	Financial Crime Data Model
ICIJ	International Consortium of Investigative Journalists
IDCS	Oracle Identity Cloud Service
MMG	Model Management and Governance
SSO	Single Sign-On
SSH	Secure Shell

2 Introduction

The Financial Crime and Compliance (FCC) Studio uses the latest technology to harness the power of Graph Analytics to give Financial Institutions the ability to effectively monitor anti-money laundering and anti-fraud programs in financial institutions.

By using the FCC Studio, financial institutions can deploy advanced machine learning algorithms and artificial intelligence to discover unknown criminals, streamline compliance operations and have unprecedented control over their Financial Crime program.

This chapter provides the information required to understand the deployment of the Oracle Financial Services (OFS) Crime and Compliance Studio (FCC Studio) application on the Kubernetes (K8s) cluster.

This release (v8.0.8.2.0) of FCC Studio can be used for the following:

- To install a new instance of FCC Studio as follows:
- FCC Studio with OFSAA (Oracle Financial Services Analytical Application)
  - Without MMG (Model Management and Governance)
  - With MMG (Model Management and Governance): **MMG pack (8.0.8.0.0), with 80801 patch** can be used on top of existing OFSAA pack. To know more about installing MMG see, MMG Installation Guide.

> **NOTE**
>
> - Here, with OFSAA is with Behavior Detection (BD) or Enterprise Case Management (ECM).
> - There is no recommended order when installing Studio and MMG.
> - MMG can also be a standalone installation or sharing same atomic schema of OFSAA (pack-on-pack with OFSAA).
> - For integrating MMG with Studio, see Integration with MMG.

- FCC Studio without OFSAA
- To upgrade an existing instance of FCC Studio on the K8s cluster as follows:
- Upgrade FCC Studio from v8.0.8.0.0 onwards to v8.0.8.2.0 with and without OFSAA.

Topics:

- Installation Check List when Studio is Deployed with OFSAA
- Installation Check List when Studio is Deployed without OFSAA

2.1 Solutions offered by FCC Studio

The FCC Studio is a platform that can be used by Data Scientists and Data Analysts for perform the FCC analysis.

The following are the solutions offered by FCC Studio:

- **Machine Learning**

  Out-of-the-box notebooks which are language agnostics and supports SparkML, ORE, R, Python, Deep Learning, On Graph, Case Similarity, Predictive Behavioral Models, AAS, and so on for your Machine Learning requirements.

- **Graph Analytics**

  Provides graph analytics such as, Pattern Matching, Graph Algorithm, Case Creation, Graph Based Investigation, PGX, and Spark.

- **Data Discovery**

  Provides out of the box notebooks that can be used for discovering the data. Also, supports Graph Pattern Discovery, Data Visualization, and Graph Questions.

- **Rapid Development**

  Provides REST interface, widgets notebooks in batch, and consumerization data science.

- **Modeling**

  Provides you the flexibility to create and import graph models and visualize the outputs.

- **Explainability**

  The intuitive Interface of the FCC Studio helps you to learn and adapt to the Interface with less training and explanation.

- **Leverage fragmented data**

  Replicates the Oracle Financial Crime Data Model (Graph and Relational) which are on the data lake and the ability to connect with any of the data set.

- **Collaboration**

  Provides an ability to collaborate and share notebooks to improve the productivity.

2.2 Installation Check List when Studio is Deployed with OFSAA

To complete the installation process, you must perform the steps listed in the following Checklist. Use this checklist to verify whether these steps are completed or not. Click the reference link to go to the topic.

Table 3: Installation Check List

Sl. No.	Activity	Mandatory	Comments
Pre-installation Steps			
1	Install all the prerequisite hardware and software.	Yes	-
2	Setup the environmental settings.	Yes	-
3	Download the files for Big Data	No	Required for graph analytics and leverage fragmented data

4	Configure the Elastic Search Component	No	Required for graph analytics and leverage fragmented data
5	Configure the Interpreter Settings	Yes	-
6	Create the Studio Schema	Yes	-
7	Assign Grants for the Database Schemas	Yes	-
8	Setup Password Stores with Oracle Wallet.	Yes	-
9	Create the Credential Keystore	Yes	-
10	Download the installer kit.	Yes	-
Installation Steps			
1	Extract the installer kit.	Yes	-
2	Place files in the Installation Directories and Place files in wallet.	Yes	-
3	Generate an Encrypted Password	Yes	-
4	Generate the Public Key and Private Key	Yes	-
5	Generate the Key Store File for Secure Batch Service	Yes	-
6	Add the Batch Service (SSL) to PGX Trust Store	Yes	-
7	Configure the Preferred Services	Yes	-
8	Configure the studio-env.yml File	Yes	-
9	Configure the Extract Transfer and Load (ETL) Process	No	Required for graph analytics and leverage fragmented data
10	Verify the Resource Allocation for FCC Studio Services	Yes	-
11	Deploy FCC Studio on the K8s Cluster	Yes	-
Post-Installation Steps			
1	Verify the Installation	Yes	-
2	Configure the Schema Creation	No	Required for graph analytics and leverage fragmented data
3	Configure the ICIJ Data	No	Required for graph analytics and leverage fragmented data
4	Access the FCC Studio Application	Yes	-
5	Perform the OFSAA Configuration for Batch Execution	No	Required if leveraging OFSAA's scheduling and executing capability.
6	Configure and Run Published Notebooks	No	Required if leveraging OFSAA's batch execution.
7	Integrate with MMG	No	Required for leveraging MMG's capabilities.

2.3 Installation Check List when Studio is Deployed without OFSAA

To complete the installation process, you must perform the steps listed in the following Checklist. Use this checklist to verify whether these steps are completed or not. Click the reference link to go to the topic.

Table 4: Installation Check List

Sl. No.	Activity		
Pre-installation Steps			
1	Install all the prerequisite hardware and software.		
2	Setup the environmental settings.		
3	Download the files for Big Data		
4	Configure the Elastic Search Component		
5	Configure the Interpreter Settings		
6	Create the Studio Schema		
7	Assign Grants for the Database Schemas		
8	Setup Password Stores with Oracle Wallet.		
9	Create the Credential Keystore		
10	Download the installer kit.		
Installation Steps			
1	Extract the installer kit.		
2	Place files in the Installation Directories and Place files in wallet.		
3	Generate an Encrypted Password		
4	Generate the Public Key and Private Key		
5	Generate the Key Store File for Secure Batch Service		
6	Add the Batch Service (SSL) to PGX Trust Store		
7	Configure the Preferred Services		
8	Configure the studio-env.yml File		

9	Configure the Extract Transfer and Load (ETL) Process		
10	Verify the Resource Allocation for FCC Studio Services		
11	Deploy FCC Studio on the K8s Cluster		
Post-Installation Steps			
1	Verify the Installation		
2	Access the FCC Studio Application		

3 Pre-installation

This chapter provides information about the tasks that must be performed before installing FCC Studio.

Topics:

- Prerequisites
- Hardware and Software Requirements
- Prerequisite Environmental Settings
- Download the Big Data Files
- Validation Checklist
- Configure the Elastic Search Component
- Configure the Interpreter Settings
- Create the Studio Schema
- Assign Grants for the Database Schemas
- Setup Password Stores with Oracle Wallet
- Create the Credential Keystore
- Download the Installer Kit

3.1 Prerequisites

The Linux machine must satisfy the following conditions:

- BD (Behavior Detection) or the ECM (Enterprise Case Management) application pack must be installed.
- Kubernetes (k8s) cluster must be installed with the following:
  - Registry to store docker images.
  - Minimum of 8 GB memory (inclusive of all nodes) available for the installation. The actual memory requirement depends on the workload/container size configuration.
  - Docker and kubectl must be installed.
  - kubectl is configured (that is, connected to cluster where you want to install FCC Studio).
  - Docker has push access to a private registry.
  - 25GB free space is available to store the FCC Studio Installer zip file in some directory.
  - 45GB free space is available in the docker root directory. You can find the docker root directory using the `docker info` command.

3.2 Hardware and Software Requirements

The following hardware and software are required for this version of FCC Studio. The installation environment or setup must have these requirements for an application to run smoothly and efficiently.

Table 5: Hardware and Software Requirements

Hardware or Software Category	Component Version
Browser	• Chrome 57.x • Firefox 52.x
Java Version	Java 8
Docker Registry	• Docker registry must be present to store docker images • Min of 45GBspace is required to save docker images
Database Server	• Oracle Database Server 12c Release 2 (12.2.0.1+) Enterprise Edition • Oracle R Enterprise 1.5.1 with Oracle R Distribution 3.3.0
Elastic Search	elasticsearch-7.6.2
Elastic Search Hadoop Jars	ES - Hadoop v7.6.2 You must download the ZIP file from https://www.elastic.co/downloads/past-releases/elasticsearch-apache-hadoop-7-6-2
Kubernetes Cluster	
Processing Server	• RHEL 7.4+ • SFTP • Oracle JRE Standard Edition 1.8.x(with JCE) • Kubernetes(K8s) cluster
PGX (Graph) Server	• RHEL 7.4+ • Kubernetes(K8s) cluster • Minimum gcc library version 4.8.2
Big Data	

Hadoop and Spark	**NOTE**: Kerberos authentication must be enabled for Big Data. • Apache Hadoop Version 3.0.0 • Apache Hive Version 2.1.1 • Apache Spark Version 2.4.0 • Apache Sqoop Version 1.4.7 The `.profile` file must be present with the `SPARK_HOME` and `PYTHON_HOME` parameters already set. **NOTE**: The product is certified for Apache-Hadoop, and any vendor-specific Hadoop distributions have to confirm compliance with Apache-Hadoop standards, and if not, the vendor the customer chooses to work with for Hadoop should ensure compliance to Apache-Hadoop standards. Any issue raised on vendor-specific distributions will be fixed only if the issue is reproducible on Apache-Hadoop, Apache-Hive, and Apache-Spark.
Hive Connectors	Hive JDBC Connectors V 2.5.15
Hadoop Security Protocol	• Kerberos R release 1.6.1 • Sentry-1.4.0

NOTE If Cloudera is not installed, the following versions are required:

- Hadoop Version 3.0.0
- Hive Version 2.1.1
- Spark Version 2.4.0
- Sqoop Version 1.4.7

Kerberos authentication must be enabled for Big Data.

3.3 Prerequisite Environmental Settings

The following prerequisite environmental settings must be set before beginning the installation of FCC Studio. These settings are the configuration that a system must have for an application to run smoothly and efficiently.

Table 6: Prerequisite Environmental Settings

Category	Expected Value
Java Settings	`PATH` in the `.profile` file must be set to include `kubectl` and the Java Runtime Environment (Java 8) absolute path. **NOTE**:

	Ensure the absolute path to `JRE/bin` is set at the beginning of the `PATH` variable. **For example**: `PATH=/usr/java/jre1.8/bin:$PATH` Ensure no SYMBOLIC links to Java installation are set in the `PATH` variable.
Oracle Database Settings	**NOTE**: This setting is required only if the Wallet has to be created on the same server as that of the FCC Studio server. Oracle Processing Server • `ORACLE_HOME` must be set in the `.profile` file pointing to the appropriate Oracle DB Client installation. • `PATH` in the `.profile` file must be set to include the appropriate `$ORACLE_HOME/bin` directory.
Download Directory	Indicates the directory where the product installer zip file is downloaded or copied. The user permission must be set to 755 for this directory.
Installation Directory	Indicates the directory where the product installer zip file is extracted and the installation files are placed. The user permission must be set to 755 for this directory. **NOTE**: The Installation and the Download Directory can be the same if the product installer zip file is not copied separately to another directory.
OS Locale	Linux: `en_US.utf8` Execute the following command to check the locale: `locale -a | grep -i 'en_US.utf'` The locale is displayed.

3.4 Download the Big Data Files

Download the following configuration files from the Cloudera installation setup:

> **NOTE** These files must be kept ready and provided in the following file structure that is used during FCC Studio installation.

Table 7: Required File Structure

File Category	File Names

Hadoop Cluster	• hive-site.xml • core-site.xml • hive-env.sh • spark-env.sh • redaction-rules.json • mapred-site.xml • yarn-site.ml
Kerberos Files	• `krb5.conf` • keytab file name as mentioned in the `studio-env.yml` file. **NOTE**: Ensure to rename your `.keytab` file to `fccstudio.keytab`.
Additional Jars (PGX)	For information about jars, see Appendix C – Additional Jars – PGX. **NOTE**: • The version of the jars is client or user-specific. These jars can be obtained from the existing jars of the Cloudera installation. • The `HiveJDBC4.jar` file is not available in the Cloudera installation setup. You must download the same from the Cloudera website. This is applicable only for Cloudera Cluster.
Additional Jars (Batch Service)	For information about jars, see Appendix D – Additional Jars – Batch Service.
ES-Hadoop Jars	`elasticsearch-spark-20_2.11-7.6.2.jar` To download the `elasticsearch-spark-20_2.11-7.6.2.jar` file, follow these steps: 1. Download the ZIP file from https://www.elastic.co/downloads/past-releases/elasticsearch-apache-hadoop-7-6-2. 2. Extract the downloaded file. 3. Navigate to the `dist` directory and download the `elasticsearch-spark-20_2.11-7.6.2.jar` file.

3.5 Validation Checklist

The Validation Checklist section provide you the information about the parameters that you can validate to avoid installation issues. This section explains the validation and actions that can be taken for some of the common parameters that are used in the `studio-env.yml` file for the installation. The parameters that can be validated are as follows:

Table 8: Required File Structure

Parameters	Validation
External Service (OFSAA_SERVICE URL)	The `OFSAA_Service` URL can be validated by clicking the URL for verification.

DB Details for Studio Schema	You can login to SQL developer and verify the DB Details for Studio Schema.
BD Config Schema	You can login to SQL developer and verify the BD Config Schema.
Studio BE Wallet Details	You can verify the Wallet details by reviewing the steps in Verify the Connectivity of the Wallet.
Atomic Wallet Details	You can verify the Wallet details by reviewing the steps in Verify the Connectivity of the Wallet.
SQL Scripts	You can login to FCC Studio using SQL developer and validate the `Studio_DBLINK_BD`, if link type is `DBLINK`, if Schema is not `DBLINK`, there is no validation required.
Cloudera	You can verify the Cloudera details and validate it by reviewing the steps in Create the Credential Keystore.
Cloudera (Keytab)	Run the command `kinit -V <KERBEROS_PRINCIPAL> -k -t <KEYTAB_FILEPATH>` to verify the keytab.

3.6 Configure the Elastic Search Component

To configure the Elastic Search component, follow these steps:

> **NOTE**
>
> - Ensure that a minimum of 4GB free RAM space is available for elastic search. If RAM is low, the shards of the elastic search fails and correct result is not fetched.
> - You must manually clean the cache if facing performance issue.

1. Navigate to the `elasticsearch-7.6.2/config` directory.
2. Configure the `elasticsearch.yml` with the following variables:

Table 9: elasticsearch.yml File

Interaction Variable Name	Significance
cluster.name	Indicates the name of the cluster.

node.name	Indicates the name given for the node.
node.master	Indicates whether the node is a master.
node.data	Indicates the node data.
path.data	Indicates the directory where you want to store the data.
path.logs	Indicates the directory where you want to store the logs.
network.host	Indicates the hostname of the machine where you want to install the elastic search service.
http.port	Indicates the port number where the elastic search service is installed.
discovery.seed_hosts	(Optional) Indicates the hostnames of the nodes of the cluster.
cluster.initial_master_nodes	(Optional) Indicates the number given to the nodes of the cluster.
indices.breaker.total.use_real_memory	• Indicates the static setting to determine whether the parent breaker must consider the real memory usage into account or only consider the amount that is reserved by the child circuit breakers. • This setting is used to prevent the `OutOfMemory` error.

3. Configure the `jvm.options` file as follows:

Table 10: elasticsearch.yml File

Interaction Variable Name	Significance
-Xms1g	• Set the value for these parameters. The maximum value set can be up to 50% of the RAM size of the machine. • Recommended value: Less than 32GB.
-Xmx1g	

4. Enter the URL in the following format into the browser:

   `http://<network.host>:<http.port>`

   The following output is displayed to indicate successful installation of the Elastic Search service.

```
{
  "name" : "node-1",
  "cluster_name" : "my-application",
  "cluster_uuid" : "_D-2qEGGSgKQPd3i-UtgWQ",
  "version" : {
    "number" : "7.6.2",
    "build_flavor" : "oss",
    "build_type" : "tar",
    "build_hash" : "1c1faf1",
    "build_date" : "2019-09-06T14:40:30.409026Z",
    "build_snapshot" : false,
    "lucene_version" : "8.1.0",
    "minimum_wire_compatibility_version" : "6.8.0",
    "minimum_index_compatibility_version" : "6.0.0-beta1"
  },
  "tagline" : "You Know, for Search"
}
```

3.7 Configure the Interpreter Settings

You must configure the interpreter settings for the following interpreters before installing FCC Studio.

NOTE Ensure to configure the settings only for the interpreters that you require.

Table 11: Pre-installation Interpreter Settings

Interpreter	Prerequisite Settings
fcc-jdbc	No additional configuration is required. **NOTE**: The FCC Studio application installed without OFSAA can use the Vanilla jdbc interpreter instead of the fcc-jdbc interpreter to connect to the Studio schema.
fcc-ore	For the required configuration, see Configure the fcc-ore Interpreter.

fcc-pyspark	• Install the py4j package in the Spark cluster. • Install the Livy server (0.5.0) on the master node of the Big Data cluster.
fcc-python	For the required configuration, see Configure the fcc-python Interpreter.
fcc-spark-scala	Install the Livy server (0.5.0) on the master node of the Big Data cluster.
fcc-spark-sql	Install the Livy server (0.5.0) on the master node of the Big Data cluster.
jdbc	No additional configuration is required.
md	No additional configuration is required.
pgql	No additional configuration is required.
pgx-algorithm	No additional configuration is required.
pgx-java	No additional configuration is required.
pyspark	For the required configuration, see Configure the PySpark Interpreter .
spark	For the required configuration, see Configure the Spark Interpreter.

Topics:

- Configure the fcc-jdbc Interpreter
- Configure the fcc-ore Interpreter
- Configure the fcc-python Interpreter
- Configure the Spark Interpreter
- Configure the PySpark Interpreter

3.7.1 Configure the fcc-jdbc Interpreter

To create context for the fcc-jdbc interpreter, follow these steps:

1. Log in to Oracle Database as a **SYSDBA** user.
2. Grant Execute permission to the user using the following command:

   ```
   grant execute dbms_rls to <Studio_DB_Username>;
   ```

   The Execute permission is granted to user.
3. Grant Create permission to the context using the following command:

   ```
   grant create any context to <Studio_DB_Username>;
   ```

   The Create permission is granted to context.

3.7.2 Configuring the fcc-ore Interpreter

To configure the fcc-ore interpreter you must install the Oracle R Distribution.

3.7.2.1 Installing the Oracle R Distribution

To install the Oracle R Distribution (ORD), enable the addons and optional_latest channels in yum as shown in the following code:

~~~
```bash
(root)# yum-config-manager --enable ol7_addons
(root)# yum-config-manager --enable ol7_optional_latest
```
~~~

After completing the previous step, pull ORD from the yum repository using the following command:

~~~
```bash
(root)# yum install R.x86_64 R-core-extra
```
~~~

To install ORD, see Install Oracle R Distribution on Linux.

3.7.3 Configure the fcc-python Interpreter

The fcc-python interpreter image includes the following:

- The support for python2 has been deprecated.
- By default, the Python interpreter points to the Python 3.6 version.
- The following Python libraries are part of the fcc-python interpreter images for Python 3.6 version:
  - `pandas 0.25.3`
  - `numpy 1.17.4`
  - `scipy 1.3.2`
  - `scikit-learn 0.23.2`
  - `matplot-lib 3.3.3`
  - `seaborn 0.9.1`
  - `cx-oracle 7.3.0`

  - `sqlalchemy 1.3.11`

To modify the Python packages in the Python 3.6 or to add a different version of Python to the Python interpreter, you must modify the Python image. As an example, follow the steps provided in the *Modifying the Python Images for the Python Interpreter* section in the *OFS Crime and Compliance Studio Administration Guide*.

3.7.3.1 Prerequisites for Installing Python Libraries

Following are the prerequisites to install Python libraries:

- FCC Studio supports any-version of Python with the following required conditions:
  - The preferred Python version is installed on the Processing Server (Studio Notebook Server) and is accessible to the Linux user of FCC Studio.
  - The Python Library (py4j) package is present for the preferred Python version.
  - The prerequisites to install the Python 3.6 libraries that are packaged with the FCC Studio Installer are as follows:
  - The Python3.6 version is installed on the Processing Server (Studio Notebook Server) and is accessible to the Linux user of FCC Studio.
  - The Python Library (py4j) package is installed and is accessible to the Linux user of FCC Studio.

3.7.4 Configure the Spark Interpreter

FCC Studio uses spark 2.4.0. Before you begin the configurations, check the prerequisites depending on your operation mode.

- Prerequisites
- Configuration

3.7.4.1 Prerequisites for using the Spark Interpreter

To configure Spark Interpreter, you must download the desired spark distribution from Spark's official website.

Spark interpreter can be used in several situations as follows:

- Connecting to remote spark cluster
  - With/without Kerberos
  - Custom Hadoop client configuration
  - Custom libraries
- Spark in local mode.

In case you want to connect to remote spark cluster, then obtain following files:

- Hadoop or Hive client configuration as per your use case
- Kerberos files (if applicable)
  - `krb5.conf`

- `keytab file`

3.7.4.1.1 Setting up spark-interpreter

The spark interpreter requires spark distribution to start. If you don't intend to use spark-interpreter, disable the interpreter by performing the following steps:

> **NOTE** If you don't intend to use spark-interpreter, disable the interpreter you can perform the following steps.

1. Navigate to `<Studio installation path>/bin` directory.
2. Open the `serviceMapping.sh` file and set spark=**false**.

The default configuration of Spark is configured for yarn-client deployment mode with Kerberos enabled remote spark cluster. For local mode skip this section and follow below.

3.7.4.1.2 Spark Interpreter with remote spark cluster

The Spark Interpreter with remote spark cluster can be performed for the following:

- Configuration with Kerberos enabled remote spark cluster
- Configuration with Kerberos disabled remote spark cluster

Configuration with Kerberos enabled remote spark cluster

1. Move the obtained Kerberos files to `<Studio Installation path>/configmaps/batchservice/user/conf` directory.

> **NOTE** These are the same Kerberos files used for ETL.

2. In case, spark-interpreter should connect with different remote spark cluster or have different Kerberos files, perform the following additional steps:
   a. Create a folder inside *<Studio Installation path>/configmaps/* directory. For example: `spark-kerberos-conf`.
   b. Navigate to `<Studio Installation path>` and open `deploy.sh` and add following command inside function `deployServices(), case spark` to create configmap from above Kerberos files.

```
kubectl -n ${NAMESPACE} create configmap spark-kerberos-conf from-
file=configmaps/spark-kerberos-conf.
```

> **NOTE** Provide proper names for configmap and folder.

3. Navigate to `<Studio Installation path>/deployments` directory
4. Open spark.yml and update the configmap name for volumes name: kerberos to spark-kerberos-conf

```
name: kerberos
configMap:
 name: spark-kerberos-conf
```

5. Place the **Hadoop** or **Hive client** configuration files to `<Studio Installation path>/configmaps/spark-interpreter-conf` directory.

> **NOTE** Do not remove the spark-default.`conf` and `spark-env.sh` files.

6. Open *spark-default.conf* and update the spark configurations accordingly.
7. Uncomment and update `spark.yarn.dist`.files and `spark.executorEnv.PYTHONPATH`.

> **NOTE** The path must be same as the path given for the downloaded spark distribution. For example: path for `spark-2.4.0-bin-hadoop2.7 spark distribution`.

8. Update the `spark.driver.host`.
9. Update the `spark.yarn.keytab`.
10. Update the `spark.yarn.principal`.
11. If required, you can add additional spark configuration.

Configuration with Kerberos disabled remote spark cluster:

1. Place the **Hadoop** or **Hive client** configuration files to `<Studio Installation path>/configmaps/spark-interpreter-conf` directory.

> **NOTE** Do not remove the spark-default.`conf` and `spark-env.sh` files.

2. Open *spark-default.conf* and update the spark configurations accordingly.
3. Uncomment and `update spark.yarn.dist`.files and `spark.executorEnv.PYTHONPATH`.

> **NOTE** The path must be same as the path given for the downloaded spark distribution. For example: path for `spark-2.4.0-bin-hadoop2.7 spark distribution`.

4. Update the `spark.driver.host`.
5. Navigate to *<Studio Installation path>/deployments* and open *spark.yml* and perform the following:
   - set **KERBEROS_ENABLED** as **FALSE**

     name: **KERBEROS_ENABLED**

     value: **FALSE**
   - update JAVA_OPTS by removing:

     ```
     "-Dsun.security.krb5.debug=false -
     Djavax.security.auth.useSubjectCredsOnly=false -
     Djava.security.krb5.conf=/var/olds-spark-
     interpreter/extralibs/kerberos/krb5.conf"
     ```

3.7.4.2 Spark Interpreter in local mode

1. Navigate to *<Studio Installation path>/deployments* and open *spark.yml* and perform the following:
   - set **KERBEROS_ENABLED** as **FALSE**

     name: **KERBEROS_ENABLED**

     value: **FALSE**
   - update JAVA_OPTS by removing:

     ```
     "-Dsun.security.krb5.debug=false -
     Djavax.security.auth.useSubjectCredsOnly=false -
     Djava.security.krb5.conf=/var/olds-spark-
     interpreter/extralibs/kerberos/krb5.conf"
     ```
2. Set `spark.master as local[*]` in interpreter configuration file.

3.7.4.3 Configuration

The Spark interpreter configuration can be divided into the following categories:

- Configuration related to deployment

  These properties can be set either in the Spark libraries, for example, the `spark-defaults.conf` file, or through the system environment variable, `SPARK_CONF`, for example, `SPARK_CONF="--conf spark.driver.memory=2g"`.

> **NOTE** These properties cannot be changed when the Spark interpreter is running.

- Configuration related to Spark runtime control

  These properties can be set from the Interpreters page of the FCC Studio application UI. This includes properties such as `spark.executor.memory`.

> **NOTE** The properties related to the driver cannot be set during runtime and are considered deployment configuration. The properties related to the executors can be set during runtime. Hence, the latter option of runtime control configuration is preferred.

A list of possible properties are available in the Spark Official Documentation. All the properties prefixed with the term "zeppelin", that are listed in the Zeppelin Spark Configuration Document can also be set from the Interpreters page of the FCC Studio application user interface.

3.7.5 Configure the PySpark Interpreter

FCC Studio uses PySpark 2.4.0. Before you begin the configurations, check the prerequisites depending on your operation mode.

- Prerequisites
- Configuration
- Use the Python Virtual Environments with PySpark

3.7.5.1 Prerequisites

The PySpark interpreter has the same prerequisites as that as the Spark Interpreter. For more information, see Configure the Spark Interpreter. Also, all Spark components must be configured to use the same Python version.

3.7.5.2 Configuration

The PySpark interpreter can be configured through the Spark interpreter with the only exception being the Python version used. By default, the Python version is set to 3, that can be changed either in the interpreter JSON files before the startup or from the Interpreters page of the FCC Studio application UI during runtime by changing the following properties:

- In the Spark Interpreter Settings page of the FCC Studio application UI (or `spark.json` file), change the value of the `spark.pyspark.python` property to the path of the Python executable that is to be used by the Spark executors.
- In the PySpark Interpreter Settings page of the FCC Studio application UI (or `pyspark.json` file), change the value of the `zeppelin.pyspark.python` property to the path of the Python executable that is to be used by the Spark driver.

3.7.5.3 Use the Python Virtual Environments with PySpark

To ensure that the two Python versions match, in case your components run on different machines, you must use the Python virtual environments with PySpark.

To use Python Virtual Environments with PySpark, follow these steps:

1. Create a Virtual Environment with Conda
2. Include Virtual Environment in the Init Container
3. Update the Interpreter Properties

3.7.5.3.1 Create a Virtual Environment with Conda

NOTE You can also use `virtualenv` to create your virtual environment instead of `conda`.

To create a virtual environment with Conda, follow these steps:

1. Ensure that you have `conda` and `conda-Pack` installed.
2. Create your virtual environment using the following command:

   ```
   conda create -y -n <environment-name> python=<python-version>
   <additional-packages>
   ```

NOTE The `<environment-name>` can be chosen freely and subsequently has to be substituted in further commands.

3. Activate your virtual environment using the following command:

   ```
   conda activate <environment-name>
   ```

4. Execute the following to obtain the path to your virtual environment:

   ```
   which python
   ```

   The obtained result is referred to as `<environment-abs-path>`.

5. Compress your virtual environment using the following command:

   ```
   conda pack -n <environment-name> -o <environment-abs-
   path>/<environment-name>.tar.gz
   ```

3.7.5.3.2 Include Virtual Environment in the Init Container

To include the virtual environment in the Init container, you must place the Virtual Environment in the same path as the Spark libraries. To provide your own Spark libraries and (or) Hadoop client-configuration files for the Spark interpreter to connect to a Spark Standalone or Yarn cluster, follow these steps:

a. Download the Spark libraries from the Spark's Official Release Archive.

b. Prepare Spark libraries by following these steps:

   i. Place your libraries in the `<Studio_Installation_Path>/docker/user/spark-interpreter-libraries/` directory.

> **NOTE** Ensure that the directory name of the Spark library is prefixed with the term ’spark’

   ii. To use separate Hadoop libraries, download them as well and place the Hadoop libraries directory in the same directory.

   iii. Be cautious when linking the two libraries, since the path where they are located is in the K8s pod, and the location is as follows:

   `/var/olds-spark-interpreter/interpreter/spark/libs/`

   iv. Change the image of the Spark interpreter Init Container in the `<Studio_Installation_Path>/deployments/spark.yml` file to `{{imageRepository}}/fcc-studio/3rdparty:init`.

   v. (Optional) Place your Hadoop Client Configuration files in the `<Studio_Installation_Path>/configmaps/spark-interpreter-conf/` directory.

The cluster's Hadoop client-side configuration files that include XML files such as `yarn-site.xml` are required and must be supplied with the Spark libraries. These files are available in the Hadoop configuration directory `(HADOOP_CONF_DIR)` of the cluster or can be downloaded from the cluster manager's user interface if you are using a Cloudera cluster.

3.7.5.3.3 Update the Interpreter Properties

The interpreter properties can either be configured in the interpreter JSON files or from the Interpreters page of the FCC Studio application UI after starting the FCC Studio application.

- In the Spark Interpreter Settings page of the FCC Studio application UI (or `spark.json`), change the following:
- Change the value of the `spark.yarn.dist.archives` property to `<environment-abs-path>/<environment-name>.tar.gz#<environment-name>`
- Change the value of the `spark.pyspark.python` property to `./<environment-name>/bin/python`
- In the PySpark Interpreter Settings page of the FCC Studio application UI (or `pyspark.json`), change the value of the `zeppelin.pyspark.python` parameter to `<environment-abs-path>/bin/python.`

3.8 Create the Hive Schema

To create hive schema, perform the following steps:

1. Login to the server where **bigdata/hive** is installed.

2. Open a hive session in the command prompt.
3. Create a new hive schema using the following script:

   ```
   create database <hive schema name>;
   ```

A new hive schema is created.

> **NOTE** Ensure that the hive schema that is created is provided as the parameter value `HIVE_SCHEMA` in the `studio-env.yml file`.

3.9 Create the Studio Schema

To create studio schema, create a new Oracle Database schema user using the following script:

```
CREATE USER <Studio Schema Username> IDENTIFIED BY <Password>;
```

A new Oracle Database schema (Studio schema) is created.

3.10 Assign Grants for the Database Schemas

Grant the following permissions to the newly created Oracle Database Schema:

- `GRANT create session TO <Studio Schema User>;`
- `GRANT create table TO <Studio Schema User>;`
- `GRANT create view TO <Studio Schema User>;`
- `GRANT create any trigger TO <Studio Schema User>;`
- `GRANT create any procedure TO <Studio Schema User>;`
- `GRANT create sequence TO <Studio Schema User>;`
- `GRANT execute on dbms_rls TO <Studio Schema User>;`
- `GRANT execute on sys.dbms_session TO <Studio Schema User>;`
- `ALTER USER <Studio Schema User> QUOTA 100M ON users;`
- `GRANT create sequence TO <Studio Schema User>;`
- `GRANT create SYNONYM TO <Studio Schema User>;`
- `GRANT create any context TO <BD or ECM Schema User>;`
- `GRANT execute on dbms_rls TO <BD or ECM Schema User>;`
- `GRANT ALL privileges TO <Studio Schema User>;`

3.11 Setup Password Stores with Oracle Wallet

As part of an application installation, administrators must set up password stores for database user accounts using Oracle Wallet. These password stores must be installed on the application database side. The installer handles much of this process, the administrators must perform some additional steps.

A password store for the application and application server user accounts must also be installed; however, the installer takes care of this entire process.

Topics:

- Setup the Password Stores for Database User Accounts
- Verify the Connectivity of the Wallet

3.11.1 Setup the Password Stores for Database User Accounts

After the database is installed and the default database user accounts are set up, administrators must set up a password store using the Oracle Wallet. This involves assigning an alias for the username and associated password for each database user account. The alias is used later during the application installation. This password store must be created on the system where the application server and database client are installed.

This section describes the steps to create a wallet and the aliases for the database user accounts. For more information on configuring authentication and password stores, see Oracle Database Security Guide.

> **NOTE** In this section, `<wallet_location>` is a placeholder text for illustration purposes. Before running the command, ensure that you have already created the `<wallet_location>` directory where you want to create and store the wallet.

To create a wallet, follow these steps:

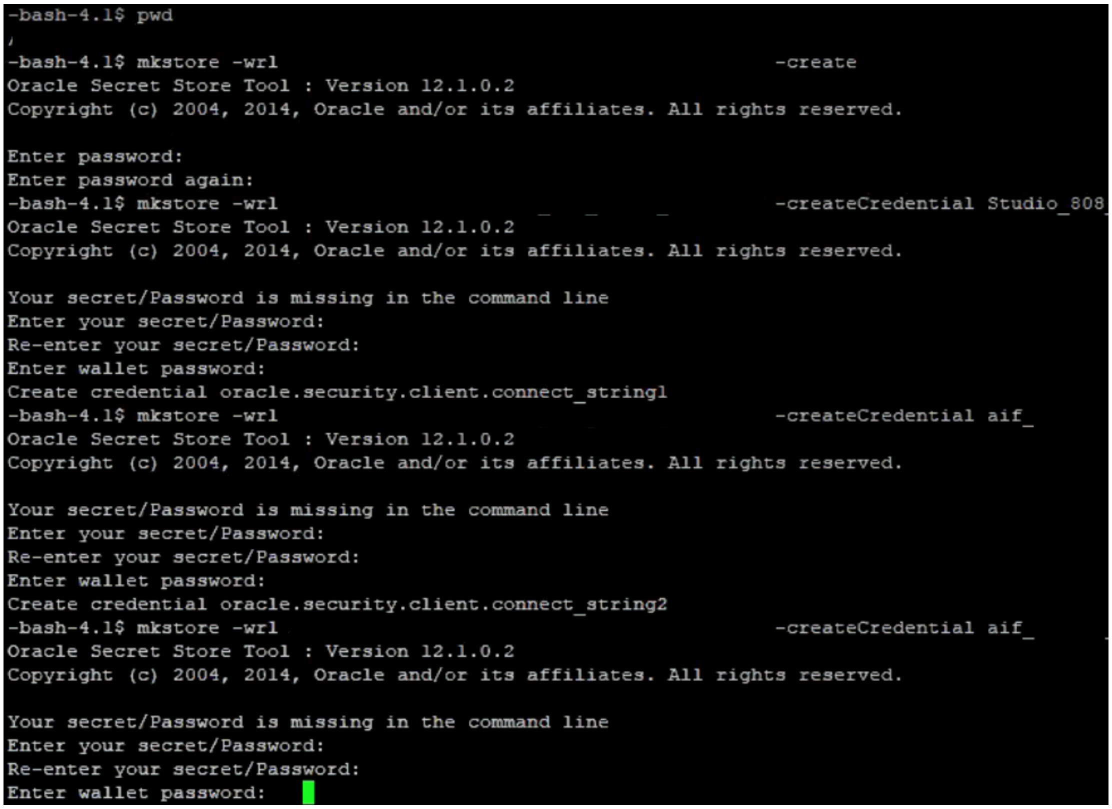
1. Login to the server as a Linux user.
2. Create a wallet in the `<wallet_location>` using the following command:

   ```
   mkstore -wrl <wallet_location> -create
   ```

   > **NOTE** The mkstore utility is included in the Oracle Database Client installation.

   After you run the command, a prompt appears. Enter a password for the Oracle Wallet in the prompt.

   Figure 1:Wallet Creation



```
-bash-4.1$ pwd
[redacted]
-bash-4.1$ mkstore -wrl [redacted] -create
Oracle Secret Store Tool : Version 12.1.0.2
Copyright (c) 2004, 2014, Oracle and/or its affiliates. All rights reserved.

Enter password:
Enter password again:
-bash-4.1$ mkstore -wrl [redacted] -createCredential Studio_808
Oracle Secret Store Tool : Version 12.1.0.2
Copyright (c) 2004, 2014, Oracle and/or its affiliates. All rights reserved.

Your secret/Password is missing in the command line
Enter your secret/Password:
Re-enter your secret/Password:
Enter wallet password:
Create credential oracle.security.client.connect_string1
-bash-4.1$ mkstore -wrl [redacted] -createCredential aif_
Oracle Secret Store Tool : Version 12.1.0.2
Copyright (c) 2004, 2014, Oracle and/or its affiliates. All rights reserved.

Your secret/Password is missing in the command line
Enter your secret/Password:
Re-enter your secret/Password:
Enter wallet password:
Create credential oracle.security.client.connect_string2
-bash-4.1$ mkstore -wrl [redacted] -createCredential aif_
Oracle Secret Store Tool : Version 12.1.0.2
Copyright (c) 2004, 2014, Oracle and/or its affiliates. All rights reserved.

Your secret/Password is missing in the command line
Enter your secret/Password:
Re-enter your secret/Password:
Enter wallet password:
```

3. Create the database connection credentials for the studio schema alias using the following command:

   ```
   mkstore -wrl <wallet_location> -createCredential <alias-name>
   <database-user-name>
   ```

   After you run the command, a prompt appears. Enter the password associated with the database user account in the prompt. You are prompted to re-enter the password. You are prompted for the wallet password used in Step 1.

4. Create the database connection credentials for the atomic schema alias using the following command:

   ```
   mkstore -wrl <wallet_location> -createCredential <alias-name>
   <database-user-name>
   ```

   NOTE Creating an atomic schema is not required when you install FCC Studio without OFSAA.

5. Create the database connection credentials for the config schema alias using the following command:

   ```
   mkstore -wrl <wallet_location> -createCredential <alias-name>
   <database-user-name>
   ```

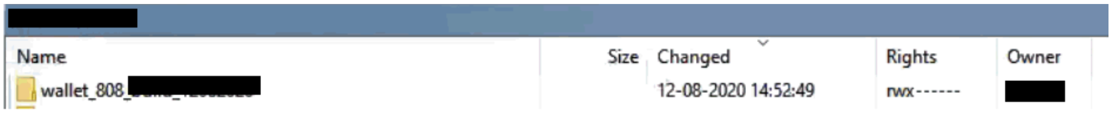
> **NOTE** Creating a config schema is not required when you install FCC Studio without OFSAA.

In this manner, create a wallet and associated database connection credentials for all the database user accounts.

The wallet is created in the `secrets/<wallet_location>` directory with the auto-login feature enabled. This feature enables the database client to access the wallet contents without using the password. For more information, see Oracle Database Security Guide.

After the wallet is created, go to the `<wallet_location>` directory and click **Refresh** to view the created wallet folder.

Figure 2:Location of the Created Wallet Folder



[redacted]

Name	Size	Changed	Rights	Owner
wallet_808_[redacted]		12-08-2020 14:52:49	rwx------	[redacted]

The wallet folder contains two files: ewallet.p12 and cwallet.sso.

6. Move the wallet folder to the `<Studio_Installed_Path>/<alias-name>` directory.
7. In the `<wallet_location>` directory, configure the `tnsnames.ora` file to include the entry for each alias name to be set up.

> **NOTE**
> - You can either update the existing `tnsnames.ora` file with the above details or create a new `tnsnames.ora` file and add the required entries.
> - `<alias-name>` is a user-defined value.

3.11.2 Verify the Connectivity of the Wallet

To verify the connectivity of the wallet, follow these steps:

1. Create a `sqlnet.ora` file in the wallet directory using the following content:

```
WALLET_LOCATION = (SOURCE = (METHOD = FILE) (METHOD_DATA = (DIRECTORY =
<Wallet_Location>)) )

SQLNET.WALLET_OVERRIDE=TRUE

SSL_CLIENT_AUTHENTICATION=FALSE
```

2. Test the connectivity using the following command:

NOTE The `ORACLE_HOME` used with the wallet must be the same version or higher than what the wallet was created.

```
$ export WALLET_LOCATION=<wallet_location>
```

`$ export TNS_ADMIN=<tnsnames.ora_location>.` If you have created a new `tnsnames.ora` file, provide the location of the new file.

```
$ sqlplus /@<alias_name>
```

The output is similar to:

```
SQL*Plus: Release 11

Connected to:

Oracle Database 12c
```

To verify if you are connected to the correct user:

```
SQL> show user
```

The output is similar to:

```
USER is "<database-user-name>"
```

3.11.3 Create the Credential Keystore

Credential keystore must be created for the Behavior Detection (BD) or Enterprise Case Management (ECM) Atomic schema and FCC Studio Schema. To create a credential keystore, follow these steps:

1. Login as HDFS Superuser.
2. Create a credential keystore on HDFS using the following command:

   ```
   hadoop credential create mydb.password.alias -provider
   jceks://hdfs/user/root/oracle.password.jceks
   ```

   Where,

   - `mydb.password.alias` is the alias name
   - `hdfs/user/root/oracle.password.jceks` is the file path of the credential keystore
3. Verify the credential keystore file using the following command:

   ```
   hadoop credential list -provider
   jceks://hdfs/user/root/oracle.password.jceks
   ```
4. Grant Read permission to the keystore file using the following command:

   ```
   hadoop fs -chmod 744 /user/root/oracle.password.jceks
   ```

NOTE Ensure the credential keystore file path and the alias are correctly mentioned in the `config.sh` file.

3.11.3.1 Copying and Adding Files

To copy the jar files, follow these steps:

1. Create the folder in the GRAPH_FILES_PATH parameter in a node of the big data cluster.
2. Create a folder called jars.
3. Navigate to the `<STUDIO_INSTALLED_PATH>/ficdb/etlJars` directory and copy all the jars present in this directory into the big data node inside the folder jars.

NOTE

To use the ES-Hadoop connector, download the commons-httpclient-3.0.1.jar and elasticsearch-spark-20_2.11-7.6.2.jar files and place them in the jars folder.

3.12 Download the Installer Kit

To download the software as a `.zip` folder, download the following mandatory one-off patch **31761460** from My Oracle Support (MOS).

4 Installation

After you download the installer kit, you can begin the installation, or deployment of the images and containers in the kubernetes environment. Perform the following steps to complete the installation:

- Extract the Installer Kit
- Place Files in the Installation Directories
- Generate an Encrypted Password
- Generate the Public and Private Keys
- Generate the Key Store File for Secure Batch Service
- Configure the Preferred Services
- Configure the studio-env.yml File
- Configure the Extract Transfer and Load _ETL_Process
- Verifying the Resource Allocation for FCC Studio Services
- Deploying FCC Studio on the K8s Cluster

4.1 Extract the Installer Kit

After downloading the **.zip** folder, follow these steps to extract the folder contents:

1. Extract the contents of the installer archive file in the download directory using the following commands:

   <FCC_Studio_Installer_Archive_File>_1of2.zip

   <FCC_Studio_Installer_Archive_File>_2of2.zip

   Both FCC Studio installer files are extracted to the same directory and the `OFS_FCCM_STUDIO` directory is obtained and is referred to as `<Studio_Installation_Path>`.

   WARNING Do not rename the application installer directory name after extraction from the archive.

2. Navigate to the download directory where the installer archive is extracted and assign execute permission to the installer directory using the following command:

   ```
   chmod 0755 OFS_FCCM_STUDIO -R
   ```

4.2 Place Files in the Installation Directories

To place the required jars and Kerberos files in the required locations, follow these steps:

1. To place the additional jar files, follow these steps:

   a. Navigate to the `<Studio_Installation_Path>/docker/user/batchservice/lib` directory.

b. Move the obtained *hdfs-libs* libraries to *<Studio Installation path>/docker/user/hdfs-libs/* directory. For information about jars, see Appendix C – Additional Jars – PGX.

> **NOTE**
> - The version of the jars is client or user-specific. These jars can be obtained from the existing jars of the Cloudera installation.
> - The `HiveJDBC4.jar` file is not available in the Cloudera setup. You must download the same from the Cloudera website.

2. To place the Kerberos files, follow these steps:

   a. Navigate to the `<Studio_Installation_Path>/configmap/batchservice/user/conf` directory.

   b. Place the following Kerberos files:

   — `krb5.conf`

   — keytab file name as mentioned in the `studio-env.yml` file.

3. For synonyms and stopwords, navigate to `<Studio_Installation_Path>/docker/user/analysis` directory.

   There are 8 text files in this directory as follows:

   - `Country`
   - `Gender`
   - `Organisation_strip`
   - `Organisation_suffix`
   - `Name_synonym`
   - `Title`
   - `Namestop`
   - `Cardinal_ordinal`

   You can add contents to these files.

> **NOTE**
> - User can decide to provide any data in the Stopword or Synonym files.
> - Each stopword must be provided in a separate line.
> - All related synonyms must be provided in the same line separated by a comma.
> - All the synonyms must be provided in the same line and ensure that there are no repetitions of the synonym. For Example: rob, robi, robie, roby, robbi.

4. If you want to perform MMG integration steps with Studio, see the Placing the Files for MMG.

4.3 Add Synonyms and Keyword files in Elastic Search

To consider the similarity when performing the elastic search you can add the synonyms and keyword files in Elastic search.

To add synonyms and keyword files in Elastic search, perform the following steps:

1. Create a folder in the name analysis in this `<Elastic Search Installation path>/config` directory.
2. You can add your synonyms and stop words to these files and place the files in the analysis folder:
   - `Title.txt`
   - `Synonym.txt`
   - `Organisation_suffix.txt`
   - `Organisation_strip.txt`
   - `Gender_OLD.txt`
   - `Gender.txt`
   - `Country.txt`
   - `Cardinal_ordinal.txt`

4.4 Place Files in Wallet

To place the files in wallet in the required locations, follow these steps:

1. To place the files in wallet, follow these steps:
   a. Navigate to the `<Studio_Installation_Path>/secrets/wallets` directory.
   b. Place the following files:
      — `tnsnames.ora`
      — `ewallet.p12`
      — `cwallet.sso`
      — `ewallet.p12.lck`
      — `cwallet.sso.lck`
2. Place the **sqlnet.ora** file into wallet and update the path for the current wallet location.

```
WALLET_LOCATION =
    (SOURCE =
        (METHOD = FILE)
        (METHOD_DATA =
            (DIRECTORY = <wallet location>)
        )
    )
```

```
SQLNET.WALLET_OVERRIDE = TRUE
```

4.5 Generate an Encrypted Password

To generate an encrypted password, follow these steps:

1. Set the `export FIC_DB_HOME` path in the `<Studio Installed Directory>/ficdb` directory.
2. Run the `echo $FIC_DB_HOME` command.
3. Go to the `<Studio_Installation_Path>/ficdb/bin` directory and run the ./`FCCM_Studio_Base64Encoder.sh` <password to be encrypted> command.

4.6 Generate the Public and Private Keys

The Public and Private keys are JSON Web Tokens (JWT) that are generated for PGX Authentication from FCC Studio.

To generate the keys, follow these steps:

> **NOTE** The following steps are mandatory for the first time FCC Studio installation.

1. Navigate to the `<Studio_Installation_Path>/ficdb/bin` directory.
2. Run the Shell Script `FCCM_Studio_JWT_Keygen.sh` from the directory.

   The Public and Private Keys are generated and available in the `<Studio_Installation_Path>/ficdb/conf` directory.
3. Copy the `private.key` and `public.key` files to the `<Studio_Installation_Path>/secrets/keys` directory.

After generating the key store file and adding the batch service to the PGX trust store, configure the user mapping for GDPR and Redaction changes in the database.

4.7 Apply GDPR and Redaction Changes for FCC Studio

The General Data Protection Regulation (GDPR) is a regulation in EU law on data protection and privacy in the European Union and the European Economic Area. You can apply the GDPR changes that is required for FCC Studio.

To apply GDPR and Redaction, you must configure the following:

- Generate the Key Store File for Secure Batch Service
- Add the Batch Service (SSL) to PGX Trust Store

4.7.1 Generate the Key Store File for Secure Batch Service

Generating the Key Store file for Secure Batch Service is a process of generating the key store parameters and changing the key store parameters from HTTP to HTTPS protocol.

> **NOTE** Proceed with this section only if you want to create a self-signed certificate.

To configure the Key Store file for Secure Batch Service, follow these steps:

1. Run the `keytool -genkey -alias batchservice -keyalg RSA -keysize 2048 -keystore <Studio_Installation_Path>/OFS_FCCM_STUDIO/secrets/keys/<Keystore file name>.jks` command in the Studio Server.

   > **NOTE** For Kubernetes, this keystore file name should be `batchservice_keystore.jks`.

   When generating the keytool ensure to provide the hostname in first name. For example:

   Question: What is your first and last name?

   Answer: Provide the value batch service name. For example: **batchservice**.
2. Specify the keystore password. The `<Keystore file name>.jks` file is created in the path `<Studio_Installation_Path>/OFS_FCCM_STUDIO/secrets/keys` directory.
3. Specify the following parameters in the *Studio env.yml* file.
   - `KEYSTORE_FILE_NAME=<Keystore file name>.jks`
   - `KEYSTORE_PASS=<password>`

4.7.2 Generate Studio Server SSL Configuration Mandatory File

To generate the Studio Server SSL Configuration Mandatory File, perform the following steps:

> **NOTE** Proceed with this section only if you want to create a self-signed certificate.

1. Run the following jks command in the Studio Server:

   ```
   keytool -genkey -alias <alias> -keyalg RSA -keystore <alias>.jks
   ```

   > **NOTE** The keystore file name must be `studio_server.jks.`
2. Specify the keystore password.
3. When generating the keytool ensure to provide the hostname in first name. For example:

Question: What is your first and last name?

Answer: Provide the fully qualified studio server hostname.

For example, `<hostname>.<domain name>`

4. Specify the any name for the other questions.
5. Specify the keystore password. The `jks` file is created in the Studio Server.
6. Run the following jks command in the Studio Server;

> **NOTE**
>
> - Use the same keystore name that is used for `jks` for importing to `P12` file (`studio_server`).
> - You must use the same **password** and **alias** that is provided in the `studio-env.yml` file.

```
keytool -importkeystore -srckeystore <alias>.jks -destkeystore
<alias_name>.p12 -srcalias <alias> -srcstoretype jks -deststoretype
pkcs12
```

7. Specify the keystore password. The `.p12` file is created in the Studio Server.
8. Copy the `.jks` and `.p12` files and place in the `<Studio Installation path>/secrets/keys` directory.

4.8 Configure the Preferred Services

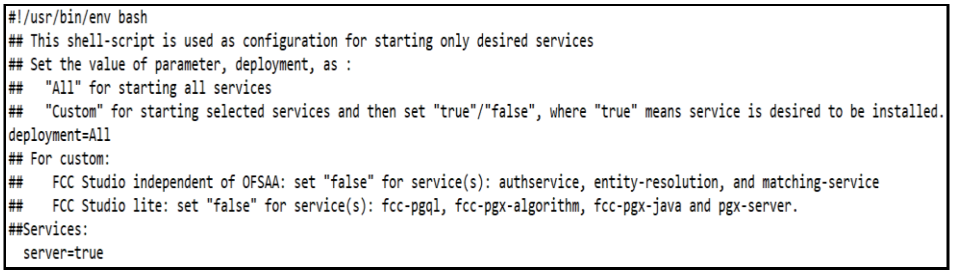
To configure the preferred services to be deployed during deployment of FCC Studio, follow these steps:

1. Navigate to the `<Studio_Installation_Path>/bin/` directory.
2. Set the `deployment` parameter depending on the services you want to deploy in the `serviceMapping.sh` file. Set the `deployment` parameter to `All` if you want to deploy all services, or set the `deployment` parameter to `Custom` if you want to choose specific services to deploy.

   If the `deployment` parameter is set to `Custom`, then set the values of the desired services to true and the values of undesired services to false.

   A sample `serviceMapping.sh` file is as follows.

Figure 4: Sample serviceMapping.sh File



```
#!/usr/bin/env bash
## This shell-script is used as configuration for starting only desired services
## Set the value of parameter, deployment, as :
##   "All" for starting all services
##   "Custom" for starting selected services and then set "true"/"false", where "true" means service is desired to be installed.
deployment=All
## For custom:
##    FCC Studio independent of OFSAA: set "false" for service(s): authservice, entity-resolution, and matching-service
##    FCC Studio lite: set "false" for service(s): fcc-pgql, fcc-pgx-algorithm, fcc-pgx-java and pgx-server.
##Services:
  server=true
```

NOTE

- Do not set `false` for the `server` service.
- Set spark as `false` if you don't intend to use spark.

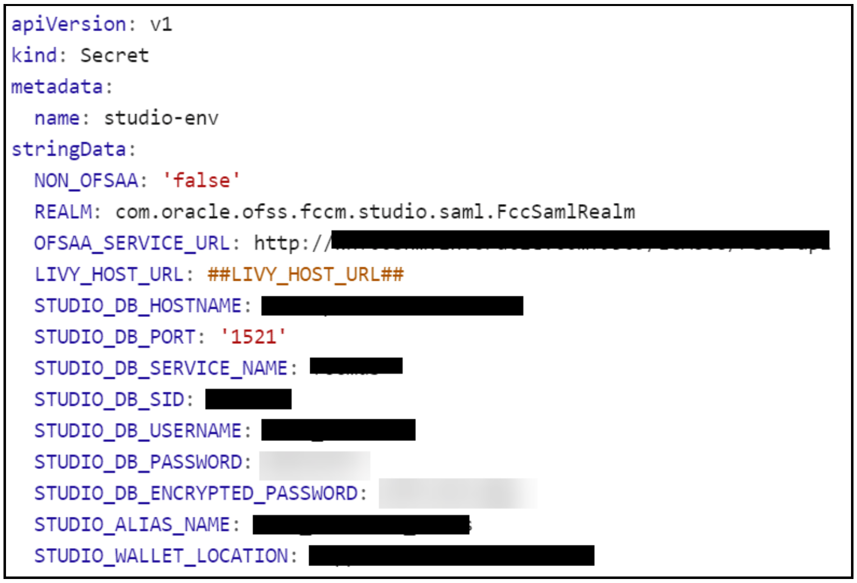
4.9 Configure the studio-env.yml File

To configure the `studio-env.yml` file for installing FCC Studio, follow these steps:

1. Login to the server as a non-root user.
2. Navigate to the `<Studio_Installation_Path>/secrets/` directory.
3. Configure the `studio-env.yml` file as shown in the following table.

   A sample `studio-env.yml` file is as follows.

Figure 4:Sample `studio-env.yml` file



```
apiVersion: v1
kind: Secret
metadata:
  name: studio-env
stringData:
  NON_OFSAA: 'false'
  REALM: com.oracle.ofss.fccm.studio.saml.FccSamlRealm
  OFSAA_SERVICE_URL: http:/[redacted]
  LIVY_HOST_URL: ##LIVY_HOST_URL##
  STUDIO_DB_HOSTNAME: [redacted]
  STUDIO_DB_PORT: '1521'
  STUDIO_DB_SERVICE_NAME: [redacted]
  STUDIO_DB_SID: [redacted]
  STUDIO_DB_USERNAME: [redacted]
  STUDIO_DB_PASSWORD: [redacted]
  STUDIO_DB_ENCRYPTED_PASSWORD: [redacted]
  STUDIO_ALIAS_NAME: [redacted]
  STUDIO_WALLET_LOCATION: [redacted]
```

NOTE

- Do not alter the parameter values that are already set in the `studio-env.yml` file
- Retain the existing placeholder values for the parameters which are not shown as mandatory in the following table.
- You must manually set the parameter value in the `studio-env.yml` file. If a value is not applicable, enter NA and ensure that the value is not entered as NULL.
- Depending on the installation architecture, ensure to provide the correct hostname for URL of PGX service in the `studio-env.yml` file.
- When upgrading FCC Studio with OFSAA, ensure to provide the same BD database, Studio schema, Hive schema, wallet related information that you used during the installation of the existing instance of FCC Studio.
- When upgrading FCC Studio with non-OFSAA, ensure to provide the same Studio schema and wallet related information that you used during the installation of the existing instance of FCC Studio.

Table 12: studio-env.yml Parameters

Parameter	Significance	Installing with OFSAA (Mandatory)	Upgrading with OFSAA (Mandatory)	Installing without OFSAA (Mandatory)
NON_OFSAA	Indicates the type of installation. • To install FCC Studio with OFSAA on the Kubernetes cluster, enter *false*. • To install FCC Studio without OFSAA on the Kubernetes cluster, enter *true*.	Enter false	Enter false	Enter true
REALM	Realm indicates functional grouping of database schemas and roles that must be secured for an application. Realms protect data from access through system privileges; realms do not give additional privileges to its owner or participants. FCC Studio uses realm based authorization and authentication for its users. For more information, see the Realm Based Authorization for FCC Studio section in the OFS Crime and Compliance Studio Administration Guide. The FCC Studio application can be accessed using the following realms: **FCCMRealm** **Value**=`com.oracle.ofss.fccm.studio.datastudio.auth.FCCMRealm`	Yes	Yes	Yes

	IdcsRealm **Value**=`oracle.datastudio.realm.idcs.IdcsRealm` **DemoRealm** **Value**=`com.oracle.ofss.fccm.studio.datastudio.auth.DemoRealm` **NOTE**: The DemoRealm is used only for demo purpose and is not recommended for usage.			
OFSAA_SERVICE_URL	Indicates the URL of the main database being used for installation. For example: `https://<HostName>:<PortNo>/<ContextName>/rest-api`	Yes	Yes	No
LIVY_HOST_URL	Indicates the URL of the Livy application. **Example**: `http://<HostName>:<PortNo>` **NOTE**: This parameter is applicable only if fcc-spark-sql, fcc-spark-scala, and (or) fcc-pyspark interpreters are to be used.	No	No	No

DB Details for Studio Schema				
STUDIO_DB_HOSTNAME	Indicates the hostname of the database where Studio schema is created.	Yes	Yes	Yes
STUDIO_DB_PORT	Indicates the port number where Studio schema is created.	Yes	Yes	Yes
STUDIO_DB_SERVICE_NAME	Indicates the service name of the database where Studio schema is created.	Yes	Yes	Yes
STUDIO_DB_SID	Indicates the SID of the database where Studio schema is created.	Yes	Yes	Yes
STUDIO_DB_USERNAME	Indicates the username of the Studio Schema (newly created Oracle Schema).	Yes	Yes	Yes
STUDIO_DB_PASSWORD	Indicates the password for the newly created schema. This value must not be blank.	Yes	Yes	Yes

STUDIO_DB_ENCRYPTED_PASSWORD	Indicates the encrypted password that is provided for the Studio schema. For example, cGFzc3dvcmQ.	Yes	Yes	Yes
Studio DB Wallet Details For more information on creating wallet, see Appendix - Setting Up Password Stores with Oracle Wallet .				
STUDIO_ALIAS_NAME	Indicates the Studio alias name. **NOTE**: Enter the alias name that was created during wallet creation.	Yes	Yes	Yes
STUDIO_WALLET_LOCATION	Indicates the Studio wallet location.	Yes	Yes	Yes
STUDIO_TNS_ADMIN_PATH	Indicates the path of the `tnsnames.ora` file where an entry for the `STUDIO_ALIAS_NAME` is present.	Yes	Yes	Yes
Hadoop Connection Details				

STUDIO_HADOOP_CREDENTIAL_ALIAS	Indicated the alias password saved in Hadoop. For example, studio.password.alias	Yes	Yes	Yes
STUDIO_HADOOP_CREDENTIAL_PATH	Indicates the credentials path. For example, <Studio Installed Path>oracle.password.jceks	Yes	Yes	Yes
DB Details for BD Config Schema				
BD_CONFIG_HOSTNAME	Indicates the hostname of the database where BD or ECM config schema is installed.	Yes	Yes	Enter NA
BD_CONFIG_PORT	Indicates the port of the database where BD or ECM config schema is installed.	Yes	Yes	Enter NA
BD_CONFIG_SERVICE_NAME	Indicates the service name of the database where BD or ECM config schema is installed.	Yes	Yes	Enter NA
BD_CONFIG_SID	Indicates the SID of the database where BD or ECM config schema is installed.	Yes	Yes	Enter NA

BD_CONFIG_USERNAME	Indicates the username for the BD, ECM, or MMG config schema.	Yes	Yes	Enter NA
BD_CONFIG_PASSWORD	Indicates the password for the BD, ECM, or MMG config schema. This value must not be blank.	Yes	Yes	Enter NA
BD Config Wallet Details For more information on creating wallet, see Appendix - Setting Up Password Stores with Oracle Wallet .				
BD_CONFIG_ALIAS_NAME	Indicates the BD or ECM config alias name. **NOTE**: Enter the alias name that was created during wallet creation.	Yes	Yes	Enter NA
BD_CONFIG_WALLET_LOCATION	Indicates the BD or ECM config wallet location.	Yes	Yes	Enter NA
BD_CONFIG_TNS_ADMIN_PATH	Indicates the path of the `tnsnames.ora` file where an entry for the `BD_CONFIG_ALIAS_NAME` is present.	Yes	Yes	Enter NA

DB Details for BD Atomic Schema				
BD_ATOMIC_HOSTNAME	Indicates the BD or ECM atomic schema hostname.	Yes	Yes	Enter NA
BD_ATOMIC_PORT	Indicates the BD or ECM atomic schema port number.	Yes	Yes	Enter NA
BD_ATOMIC_SERVICE_NAME	Indicates the BD or ECM atomic schema service name.	Yes	Yes	Enter NA
BD_ATOMIC_SID	Indicates the BD or ECM atomic schema SID.	Yes	Yes	Enter NA
BD_ATOMIC_USERNAME	Indicates the username of the BD or ECM atomic schema.	Yes	Yes	Enter NA
BD_ATOMIC_PASSWORD	Indicates the password of the BD or ECM atomic schema. This value must not be blank.	Yes	Yes	Enter NA

BD Atomic Wallet Details. For more information on creating wallet, see Appendix - Setting Up Password Stores with Oracle Wallet .				
BD_ATOMIC_ALIAS_NAME	Indicates the BD or ECM atomic alias name. **NOTE**: Enter the alias name that was created during wallet creation.	Yes	Yes	Enter NA
BD_ATOMIC_WALLET_LOCATION	Indicates the BD or ECM atomic wallet location.	Yes	Yes	Enter NA
BD_ATOMIC_TNS_ADMIN_PATH	Indicates the path of the tnsnames.ora file where an entry for the BD_ATOMIC_ALIAS_NAME is present.	Yes	Yes	Enter NA
SQL Scripts				
FSINFODOM	Indicates the name of the BD or ECM Infodom.	Yes	Yes	Enter NA
FSSEGMENT	Indicates the name of the BD or ECM segment.	Yes	Yes	Enter NA

DATAMOVEMENT_LINK_NAME	• If the newly created schema is in a different database host, you must create a DB link and provide the same link in this parameter. Alternatively, you can provide the source schema name. • If no DB link is present, provide the <SCHEMA_NAME> in this parameter. • If the newly created schema is in the same database host, the value for this parameter is the user name of the BD or ECM atomic schema.	Yes	Yes	Enter NA
DATAMOVEMENT_LINK_TYPE	If the DB link is used, enter DBLINK in this field. If the DB link is not used, enter SCHEMA in this field.	Yes	Yes	Enter NA
Cloudera Setup Details Contact System Administrator to obtain the required details for these parameters.				
HADOOP_CREDENTIAL_PROVIDER_PATH	Indicates the path where Hadoop credential is stored.	Yes	Yes	Enter NA

HADOOP_PASSWORD_ALIAS	Indicates the Hadoop alias given when creating the Hadoop credentials. **NOTE**: Enter the alias name that was created during wallet creation. For information on how to create a credential keystore, see Creating the Credential Keystore	Yes	Yes	Enter NA
Hive_Host_Name	Indicates the Hive hostname.	Yes	Yes	Enter NA
Hive_Port_number	Indicates the Hive port number. Contact your System Administrator to obtain the port number.	Yes	Yes	Enter NA
HIVE_PRINCIPAL	Indicates the Hive Principal. Contact your System Administrator to obtain this value.	Yes	Yes	Enter NA
HIVE_SCHEMA	Indicates the new Hive schema name.	Yes	Yes	Enter NA
JAAS_CONF_FILE_PATH	Created for future use.	No	No	No

Krb_Host_FQDN_Name	Indicates the Kerberos host FQDN name.	Yes	Yes	Enter NA
Krb_Realm_Name	Indicates the Kerberos realm name.	Yes	Yes	Enter NA
Krb_Service_Name	Indicates the Kerberos service name. Example: Hive	Yes	Yes	Enter NA
KRB5_CONF_FILE_PATH	Created for future use.	No	No	No
security_krb5_kdc_server	Created for future use.	No	No	No
security_krb5_realm	Created for future use.	No	No	No
server_kerberos_keytab_file	Created for future use. **Note**: This is required when using Spark Interpreter.	Yes	Yes	Enter NA

server_kerberos_krb5_conf_file	Created for future use. **Note**: This is required when using Spark Interpreter.	Yes	Yes	Enter NA
server_kerberos_principal	Created for future use. **Note**: This is required when using Spark Interpreter.	Yes	Yes	Enter NA
SQOOP_HOSTMACHINE_USER_NAME	Indicates the user name of the Big Data server where SQOOP will run.	Yes	Yes	Enter NA
SQOOP_PARAMFILE_PATH	1. Create a file with the name `sqoop.properties` in the Big Data server and add the following entry to the same: 2. `oracle.jdbc.mapDateToTimestamp=false` 3. Enter the location of the `sqoop.properties` file as the value for this parameter. 4. Example: `/scratch/ofsaa/` **NOTE**: Ensure that the location name ends with a '/'.	Yes	Yes	Enter NA
SQOOP_PARTITION_COL	Indicates the column in which the HIVE table is partitioned. The value must be `SNAPSHOT_DT`	Yes	Yes	Enter NA

SQOOP_TRG_HOSTNAME	Indicates the hostname of the Big Data server where SQOOP will run.	Yes	Yes	Enter NA
SQOOP_TRG_PASSWORD	Indicates the password of the user of the Big Data server where SQOOP will run. This value must not be blank.	Yes	Yes	Enter NA
SQOOP_WORKDIR_HDFS	Indicates the SQOOP working directory in HDFS. Example: `/user/ofsaa`	Yes	Yes	Enter NA
Internal Services				
AUTH_SERVICE_URL	Indicates the AUTH service URL that gets activated after the `fcc-studio.sh` file runs. Example: `http://<HostName>:7041/authservice`	Yes	Yes	No
BATCH_SERVICE_URL	Indicates the Batch service URL that gets activated after the `fcc-studio.sh` file runs. **Example**: `http://<HostName>:7043/batchservice`	Yes	Yes	Yes

META_SERVICE_URL	Indicates the META service URL that gets activated after the `fcc-studio.sh` file runs. **Example**: `http://<HostName>:7045/metaservice`	Yes	Yes	Yes
SESSION_SERVICE_URL	Indicates the Session service URL that gets activated after the `fcc-studio.sh` file runs. **Example**: `http://<HostName>:7047/sessionservice`	Yes	Yes	Yes
PGX_SERVER_URL	Indicates the URL of the PGX server. **Example**: http://<HostName>:<PortNo> The value for PortNo must be 7007.	Yes	Yes	Yes
ORE Interpreter Settings NOTE: This section is applicable only if ORE interpreter is used.				
RSERVE_USERNAME	Indicates the RServe username. Contact your System Administrator for the username.	No	No	No
RSERVE_PASSWORD	Indicates the RServe password. Contact your System Administrator for the username.	No	No	No

HTTP_PROXY	Indicates the proxy for the host where FCC Studio is deployed.	No	No	No
HTTPS_PROXY	Indicates the proxy for the host where FCC Studio is deployed.	No	No	No
REPO_CRAN_URL	Indicates the URL from where the R packages are obtained. The format for the REPO_CRAN_URL is as follows: https://cran.r-project.org/	No	No	No
USERS_LIB_PATH	Indicates the path where the R packages are installed. Default value: `/usr/lib64/R/library`	No	No	No
RSERVE_CONF_PATH	Indicates the path where the `Rserve.conf` file is present. Default value: `/var/ore-interpreter/rserve`	No	No	No
ElasticSearch Cluster details				

ELASTIC_SEARCH_HOSTNAME	Indicates the hostname of the database where the elastic search service is installed.	Yes	Yes	Yes
ELASTIC_SEARCH_PORT	Indicates the port number where the elastic search service is installed.	Yes	Yes	Yes
Matching Service				
EXECUTOR_THREADS	Indicates the number of threads to run in parallel during one scroll. For example: 10	Yes	Yes	Yes
SCROLL_TIME	Indicates the duration for which the scroll_size output is active. For example: 5	Yes	Yes	Yes
SCROLL_SIZE	Indicates the amount of data that must be obtained in one attempt when a query is fired on an index in the elastic search service. For example: 1000	Yes	Yes	Yes

ELASTICRESPONSE_BUFFERLIMIT_BYTE	Indicates the buffer size of the response obtained from the elastic search service. For example: 200	Yes	Yes	Yes
MATCHING_SERVICE_HOSTNAME	Indicates the hostname of the database where matching service is installed.	Yes	Yes	Yes
MATCHING_SERVICE_PORT	Indicates the port number where matching service is installed.	Yes	Yes	Yes
ER_SERVICE_URL	Indicates the URL of the entity resolution service.	Yes	Yes	Yes
ER_SERVICE_PORT	Indicates the port number where the entity resolution service is installed. Default value: 7051	Yes	Yes	Yes
Graphs				
HDFS_GRAPH_FILES_PATH	Indicates the file path in the HDFS where the `graph.json` file is formed.	Yes	Yes	Yes
GRAPH_FILES_PATH	Indicates the directory in the Big Data server for graph files.	Yes	Yes	Yes

GRAPH_NAME	Indicates the name you want to assign to the global graph at the end of ETL.	Yes	Yes	Yes
ETL				
HDFS_GRAPH_FILES_PATH	Indicates the filepath in the HDFS where the `graph.json` is formed.	Yes	Yes	No
GRAPH_FILES_PATH	Indicates the directory in the Big Data server for graph files.	Yes	Yes	No
GRAPH_NAME	Indicates the name you want to assign to the global graph at the end of ETL.	Yes	Yes	No
ETL_PROCESSING_RANGE	Indicates the duration for which the data would be moved from Oracle to Hive. For example: If the ETL_PROCESSING_RANGE = 2Y, 3M, 10D, that is, 2 years, 3 months, and 10 days, and the present date is 20200814, then the data movement occurs for the range 20180504 to 20200814.	Yes	Yes	No

OLD_GRAPH_SESSION_DURATION	Indicates the session older than this specified duration will be removed from the PGX server. If unsure, you can set this value for a week (7D).	Yes	Yes	No
REMOVE_TRNXS_EDGE_AFTER_DURATION	Indicates the date range for which transaction edges will be maintained in graph. For example: 6Y, 3M, 10D, which means 6 years, 3 months and 15 days.	Yes	Yes	No
CONNECTOR_CHANGESET_SIZE	Indicates the number of nodes or edges you want to process during an update of graph. If unsure, you can set it to 10000.	Yes	Yes	No
PGX_SERVER_URLS	Indicates the comma ‘,’ separated values of PGX URLs. If you have only one PGX URL, then the value is `http://<k8s master hostname FQDN>:7007.`	Yes	Yes	No
Quantifind Details For Quantifind, the generated Quantifind token must be encoded. Use the `<Fic_DB_path>/FCCM_Studio_Base64Encoder.sh` file for encoding Quantifind token.				
QUANTIFIND_URL	Indicates the URL of the Quantifind. For example, https://api-test.quantifind.com	Yes	Yes	Yes

ENCRYPTED_QUANTIFIND_TOKEN	Indicates the token that is generated when integrating with Quantifind. For example, c2FtcGxlX2VuY3J5cHRlZF9xdWFudGlmaW5kX3Rva2Vu.	Yes	Yes	Yes
QUANTIFIND_APPNAME	Indicates the Quantifind App Name. For example, OracleIntegrationTest	Yes	Yes	Yes
QUANTIFIND_ENABLED	Indicates that Quantifind is enabled. Options are True or False.	Yes	Yes	Yes
HTTPS_PROXY_HOST	Indicates the proxy host that is used. For example, www-proxy-idc.in.oracle.com	Yes	Yes	Yes
HTTPS_PROXY_PORT	Indicates the proxy port that is used. For example, 80	Yes	Yes	Yes
HTTPS_PROXY_USERNAME	Indicates the proxy username used if there is any. For example, ##HTTP_PROXY_USERNAME##	Yes	Yes	Yes
HTTPS_PROXY_PASSWORD	Indicates the proxy password used if there is any. For example, ##HTTP_PROXY_PASSWORD##	Yes	Yes	Yes

SAML The SAML related parameters are applicable only if SAMLRealm is used in the Realm parameter.	1. For SAML Realm, the certificate from IDP (key.cert file) is required. 2. The certificate that is obtained from the IDP must be renamed to `key.cert` and placed in the `<Studio_Installation_Path>/OFS_FCCM_STUDIO/datastudio/server/conf` directory. 3. This certificate is used to identify the trust of the SAML response from the Identity Provider. 4. Specify the Role Attribute name from IDP, in which the User Roles are present in the SAML response.			
SAML_ISSUER	Indicates the SAML entity ID (Studio URL) configured in the IDP.	Yes	Yes	Yes
SAML_DESTINATION	Indicates the SAML IDP URL that is provided by the Identity Provider after creating the SAML Application.	Yes	Yes	Yes
SAML_ASSERTION	Indicates the SAML consume URL (Studio/URL/saml/consume) that is configured in IDP.	Yes	Yes	Yes
SAML_ROLE_ATTRIBUTE	Indicates the SAML client identifier provided by the SAML Administrator for the Role and Attributes information, while creating the SAML application for FCC Studio.	Yes	Yes	Yes

SAML_LOGOUT_URL	Indicates the SAML client identifier provided by the SAML Administrator for the Logout URL information when creating the SAML application for FCC Studio.	Yes	Yes	Yes
SAML_COOKIE_DOMAIN	Indicates the SAML client identifier provided by the SAML Administrator for the Logout URL information when creating the SAML application for FCC Studio.	Yes	Yes	Yes
API_USER	Indicates the API users.	Yes	Yes	Yes
IDCS NOTE: The IDCS related parameters are applicable only if IdcsRealm is used in the Realm parameter.				
IDCS_HOST	Indicates the server of the Oracle Identity Cloud Service (IDCS) instance.	Yes	Yes	Yes
IDCS_PORT	Indicates the port number of the IDCS instance.	Yes	Yes	Yes
IDCS_SSL_ENABLED	Indicates if SSL is enabled for the IDCS application. Default value: true	Yes	Yes	Yes

LOGOUT_URL	Indicates the URL to redirect after logout from FCC Studio.	Yes	Yes	Yes
IDCS_TENANT	Indicates the IDCS tenant provided by the IDCS Administrator while creating the IDCS application for FCC Studio.	Yes	Yes	Yes
IDCS_CLIENT_ID	Indicates the IDCS client identifier provided by the IDCS Administrator while creating the IDCS application for FCC Studio.	Yes	Yes	Yes
IDCS_CLIENT_SECRET	Indicates the IDCS client secret provided by the IDCS Administrator while creating the IDCS application for FCC Studio.	Yes	Yes	Yes
FCDM_SOURCE	Indicates the source database for FCC Studio. The available options are ECM or BD. **NOTE**: • FCC Studio can use either the BD or ECM schema as the source of FCDM data for the graph. • Ensure to enter the value as ECM whenever ECM integration is required with Investigation Hub. Here, ECM schema is used as the source of the FCDM data to load the case information into the graph.	Enter BD or ECM	Enter BD or ECM	Enter NA

Graph Settings				
CB_CONFIGURED	Indicates the setting of the graph edges. When the corresponding edges of the graph is required, set the value to `true`.	Enter true or false	Enter true or false	Enter NA
Keystore file and pass details for batch service				
KEYSTORE_FILE_NAME	Indicates the keystore file name used for secure batch service. For example: batch_keystore.jks	Yes	Yes	Yes
KEYSTORE_PASS	Indicates the keystore password used for the secure batch service.	Yes	Yes	Yes
KEYSTORE_ALIAS	Indicates the keystore alias name used for the secure batch service. For example: batchservice	Yes	Yes	Yes
`STUDIO_SERVER_SSL_PASSWORD`	Indicates the SSL password that is defined by the user.	Yes	Yes	Yes
`STUDIO_SERVER_SSL_ALIAS`	Indicates the SSL alias that is provided by the user	Yes	Yes	Yes

4.10 Configure the Extract Transfer and Load (ETL) Process

Extract Transfer and Load (ETL) is the procedure of copying data from one or more sources into a destination system which represents the data differently from the source or in a different context than the source. Data movement and graph loading is performed using ETL.

> **NOTE** In case you have 8.0.7.4.0 installed and the spark cluster has both `batchservice-8.0.7.*.0.jar` and `elasticsearch-spark-20_2.11-7.* jar` files installed, you must remove them from the spark class path.

To configure the Data Movement and Graph Load, copy the `FCCM_Studio_SqoopJob.sh`,`FCCM_Studio_ETL_Graph.sh`, `FCCM_Studio_ETL_Connector.sh`, and `FCCM_Studio_ETL_BulkSimilarityEdgeGeneration.sh` files from the `<Studio_Installed_Path>/out/ficdb/bin` directory and add in the `<FIC_HOME of OFSAA_Installed_Path>/ficdb/bin` directory. For information **Configure ETL** and **Execute ETL** sections in the *OFS Crime and Compliance Studio Administration Guide*.

> **NOTE** Before you run the sqoop job, ensure that the `serverconfig.properties` file from the `<Studio_Installed_Path>/ batchservice/conf` directory has the correct values.

4.10.1 Configure the Extract Transfer Load (ETL) Services

To configure the ETL services, follow these steps:

1. Place the Hadoop Cluster files in the `<Studio_Installation_Path>/configmaps/spark-interpreter-conf` directory. For more information on the file structure, see Required File Structure.
2. Place the Kerberos files in the `<Studio_Installation_Path>/configmaps/batchservice/user/conf/` directory. For more information on the file structure, see Required File Structure.
3. Place the following jars in the `<Studio_Installation_Path>/docker/user/batchservice/lib/` directory. For more information about jars, see Appendix D – Additional Jars – Batch Service.

NOTE

- The version of the jars are client/user-specific. These jars can be obtained from existing jars of Cloudera installation.
- The `HiveJDBC4.jar` file is not available in the Cloudera setup. You must download the same from the Cloudera website.

4. Configure the `config.sh` file in `<Studio_Installation_Path>/bin` directory to replace the placeholder values in the applicable files in the `configmaps` directory as described in the following table:

NOTE Do not alter the parameter values that are already set in the `config.sh` file

Table 13:Configuring config.sh File

Parameter	Description
Deployment Configuration	
NAMESPACE	Enter a value to create a namespace with the specified value. For example: fccs
PGX Service	
PGX_SERVER_NUM_REPLICAS	Indicates the number of replicas of the PGX server. For example: 1
PGX_GLOBAL_GRAPH_NAME	Indicates the name that the pre-loaded global graph is published with and the FCC Studio users can use to reference the global graph. For example: GlobalGraphIH

URL_GLOBAL_GRAPH_CONFIG_JSON	Indicates the HDFS URL where the PGX graph configuration .json file is stored at the end of the ETL. The location can be either local or hdfs path. For example: `hdfs:///user/fccstudio/graph.json`
HDFS_GRAPH_FILES_PATH	Indicates the filepath in the HDFS where the `graph.json` is formed.
FCC_STUDIO_URL	Indicates the FCC Studio URL that starts with HTTPS.
Quantifind Details	
QUANTIFIND_URL	Indicates the URL of the Quantifind. For example, https://api-test.quantifind.com
ENCRYPTED_QUANTIFIND_TOKEN	Indicates the token that is generated when integrating with Quantifind. For example, c2FtcGxlX2VuY3J5cHRlZF9xdWFudGlmaW5kX3Rva2Vu.
QUANTIFIND_APPNAME	Indicates the Quantifind App Name. For example, OracleIntegrationTest.
QUANTIFIND_ENABLED	Indicates that Quantifind is enabled. Options are True or False.
SSL Password	
STUDIO_SERVER_SSL_PASSWORD	Indicates the Studio Server SSL password.
Matching Service	
ELASTIC_SEARCH_HOSTNAME	Indicates the Host name used for Elastic search.
ELASTIC_SEARCH_PORT	Indicates the search port of Elastic search.

STUDIO_ALIAS_NAME	Indicates the alias name for Studio used for the matching service.
EXECUTOR_THREADS	Indicates the executor thread details. The limit is 4.
ELASTICRESPONSE_BUFFERLIMIT_BYTE	Indicates the elastic response details. The limit is 4
SCROLL_TIME	Indicates the scroll time details. The limit is 30
SCROLL_SIZE	Indicates the scroll size details. The limit is 500

5. Grant Execute permission to the `<Studio_Installation_Path>/bin` directory using the following command:

   ```
   chmod 755 install.sh config.sh
   ```

6. Run the following command:

   ```
   ./install.sh
   ```

> **NOTE**
>
> - Execution of the `install.sh` command does not generate any log file.
> - The values for the `<URL_GLOBAL_GRAPH_CONFIG_JSON> and <PGX_GLOBAL_GRAPH_NAME>` parameters in the `<Studio_Installation_Path>/configmaps/pgx-server/pgx.conf` file are auto-populated with the values that are configured in the `<Studio_Installation_Path>/bin/config.sh` file.

4.10.1.1 Loading Graphs

Loading graphs to FCC Studio can be based on the following scenarios:

- Loading sample graph without running ETL
- Loading the graph generated from ETL

4.10.1.1.1 Loading sample graph without running ETL

To load sample graph without running ETL, perform the following steps:

1. Navigate to the `<Studio_Installation_Path>/configmaps/pgx-server/` directory and modify the `pgx.conf` file for the highlighted parameters:

   ```
   "preload_graphs": [
   ```

```
    {
      "path": "/data/graph/sample-graph.json",
      "name": "GlobalGraphIH",
      "publish": false,
      "publish_with_snapshots": true
    }
  ],
  "pgx_realm": {
    "implementation":
"com.oracle.ofss.fccm.studio.pgx.FCCMPgxRealm"
  },
  "file_locations": [
    {
      "name": "hdfs_storage",
      "location": "/data/graph"
    }
  ],
```

4.10.1.1.2 Loading the graph generated from ETL

You can load graph generated from **ETL**, based on the following:

- **PGX** fails, until you have a graph generated from **ETL** on the **HDFS**. Once the graph is generated, and then, as soon as the **PGX** server pods restart, the graph is pre-loaded to the Studio.
- **PGX** starts at the time of deployment, and user has to re-deploy Studio with the **PGX** related configuration, once you have a graph generated from **ETL** on the **HDFS**.
  - Create a backup of pgx.conf, the backup can be used when the graph is generated from ETL.
  - At the time of deployment, you must deleted the following lines from `pgx.conf` file.

```
"preload_graphs": [
  {
    "path": "##URL_GLOBAL_GRAPH_CONFIG_JSON##",
    "name": "##PGX_GLOBAL_GRAPH_NAME##",
    "publish": false,
    "publish_with_snapshots": true
  }
],
```

— The following lines must be deleted multiple times.

```
,
                {
                  "preloaded_graph":
"##PGX_GLOBAL_GRAPH_NAME##",
                  "grant": "manage"
                }
```

- Proceed with the studio deployment.
- Once the graph is generated, perform the following:
  - Replace the existing `pgx.conf` file with the backed up `pgx.conf` file
- Restart Studio.

4.11 Verify the Resource Allocation for FCC Studio Services

The required resources must be allocated to the FCC Studio services as per the architecture.

Topics:

- Resource Limits
- Resource Types
- Resource Parameters in FCC Studio

4.12 Resource Limits

For FCC Studio to run reliably, the available resources of the Kubernetes cluster must be allocated accordingly. The components are memory-intensive and therefore it is recommended to set memory constraints for each component.

4.13 Resource Types

Each container requires a memory request and memory limit size as defined by the Kubernetes API. In short, containers specify a request, which is the amount of that resource that the system will guarantee to the container and a limit which is the maximum amount that the system will allow the container to use. For more information on troubleshooting tips, see Managing Compute Resources for Containers.

Some components require additional resource limits which are set as environment variables.

4.14 Resource Parameters in FCC Studio

After extracting the FCC Studio application installer software, the resource limits must be adjusted for each component. The configuration files can be found in the `<Studio_Installation_Path>` directory.

NOTE

- The sizing recommendations are preliminary. In the case of deployment failures, a manual configuration of the sizing parameters is required.
- Depending on the use case, the recommended value changes.
- The default value in the following table is the value that is already set in the file.

Table 14: Resource Parameters in FCC Studio

Configuration File/Container	Parameter type	Parameter Name	Description	Recommendation
server.yml / server	k8	spec.containers[].resources.requests.memory	Memory request size for the FCC server (web application) component.	default
	k8	spec.containers[].resources.requests.memory	Memory limit size for the FCC server (web application) component.	default
agent.yml / agent	k8	spec.containers[].resources.requests.memory	Memory request size for the Agent (manages all interpreters) component.	default

	k8	spec.containers[].resources.limits.memory	Memory limit size for the Agent (manages all interpreters) component.	default
pgx-server.yml / pgx-server	k8	spec.containers[].resources.requests.memory	Memory request size for the PGX server (manages graph processing) component.	Slightly less than the memory of the PGX server as calculated in the sizing guide.
	k8	spec.containers[].resources.requests.memory	Memory limit size for the PGX server (manages graph processing) component.	The same as the request size above.
	ENV VAR (JAVA_OPTS)	-Xmx -Xms	The maximum and minimum heap memory size (mainly used for storing graphs' string properties) for the Java process of PGX.	58% of the container's memory limit size above. For a better understanding of this sizing parameter, see the PGX 20.0.2 Memory Consumption documentation.

	ENV VAR (JAVA_OPTS)	-Dpgx.max_off_heap_size	The maximum off-heap memory size in megabytes (mainly used for storing graphs except for their string properties) that PGX tries to respect.	42% of the container's memory limit size above. For a better understanding of this sizing parameter, see the PGX 20.0.2 Memory Consumption documentation.
fcc-pgx.yml / pgx-interpreter	k8	spec.containers[].resources.requests.memory	Memory request size for the PGX interpreter.	4Gi
	k8	spec.containers[].resources.limits.memory	Memory limit size for the PGX interpreter.	16Gi Sizing should depend on the number and behavior (memory requirements of sessions) of concurrent users
authservice.yml / authservice	k8	spec.containers[].resources.requests.memory	Memory request size for the authservice (used for getting roles of a user from DB) component.	default

	k8	spec.containers[].resources.limits.memory	Memory limit size for the authservice (used for getting roles of a user from DB) component.	default
metaservice.yml / metaservice	k8	spec.containers[].resources.requests.memory	Memory request size for the metaservice (used for custom interpreter api's like loaddataset, listdataset in scala interpreter etc.) component.	default
	k8	spec.containers[].resources.limits.memory	Memory limit size for the metaservice (used for custom interpreter APIs such as loaddataset, listdataset in Scala interpreter and so on) component.	default

sessionservice.yml / sessionservice	k8	spec.containers[].resources.requests.memory	Memory request size for the sessionservice (used for managing session between PGX and Scala interpreter) component.	default
	k8	spec.containers[].resources.limits.memory	Memory limit size for the sessionservice (used for managing session between PGX and Scala interpreter) component.	default
batchservice.yml / batchservice	k8	spec.containers[].resources.requests.memory	Memory request size for the batchservice (used for managing batches like sqoopjob, graph load, notebook execution and so on) component.	1 Gi as request **Note**: This depends on the amount of data theat you process in the ETL.

	k8	spec.containers[].resources.limits.memory	Memory limit size for the batchservice (used for managing batches like sqoopjob, graph load, notebook execution and so on) component.	2 Gi as request **Note**: This depends on the amount of data theat you process in the ETL.
entity-resolution.yml/ entity resolution	k8	spec.containers[].resources.requests.memory	Memory request size for the Entity Resolution component.	By default, 4.
	k8	spec.containers[].resources.limits.memory	Memory limit size for the Entity Resolution component.	By default, 8.
matching-service.yml/ matching service	k8	spec.containers[].resources.requests.memory	Memory request size for the Matching Service component.	• memory: 6Gi • cpu: 3 **Note**: This depends on the size of the data that you are processing
	k8	spec.containers[].resources.limits.memory	Memory limit size for the Matching Service component.	• memory: 12Gi • cpu: "6" **Note**: This depends on the size of the data that you are processing

spark.yml/spark and pyspark Interpreter	k8	spec.containers[].resources.requests.memory	Memory request size for the Spark interpreter.	default
	k8	spec.containers[].resources.limits.memory	Memory limit size for the Spark interpreter.	default
fcc-jdbc.yml / fcc-jdbc	k8	spec.containers[].resources.requests.memory	Memory request size for the JDBC connection.	default
	k8	spec.containers[].resources.limits.memory	Memory limit size for the JDBC connection.	default
fcc-livy.yml / fcc-spark-scala, fcc-spark-sql, and fcc-pyspark interpreters	k8	spec.containers[].resources.requests.memory	Memory request size for the livy connection to big data Spark cluster.	default
	k8	spec.containers[].resources.limits.memory	Memory limit size for the livy connection to Big data Spark cluster.	default
fcc-markdown.yml / markdown-interpreter	k8	spec.containers[].resources.requests.memory	Memory request size for the Markdown interpreter.	default

	k8	spec.containers[].resources.limits.memory	Memory limit size for the Markdown interpreter.	default
fcc-ore.yml / ore-interpreter	k8	spec.containers[].resources.requests.memory	Memory request size for the ORE connection.	default
	k8	spec.containers[].resources.limits.memory	Memory limit size for the ORE connection.	default
fcc-python.yml / python-interpreter	k8	spec.containers[].resources.requests.memory	Memory request size for the Python interpreter.	depending on use case
	k8	spec.containers[].resources.limits.memory	Memory limit size for the Python interpreter.	depending on use case

4.15 Deploy FCC Studio on the K8s Cluster

To deploy FCC Studio on the K8s cluster, follow these steps:

1. Navigate to the `<Studio_Installation_Path>` directory.
2. Execute the following command:

```
./fcc-studio.sh --registry <registry URL>:<registry port>
```

NOTE Execute the `./fcc-studio.sh -h` command for usage instructions.

Congratulations! Your installation is complete.

After successful completion, the script displays a URL that can be used to access the FCC Studio Application. For more information, see Access the FCC Studio Application.

5 Post-installation Steps when OFSAA is Installed

On successful installation of FCC Studio, you must perform the following post-installation configurations.

Topics:

5.1 Verify the Installation

1. To verify the FCC Studio deployment, wait for a minimum of 10 minutes after completing the execution of the `./fcc-studio.sh` command, and run the `kubectl get pods -n <Namespace>` command.

   The pod details are displayed to indicate the status of the services. You can also check the logs of the FCC Studio services from the Kubernetes Dashboard.

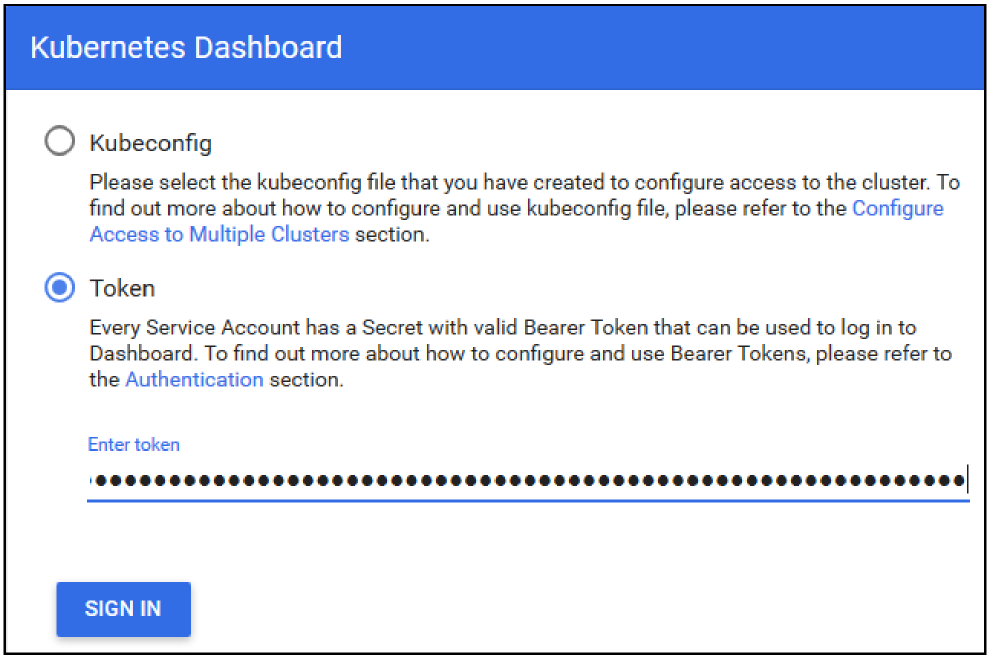
NOTE	
	- For FCC Studio deployed with OFSAA, ensure all the pods are ready before accessing the FCC Studio application. - For FCC Studio deployed with non-OFSAA, ensure the metaservice is up and running before accessing the FCC Studio application.

5.1.1 Check Logs of FCC Studio Services

The Kubernetes UI enables you to view the logs of the services installed as part of FCC Studio. To check the logs of the FCC Studio services from the Kubernetes dashboard, follow these steps:

1. Access the Kubernetes Dashboard. The Kubernetes Dashboard login page is displayed.

Figure 5:Kubernetes Dashboard



Kubernetes Dashboard

○ Kubeconfig

Please select the kubeconfig file that you have created to configure access to the cluster. To find out more about how to configure and use kubeconfig file, please refer to the Configure Access to Multiple Clusters section.

● Token

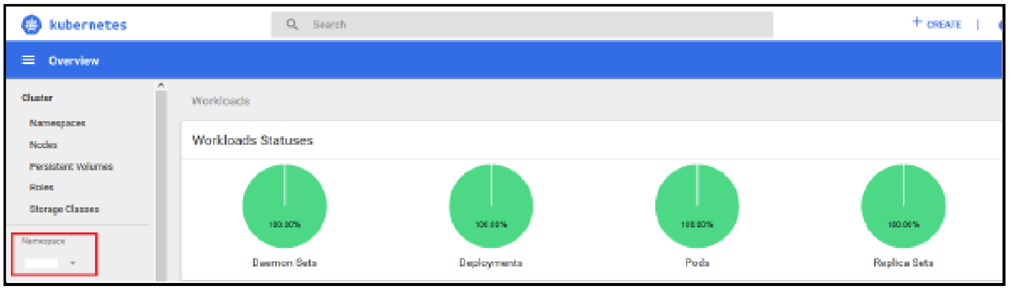
Every Service Account has a Secret with valid Bearer Token that can be used to log in to Dashboard. To find out more about how to configure and use Bearer Tokens, please refer to the Authentication section.

Enter token

●●

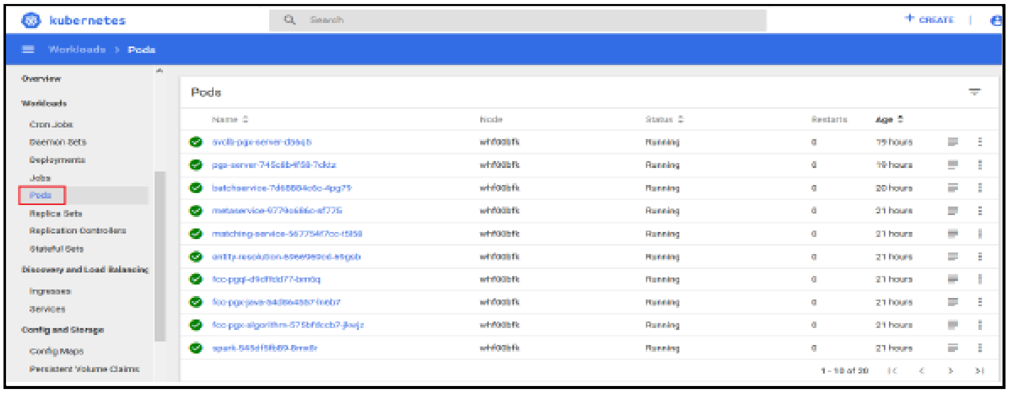
2. Select **Token** and enter the Admin user secret token in the Enter Token field.
3. Click **SIGN IN**. The Kubernetes Dashboard page is displayed.
4. Select <Namespace> from the Namespace drop-down list on the menu items displayed on the LHS.

Figure 6:Kubernetes Dashboard Overview



5. Navigate to Workloads > Pods from the menu items displayed on the LHS. The Pods page is displayed with the details of all the services installed as part of the FCC Studio installation.

Figure 7:Kubernetes Dashboard Pods



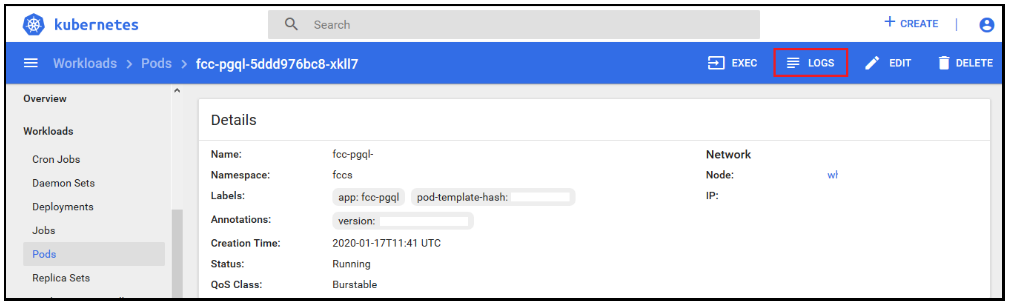
Pods

	Name	Node	Status	Restarts	Age
✓	svcli-pgx-server-d5bqjb	whf00bfk	Running	0	19 hours
✓	pgx-server-745c8b4f58-7ckkz	whf00bfk	Running	0	19 hours
✓	batchservice-7d68884c6c-4pg79	whf00bfk	Running	0	20 hours
✓	metaservice-6779c66bbc-sf7z6	whf00bfk	Running	0	21 hours
✓	matching-service-567754f7cc-t5f58	whf00bfk	Running	0	21 hours
✓	entity-resolution-6566969cd-45gqb	whf00bfk	Running	0	21 hours
✓	fcc-pgql-d9dffdd77-bmfq	whf00bfk	Running	0	21 hours
✓	fcc-pgx-java-94d8b4587-fnbb7	whf00bfk	Running	0	21 hours
✓	fcc-pgx-algorithm-575bf8ccb7-jkwjz	whf00bfk	Running	0	21 hours
✓	spark-545d15fb89-8rw8r	whf00bfk	Running	0	21 hours

1 - 10 of 30

6. Click the service name from the Name column. The service details are displayed.
7. Click the Logs tab.

Figure 8:Kubernetes Dashboard Logs



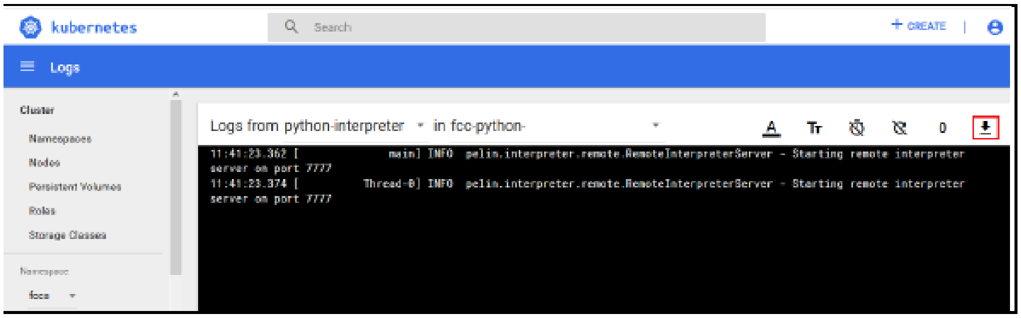
Details

Name: fcc-pgql-
Namespace: fccs
Labels: app: fcc-pgql pod-template-hash:
Annotations: version:
Creation Time: 2020-01-17T11:41 UTC
Status: Running
QoS Class: Burstable

Network
Node: wl
IP:

The service logs are displayed and you can download the logs by clicking Download Logs icon.

Figure 9:Sample Log



```
11:41:23.362 [          main] INFO  pelin.interpreter.remote.RemoteInterpreterServer - Starting remote interpreter
server on port 7777
11:41:23.374 [      Thread-0] INFO  pelin.interpreter.remote.RemoteInterpreterServer - Starting remote interpreter
server on port 7777
```

WARNING If you notice any errors in the log files, do not proceed further. Contact My Oracle Support (MOS) and provide the applicable error code and log files.

If the installation of FCC Studio is unsuccessful, you must reinstall the application after performing the cleanup tasks. For more information, see Reinstall FCC Studio.

5.2 Configure the Schema Creation

Schema creation is a one- time activity that replicates the table structure from the Financial Crime Data Model (FCDM) Atomic schema to the Hive Atomic schema.

Topics:

- Configure the Schema Creation from the FCC Studio Server

5.2.1 Configure the Schema Creation from the FCC Studio Server

To configure Schema Creation from FCC Studio server, follow these steps:

1. Set `FIC_DB_HOME` path to `<Studio_Installation_Path>/out/ficdb`.

   > **NOTE** The `$FIC_DB_HOME` path can be set from the `.profile` file.

2. Create a Hive Schema with the name mentioned in the `HIVE_SCHEMA` parameter in the `studio-env.yml` file.

   For information on the `studio-env.yml` file, see Configure the studio-env.yml File.

3. Execute the following shell script in the `<Studio_Installation_Path>/out/ficdb/bin/` directory to create tables in Hive Schema:

   ```
   ./FCCM_Studio_SchemaCreation.sh HIVE
   ```

4. Check the batch service logs in the Kubernetes Dashboard.
5. Check the hive schema for table creation, if the table is not created, then follow these steps:

   a. Login to the atomic schema of BD/ECM and run the following query:

   ```
   select * from fcc_orahive_datatypemapping;
   ```

   The `fcc_orahive_datatypemapping` table must have only 5 rows. If there are more than 5 rows, run the following query to delete the additional rows:

   ```
   Select * from fcc_orahive_datatypemapping for update
   ```

   b. Login as a studio user and run the following query:

   ```
   select * from fcc_datastudio_schemaobjects
   ```

   Run the following query to replace all `Y` values with '':

   ```
   update fcc_datastudio_schemaobjects set
   SCHEMA_OBJ_GENERATED=''
   ```

   After the schema creation is successful, the value of the SCHEMA_OBJ_GENERATED attribute changes to Y.

c. Repeat the step no 3.

5.3 Configure the ICIJ Data

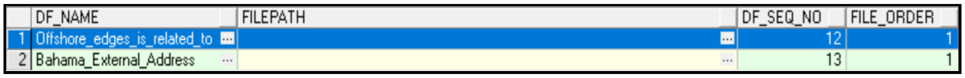
To configure the International Consortium of Investigative Journalists (ICIJ) data, you must configure the file path. To configure the file path, follow these steps:

NOTE

- The FCC Studio graph model is configured to include ICIJ watchlist files.
- Only applicable if customer wants ICIJ data in the graph generated by ETL.

1. Place the watchlist files in HDFS, that is accessible by the user.
2. Update the `FILEPATH` of the watch list files in the `fcc_studio_etl_files` table. The FILEPATH refers to the complete hdfs filepath of the csv file. For mapping between DF_NAME and FILEPATH, see the following image:

Figure 10: fcc_studio_etl_files Table



	DF_NAME	FILEPATH	DF_SEQ_NO	FILE_ORDER
1	Offshore_edges_is_related_to		12	1
2	Bahama_External_Address		13	1

The following table provides the file path for the csv files:

Table 15: Path of CSV Files

DF_NAME	File Path
Panama_External_Ad dress	panama_papers.nodes.address.csv
Panama_External_Entity	panama_papers.nodes.entity.csv
Panama_External_Entity	panama_papers.nodes.intermediary.csv
Panama_External_Entity	panama_papers.nodes.officer.csv
Panama_edges_address_of	panama_papers.edges.csv
Panama_edges_is_related_to	panama_papers.edges.csv
Offshore_External_Address	offshore_leaks.nodes.address.csv
Offshore_External_Entity	offshore_leaks.nodes.entity.csv

Offshore_External_Entity	offshore_leaks.nodes.intermediary.csv
Offshore_External_Entity	offshore_leaks.nodes.officer.csv
Offshore_edges_address_of	offshore_leaks.edges.csv
Offshore_edges_is_related_to	offshore_leaks.edges.csv
Bahama_External_Address	bahamas_leaks.nodes.address.csv
Bahama_External_Entity	bahamas_leaks.nodes.entity.csv
Bahama_External_Entity	bahamas_leaks.nodes.intermediary.csv
Bahama_External_Entity	bahamas_leaks.nodes.officer.csv
Bahama_edges_address_of	bahamas_leaks.edges.csv
Bahama_edges_is_related_to	bahamas_leaks.edges.csv
Paradise_External_Address	paradise_papers.nodes.address.csv
Paradise_External_Entity	paradise_papers.nodes.entity.csv
Paradise_External_Entity	paradise_papers.nodes.intermediary.csv
Paradise_External_Entity	paradise_papers.nodes.officer.csv
Paradise_External_Entity	paradise_papers.nodes.other.csv
Paradise_edges_is_related_to	paradise_papers.edges.csv
Paradise_edges_address_of	paradise_papers.edges.csv
Paradise_edges_is_linked_to	paradise_papers.edges.csv

5.4 Restart the PGX Service

You must restart the PGX service to ensure that graphs are created. To restart the PGX service, follow these steps:

NOTE Restart the PGX service only after the `./FCCM_Studio_ETL_Graph.sh` sqoop job is run.

1. Navigate to the `<Studio_Installed_Path>/out` directory.
2. Start a new putty session and run the following commands:

```
kubectl -n fccs delete -f deployments/pgx-server.yml
kubectl -n fccs apply -f deployments/pgx-server.yml
```

5.5 Loading Analysis Data to Elastic Search

NOTE Before running Bulk execution for the first time, after graph job , you must `remove fcc_idx_lookup* entries` if available from ES screen and need to run `FCCM_Studio_LoadAnalysisData.sh.` It will update the entries in ES screen

To load the synonyms and stop words to elastic search, perform the following steps:

1. Once, the contents are finalized, before running the similarity edge script. In the `ficdb` path, execute the following shell script with no parameters.

```
./FCCM_Studio_LoadAnalysisData.sh
```

5.6 Integration with MMG

Financial institutions require models that work on traditional statistical techniques, modern machine learning methods, computational and simulation models. Oracle Financial Services Model Management and Governance leverage the Data Studio environment to develop, deploy, and manage models at the enterprise level.

As a Model Management and Governance toolkit, it enables institutions to implement their IT policies while providing flexibility and freedom that Data Scientists and Statistical Modelers desire.

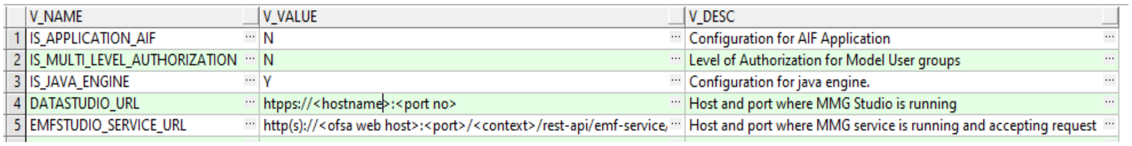
To know more about MMG roles, sandbox creation and publishing, see the MMG User Documentation.

NOTE

- To integrate FCC Studio with MMG, you must provide the data source, atomic and config schema parameters of MMG.
- The MMG config schema's **"NEXTGENEMF_CONFIG"** table, must be updated with the following parameters.

The **"NEXTGENEMF_CONFIG"** table details are as follows:

- **DATASTUDIO_URL**: The host and port details where Studio is running `(https://<servername>:<port no>).`
- **EMFSTUDIO_SERVICE_URL**:The host and port details where MMG service is running and accepting request `(https://<ofsaa web host>:<port>/<context>/rest-api/emf-service/v1)`
- **IS_APPLICATION_AIF**: Configuration for AIF Application. Specify **N** to use Studio only.
- **IS_JAVA_ENGINE**: Configuration for java engine. Specify **Y** to use Studio.
- **IS_MULTI_LEVEL_AUTHORIZATION**: These are the level of authorization for Model User groups. Specify **N** to use Studio. For more information, see MMG User Documentation.



	V_NAME	V_VALUE	V_DESC
1	IS_APPLICATION_AIF	N	Configuration for AIF Application
2	IS_MULTI_LEVEL_AUTHORIZATION	N	Level of Authorization for Model User groups
3	IS_JAVA_ENGINE	Y	Configuration for java engine.
4	DATASTUDIO_URL	htpps://<hostname>:<port no>	Host and port where MMG Studio is running
5	EMFSTUDIO_SERVICE_URL	http(s)://<ofsa web host>:<port>/<context>/rest-api/emf-service	Host and port where MMG service is running and accepting request

5.6.1 Placing the Files for MMG

To place the files for MMG integration, perform the following steps:

1. Copy the following jars from **MMG tomcat**, **Weblogic**, or **Webserver** `<WEB-INF>/lib` directory.
   - `aai-client.jar`
   - `aai-common-client.jar`
   - `aai-comonlanding-service.jar`
   - `aai-common-service.jar`
   - `aai-core.jar`
   - `AESCryptor.jar`
   - `FICServer.jar`
2. Place the jars in `<Studio_Installation_Path>/docker/user/authservice` directory.
3. Copy following files from the ../`FIC_HOME/conf` directory.
   - `Dynamic.dtd`
   - `Lookup.dtd`
   - `AESCryptKey.ext`
   - `keypair.store`
   - `keystore.properties`
   - `ofsaa8xskey.ext`
   - `LookupServices.xml`

- `DynamicServices.xml`

4. Place the files in this path `<Studio_Installation_Path>/secrets/mmg-conf` directory. Perform your Installation.

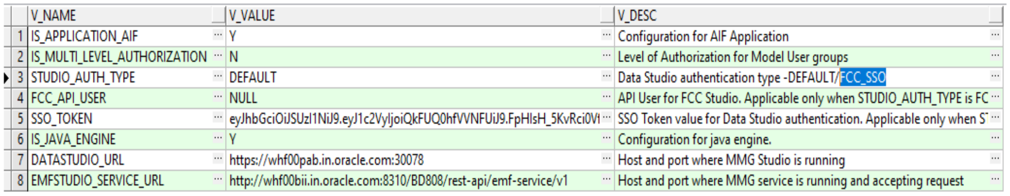
5.6.2 Integration with MMG (SAML)

To integration with MMG using SAML, you must perform the following:

1. Apply the patch MMG Patch *(32281016_GENERIC.zip)* from My Oracle Support (MOS).

2. Specify the following detials in the **nextgenemf config** table:

   - **STUDIO_AUTH_TYPE**: It is the Data Studio authentication type, in case of SAML, it is **FCC_SSO**.
   - **FCC_API_USER**: Indicates the API User details for FCC Studio, applicable only when **STUDIO_AUTH_TYPE** is **FCC_SSO**.
   - **SSO_TOKEN**: The token that is generated for accessing MMG. For more information , see SSO Token Generation.



	V_NAME	V_VALUE	V_DESC
1	IS_APPLICATION_AIF	Y	Configuration for AIF Application
2	IS_MULTI_LEVEL_AUTHORIZATION	N	Level of Authorization for Model User groups
3	STUDIO_AUTH_TYPE	DEFAULT	Data Studio authentication type -DEFAULT/FCC_SSO
4	FCC_API_USER	NULL	API User for FCC Studio. Applicable only when STUDIO_AUTH_TYPE is FC
5	SSO_TOKEN	eyJhbGciOiJSUzI1NiJ9.eyJ1c2VyIjoiQkFUQ0hfVVNFUiJ9.FpHIsH_5KvRci0Vl	SSO Token value for Data Studio authentication. Applicable only when S
6	IS_JAVA_ENGINE	Y	Configuration for java engine.
7	DATASTUDIO_URL	https://whf00pab.in.oracle.com:30078	Host and port where MMG Studio is running
8	EMFSTUDIO_SERVICE_URL	http://whf00bii.in.oracle.com:8310/BD808/rest-api/emf-service/v1	Host and port where MMG service is running and accepting request

5.6.2.1 SSO Token Generation

To generate the SSO Token, perform the following steps:

1. Navigate to the `<Studio_K8_Installation_Path>/out/ficdb/bin` directory.

2. Export the ficdb contents from the `<Studio_K8_Installation_Path>/out/ficdb` directory.

3. Run the script: `fic_db_home/FCCM_Studio_Generate_APIToken.sh <API_USER>`.

   For example, use the `./FCCM_Studio_Generate_APIToken.sh BATCH_USER`.

4. The token is generated in the command prompt. The generated SSO Token can be used in the **NEXTGENEMF_CONFIG** table.

5.7 Access the FCC Studio Application

To access FCC Studio, follow these steps:

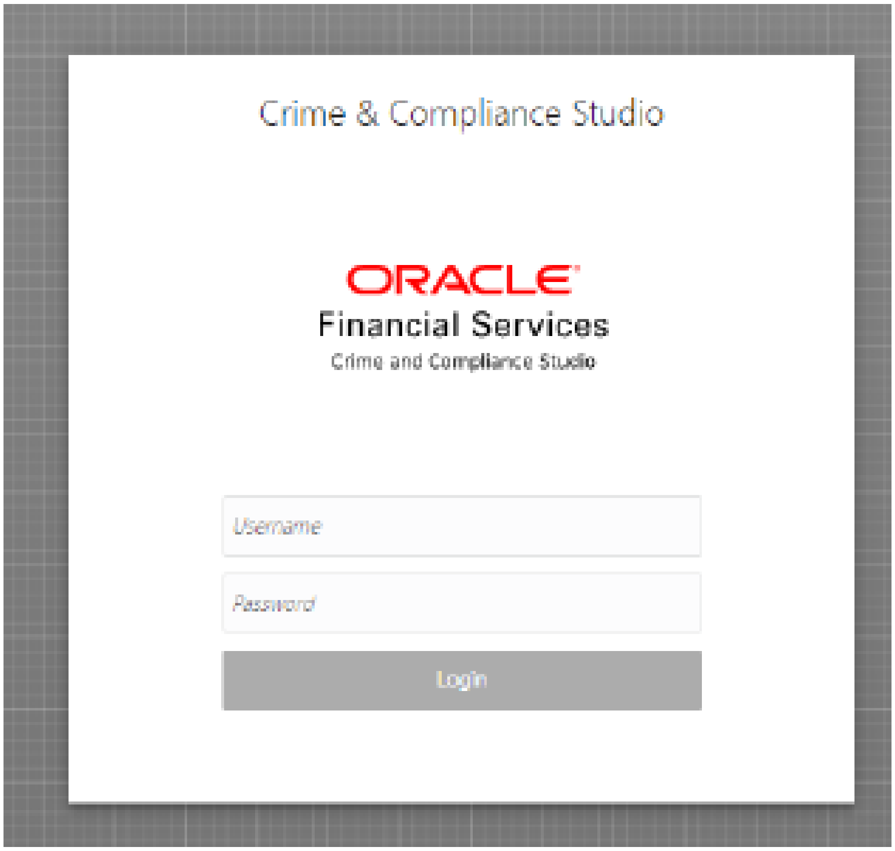
1. Enter the URL in the following format in the web browser:

   `https://<Host_Name>:<Port_Number>`

Here `<Port_Number>` is 30078 for the FCC Studio application installed on kubernetes.

The FCC Studio application login page is displayed.

Figure 11:FCC Studio Application Login Page



2. Enter the **Username** and **Password**.
3. Click **Login**.

   After you access the application, you can view the ready-to-use notebooks. To check if you have been assigned any roles, create a notebook. If you cannot create a notebook, contact My Oracle Support (MOS).

5.8 Perform the OFSAA Configuration for Batch Execution

> **NOTE** This configuration is not applicable for FCC Studio installed without OFSAA.

To perform OFSAA configuration for batch execution, follow these steps:

1. Copy the files in the <`Studio_Installation_Path>/ficdb/bin` directory to the server where the BD or ECM pack is installed and to the `$FIC_DB_HOME/bin` directory of the OFSAA setup.
2. Execute the following command to grant Execute permission to the files:

   ```
   chmod +x <filenames>
   ```

3. Copy all the files from the `<Studio_Installation_Path>/ficdb/lib` directory into the `$FIC_DB_HOME/lib` directory.

   For information on running FCC Studio Batches, see Managing Studio Batches chapter in the *Oracle Financial Services Crime and Compliance Studio Administration Guide*.

5.9 Configure and Run Published Notebooks

> **NOTE** This configuration is not applicable for FCC Studio installed without OFSAA.

To perform the configuration required to run published notebooks, copy the required `FCCM_Studio_NotebookExecution.sh` file from the `<Studio_Installation_Path>/out/ficdb/bin` directory into the `<FIC_HOME of OFSAA_Installed_Path>/ficdb/bin` directory.

For information on running published notebooks, see the Executing Published Notebook section in the *OFS Crime and Compliance Studio Administration Guide*.

6 Post-installation Steps when OFSAA is Not Installed

On successful installation of FCC Studio, you must perform the following post-installation configurations.

Topics:

- Verify the Installation
- Checking Logs of FCC Studio Services
- Restart the PGX Service
- Access the FCC Studio Application

> **NOTE** Before running the post-installation steps, an SSH connection to the Big Data server must be configured

6.1 Verify the Installation

1. To verify the FCC Studio deployment, wait for a minimum of 10 minutes after completing the execution of the `./fcc-studio.sh` command, and run the `kubectl get pods -n <Namespace>` command.

   The pod details are displayed to indicate the status of the services. You can also check the logs of the FCC Studio services from the Kubernetes Dashboard.

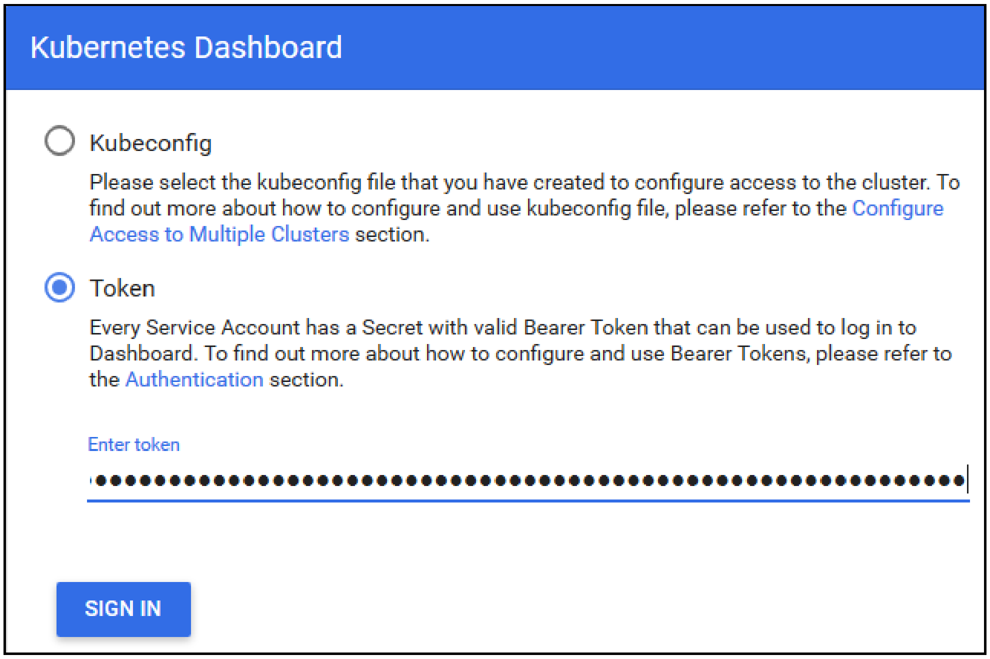
> **NOTE**
> - For FCC Studio deployed with OFSAA, ensure all the pods are ready before accessing the FCC Studio application.
> - For FCC Studio deployed with non-OFSAA, ensure the metaservice is up and running before accessing the FCC Studio application.
> - PGX Server pod does not start, until ETL process is completed.

6.1.1 Checking Logs of FCC Studio Services

The Kubernetes UI enables you to view the logs of the services installed as part of FCC Studio. To check the logs of the FCC Studio services from the Kubernetes dashboard, follow these steps:

1. Access the Kubernetes Dashboard. The Kubernetes Dashboard login page is displayed.

   Figure 12:Kubernetes Dashboard



Kubernetes Dashboard

○ Kubeconfig

Please select the kubeconfig file that you have created to configure access to the cluster. To find out more about how to configure and use kubeconfig file, please refer to the Configure Access to Multiple Clusters section.

● Token

Every Service Account has a Secret with valid Bearer Token that can be used to log in to Dashboard. To find out more about how to configure and use Bearer Tokens, please refer to the Authentication section.

Enter token

••

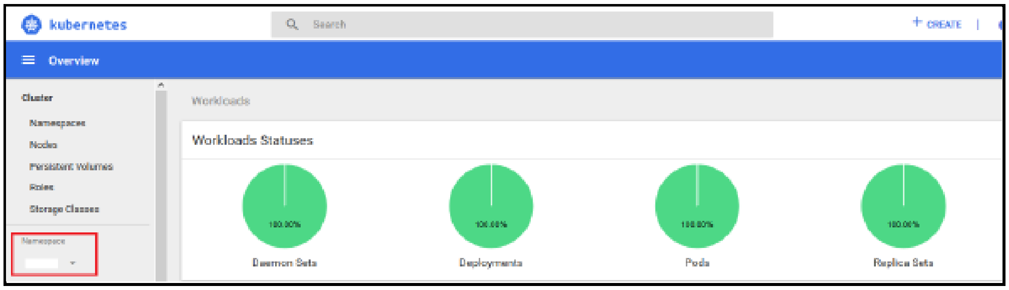
SIGN IN

2. Select **Token** and enter the Admin user secret token in the Enter Token field.

3. Click **SIGN IN**. The *Kubernetes Dashboard* page is displayed.

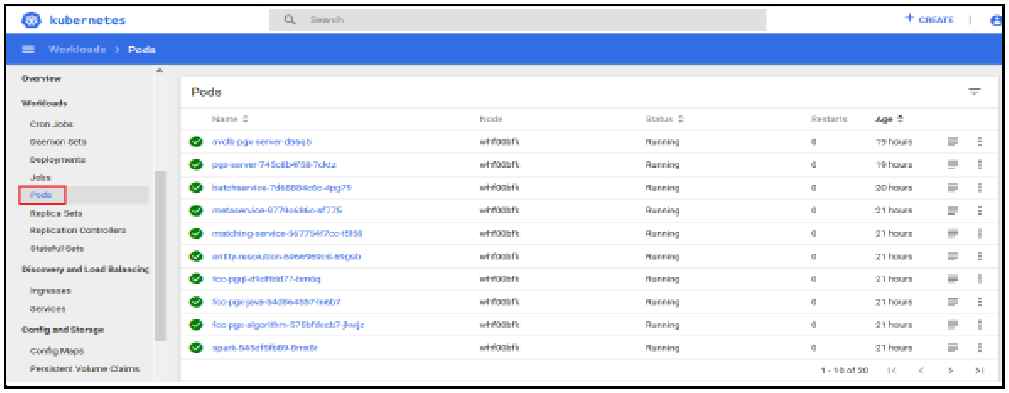
4. Select <Namespace> from the Namespace drop-down list on the menu items displayed on the LHS.

Figure 13:Kubernetes Dashboard Overview



5. Navigate to Workloads > Pods from the menu items displayed on the LHS. The *Pods* page is displayed with the details of all the services installed as part of the FCC Studio installation.

Figure 14:Kubernetes Dashboard Pods



Pods

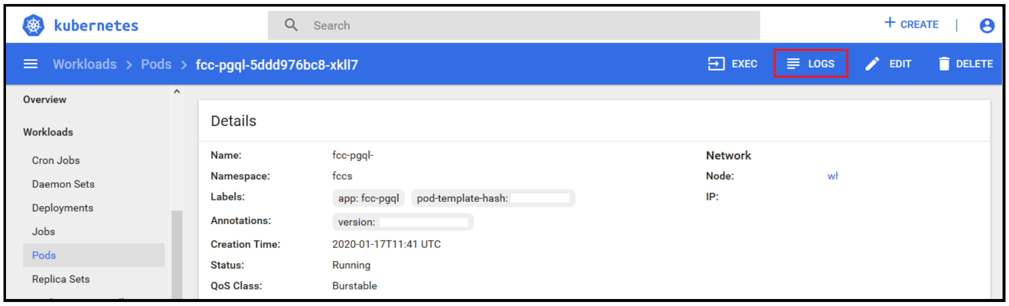
Name	Node	Status	Restarts	Age
avclb-pgx-server-d5bq5	whf00bfk	Running	0	19 hours
pgx-server-745c8b4f58-7ckdz	whf00bfk	Running	0	19 hours
batchservice-7d68884c6c-4pg79	whf00bfk	Running	0	20 hours
metaservice-6779c6f8c-sf776	whf00bfk	Running	0	21 hours
matching-service-567754f7cc-l5l58	whf00bfk	Running	0	21 hours
entity-resolution-6f6699d6d-s5gpb	whf00bfk	Running	0	21 hours
fcc-pgql-d9dffdd77-bmfq	whf00bfk	Running	0	21 hours
fcc-pgx-java-84d8b64587-lnnb7	whf00bfk	Running	0	21 hours
fcc-pgx-algorithm-575bfdccb7-jkwjz	whf00bfk	Running	0	21 hours
spark-545d15fb89-8rnd8	whf00bfk	Running	0	21 hours

1 - 10 of 20

6. Click the service name from the Name column. The service details are displayed.

7. Click the **Logs** tab.

Figure 15:Kubernetes Dashboard Logs



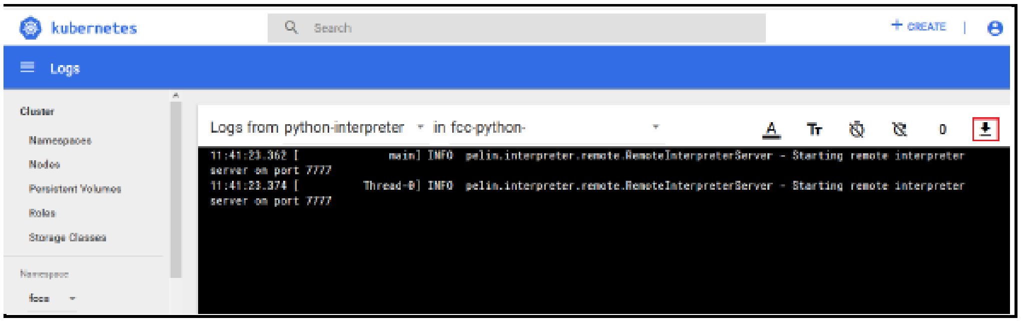
Details

Name: fcc-pgql-
Namespace: fccs
Labels: app: fcc-pgql pod-template-hash:
Annotations: version:
Creation Time: 2020-01-17T11:41 UTC
Status: Running
QoS Class: Burstable

Network
Node: wl
IP:

The service logs are displayed and you can download the logs by clicking Download Logs icon.

Figure 16:Sample Log



```
11:41:23.362 [            main] INFO  pelin.interpreter.remote.RemoteInterpreterServer - Starting remote interpreter
server on port 7777
11:41:23.374 [        Thread-0] INFO  pelin.interpreter.remote.RemoteInterpreterServer - Starting remote interpreter
server on port 7777
```

WARNING If you notice any errors in the log files, do not proceed further. Contact My Oracle Support (MOS) and provide the applicable error code and log files.

If the installation of FCC Studio is unsuccessful, you must reinstall the application after performing the cleanup tasks. For more information, see Reinstall FCC Studio.

6.2 Restart the PGX Service

You must restart the PGX service to ensure that graphs are created. To restart the PGX service, follow these steps:

> **NOTE** Restart the PGX service only after the `./FCCM_Studio_ETL_Graph.sh` graph job is run.

1. Navigate to the `<Studio_Installed_Path>/out` directory.
2. Start a new putty session and run the following commands:

```
kubectl -n fccs delete -f deployments/pgx-server.yml
kubectl -n fccs apply -f deployments/pgx-server.yml
```

6.3 Access the FCC Studio Application

To access FCC Studio, follow these steps:

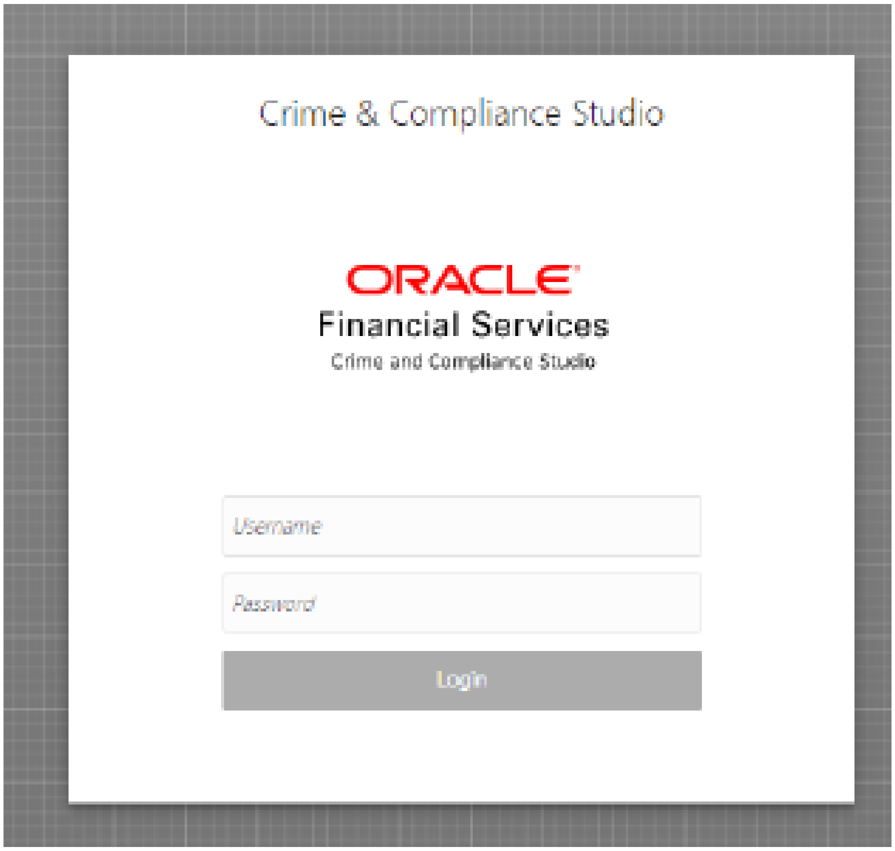
1. Enter the URL in the following format in the web browser:

   `https://<Host_Name>:<Port_Number>`

   Here `<Port_Number>` is 30078 for the FCC Studio application installed on-kubernetes.

   The FCC Studio application login page is displayed.

   Figure 17:FCC Studio Application Login Page



2. Enter the Username and Password.

3. Click Login.

   After you access the application, you can view the ready-to-use notebooks. To check if you have been assigned any roles, create a notebook. If you cannot create a notebook, contact My Oracle Support (MOS).

6.4 Configure Infer and Training API

If you want to use the INFER and Training API, you need to perform the following:

1. Install Python3
2. Install oracle instantclient(basic) latest version.(If required, login with root unzip in `/opt/oracle` directory give permissions.)
3. Install python3-devel, in case it does not exist.
4. Install numpy.
5. Install `namepackage whl package (pip3 install <wel package>)`. This is the python packages folder of fcc-studio

7 Upgrade

Follow these steps to upgrade an existing instance of FCC Studio:

1. Upgrade Scenarios
2. Upgrade Steps with OFSAA
3. Upgrade Steps without OFSAA
4. Configure the studio-env.yml File for Upgrade

You can upgrade an existing instance of FCC Studio as follows:

7.1 Upgrade Scenarios

This section provides information about Studio Upgrade. Following are the upgrade scenarios:

- **Upgrade FCC Studio from v8.0.8.0.0 onwards to v8.0.8.x**
  - **With OFSAA**.

> **NOTE** Here, ensure to provide the same BD database, Studio schema, Hive schema, wallet related information that you used during the installation of the existing instance FCC Studio.

  - **Without OFSAA.**

> **NOTE** Here, ensure to provide the same Studio schema and wallet related information that you used during the installation of the existing instance of FCC Studio.

For more information, about cleanup steps that is required for your upgrade, see Cleanup for Upgrade.

7.2 Upgrade Steps with OFSAA

The following table provides the steps to upgrade FCC Studio with OFSAA.

Table 16: Upgrade Steps with OFSAA

Sl. No.	Activity
Pre-installation Steps	

1	Download the installer kit.
Installation Steps	
1	Extract the installer kit.
2	Place files in the Installation Directories and Place files in wallet.
3	Generate an Encrypted Password
4	Generate the Public Key and Private Key
5	Generate the Key Store File for Secure Batch Service
6	Add the Batch Service (SSL) to PGX Trust Store
7	Configure the Preferred Services
8	Configure the studio-env.yml File
9	Verify the Resource Allocation for FCC Studio Services
10	Deploy FCC Studio on the K8s Cluster
11	Clean up activity if required.
Post-Installation Steps	
1	Verify the Installation
4	Access the FCC Studio Application
3	Upgrade (Replacing Batch service jar for ETL)
5	Perform the OFSAA Configuration for Batch Execution
6	Configure and Run Published Notebooks

7.3 Cleanup for Upgrade

For upgrade from **8.0.8.0.0** to **8.0.8.x**, if you are using **Spark**, **Py-Spark**, and **FCC ORE** interpreters, then you must delete all the entries from the following tables from **Studio Schema** and then **8.0.8.x** must be deployed.

Table Names as follows:

- **DS_INTERPRETER_ABILITIES**
- **DS_INTERPRETER_CREDENTIALS**
- **DS_INTERPRETER_PROPS**
- **DS_INTERPRETER_VARIANT**

Before you begin the upgrade process, perform the following cleanup steps:

NOTE You must delete the previous namespace, before upgrading.

1. Navigate to the `DATABASECHANGELOG` table in the Studio Schema.
2. Run the following SQL statements in the Studio Schema:

   ```
   select * from DatabaseChangeLog a where REGEXP_LIKE
   (a.id,'FCC_DATASTUDIO_CONFIG');
   ```

   ```
   select * from DatabaseChangeLog a where REGEXP_LIKE
   (a.id,'FCC_STUDIO_DATASTUDIO_CONFIG_808');
   ```

   The entries in the `DATABASECHANGELOG` table that match the criteria are displayed.
3. Delete all the entries generated as the result of above two SQL statements. The entries are as follows:

   ```
   FCC_DATASTUDIO_CONFIG_8.0.7.3.0
   FCC_DATASTUDIO_CONFIG_8.0.7
   FCC_DATASTUDIO_CONFIG_8.0.7.4.0
   FCC_STUDIO_DATASTUDIO_CONFIG_808
   ```

7.3.1 Start the FCC Studio Application

To start the FCC Studio application, follow these steps:

1. Navigate to the `<Studio_Installation_Path>/bin/` directory.
2. Run the following command:

   ```
   ./fcc-studio.sh --registry <registry URL>:<registry port>
   ```

   The FCC Studio application is restarted.

   Check the logs of the FCC Studio services from the Kubernetes Dashboard. For more information, see Checking Logs of FCC Studio Services.

   Once all the services are up and running, the FCC Studio application can be accessed using the following URL:

   `http://<HostName>:30078`

7.4 Upgrade Steps without OFSAA

The following table provides the steps to upgrade FCC Studio without OFSAA.

Table 17: Upgrade Steps without OFSAA

Sl. No.	Activity
Pre-installation Steps	

1	Download the installer kit.
Installation Steps	
1	Extract the installer kit.
2	Place files in the Installation Directories and Place files in wallet.
3	Generate an Encrypted Password
4	Generate the Public Key and Private Key
5	Generate the Key Store File for Secure Batch Service
6	Add the Batch Service (SSL) to PGX Trust Store
7	Configure the Preferred Services
8	Configure the studio-env.yml File
9	Verify the Resource Allocation for FCC Studio Services
10	Deploy FCC Studio on the K8s Cluster
Post-Installation Steps	
1	Verify the Installation
2	Access the FCC Studio Application
3	Upgrade (Replacing Batch service jar for ETL)

7.5 Configure the studio-env.yml File for Upgrade

Configure the `studio-env.yml` file to upgrade FCC Studio with OFSAA. For more information, see Configure the studio-env.yml File.

7.6 Post-Installation Steps for Upgrade

For upgrade from 80800 to 808x, perform the following steps:

1. Navigate to the `config.sh` and copy the `GRAPH_FILES_PATH` parameter's value.
2. Navigate to the path from the previous step in big data node.
3. Navigate to `jars` folder.
4. Remove older batchservice jar.
5. Navigate to the `<STUDIO>/ficdb/etlJars` directory.
6. Copy the batch service jar present in this directory into the big data node inside the folder `jars`.

8 Reinstall FCC Studio

If the installation of FCC Studio is unsuccessful, you must reinstall the application after performing the required cleanup tasks.

To reinstall FCC Studio, follow these steps:

1. Execute the following command to delete the namespace of FCC Studio:

   ```
   kubectl delete namespace <Namespace>
   ```

2. Navigate to the `<Studio_Installation_Path>` path and correct the parameters or files as suggested by the error.

3. Navigate to `<Studio_Installation_Path>/secrets` directory and re-enter the values of sensitive information in the `studio-env.yml` file. For example, `STUDIO_DB_PASSWORD, HADOOP_PASSWORD-ALIAS`, and so on.

4. Perform database clean up by performing the following:

Schema	Applicable for OFSAA	Applicable for non-OFSAA
Cleanup for Studio Schema	Yes	Yes
Cleanup for BD or ECM Atomic Schema	Yes	No
Cleanup for BD or ECM Config Schema	Yes	No

5. Redeploy FCC Studio. For more information, see Deploying FCC Studio on the K8s Cluster.

8.1 Cleanup for Studio Schema

To clean up the Studio schema, follow these steps:

1. Drop the existing Studio schema and create a new Studio schema.

   > **NOTE** The username and password credentials of the Studio Schema in the wallet files must be updated accordingly. (If applicable)

2. Grant the following permissions to the newly created Oracle Database Schema:

   - `GRANT create session TO <Schema User>;`

- `GRANT create table TO <Schema User>;`
- `GRANT create view TO <Schema User>;`
- `GRANT create any trigger TO <Schema User>;`
- `GRANT create any procedure TO <Schema User>;`
- `GRANT create sequence TO <Schema User>;`
- `GRANT execute on dbms_rls TO <Schema User>;`
- `GRANT execute on sys.dbms_session TO <Schema User>;`
- `ALTER USER <Schema User> QUOTA 100M ON users;`
- `GRANT create sequence TO <Schema User>;`
- `GRANT create SYNONYM TO <Schema User>;`
- `GRANT ALL privileges TO <Studio Schema User>;`

> **NOTE** If dropping the schema is not an option, drop the tables and sequences as mentioned in Appendix - Tables and Sequences.

8.2 Cleanup for BD or ECM Atomic Schema

To clean up the BD or ECM Atomic Schema, follow these steps:

1. Log in to the BD or ECM Atomic Schema.
2. Truncate the DATABASECHANGELOG and DATABASECHANGELOGLOCK tables using the following command:

```
TRUNCATE TABLE DATABASECHANGELOGLOCK;

TRUNCATE TABLE DATABASECHANGELOG;
```

8.3 Cleanup for BD or ECM Config Schema

To clean up the BD or ECM Config schema, follow these steps:

1. Log in to the BD or ECM Config Schema.
2. Truncate the DATABASECHANGELOG and DATABASECHANGELOGLOCK tables using the following command:

```
TRUNCATE TABLE DATABASECHANGELOGLOCK;

TRUNCATE TABLE DATABASECHANGELOG;
```

9 Appendix - Starting and Stopping Services

Following are the steps to start and stop the service and authservice files. Similar steps is applicable for other services.

9.1 Start a Service

To start a service, follow these steps:

1. Open the `<Studio_Installation_Path>/out/deploy.sh` file

   The `deploy.sh` file contains details of the commands to start the FCC Studio services.

2. Navigate to the `<Studio_Installation_Path>/out` directory.
3. Run the start command in the console to start a service:

   For example:

   ```
   kubectl -n <Namespace> apply -f deployments/authservice.yml
   ```

   You can check the logs of FCC Studio from the Kubernetes Dashboard.

9.2 Stop a Service

To stop a service, follow these steps:

1. Navigate to the <Studio_Installation_Path>/out directory.
2. Run the stop command in the console to stop service:

   For example:

   ```
   kubectl -n <Namespace> delete -f deployments/authservice.yml
   ```

10 Appendix A - Tables and Sequences

The list of tables and sequences to be dropped during reinstallation of FCC Studio are as follows:

- Studio Schema Tables
- Studio Schema Sequences

10.1 Studio Schema Tables

The following table lists the Studio Schema tables that must be dropped during reinstallation of FCC Studio.

DS_PARAGRAPH	DS_NOTEBOOK_TAGS	DS_TASK_RESULTS
DS_ENTITY_PERMISSIONS	DS_ROLE	DS_PERMISSION_ACTIONS
DS_GROUP	DS_IS_PERMITTED	DS_PERMISSION_MAPPING
DS_USER_PERMS_MAP	DS_USER_ROLES	DS_NOTEBOOK
DS_INTERPRETER_RESULT_MSGS	DS_USER	DS_PERMS_MAP_ACTIONS
DS_ENTITY_PERMS_MAP	DS_TASK	DS_GRAPH
DS_INTERPRETER_RESULT	DS_GROUP_PERMS_MAP	DS_NOTEBOOK_RELATIONS
DS_INTERPRETER_PROPS	DS_JOB	DS_PERMISSION
DS_ROLE_PERMS_MAP	DS_VISUALIZATION_TEMPLATE	DS_RESULT_MESSAGE

DS_INTERPRETER_ABILITIES	DATABASECHANGELOG	DATABASECHANGELOGLOCK
DS_USER_GROUPS	DS_INTERPRETER_VARIANT	DS_COMMENT
DS_PARAGRAPH_RELATIONS		

10.2 Studio Schema Sequences

The following table lists the Studio Schema sequences that must be dropped during reinstallation of FCC Studio.

SEQ_COMMENT	SEQ_ENTITY_PERMISSIONS	SEQ_GRAPH
SEQ_GROUP	SEQ_INTERPRETER_RESULT	SEQ_INTERPRETER_VARIANT
SEQ_JOB	SEQ_NOTEBOOK	SEQ_PARAGRAPH
SEQ_PERMISSION	SEQ_PERMISSION_MAPPING	SEQ_RESULT_MESSAGE
SEQ_ROLE	SEQ_TASK	SEQ_USER
SEQ_VISUALIZATION_TEMPLATE		

11 Appendix B - Using Python Virtual Environments with PySpark

To use Python Virtual Environments with PySpark, follow these steps:

1. Create a Virtual Environment with Conda
2. Include a Virtual Environment in the Init Container
3. Update the Interpreter Properties

11.1 Create a Virtual Environment with Conda

> **NOTE** You can also use `virtualenv` to create your virtual environment instead of `conda`.

To create a virtual environment with Conda, follow these steps:

1. Ensure that you have `conda` and `conda-pack` installed.
2. Create your virtual environment using the following command:

   ```
   conda create -y -n <environment-name> python=<python-version>
   <additional-packages>
   ```

   > **NOTE** The `<environment-name>` can be chosen freely and subsequently must be used in further commands.

3. Activate your virtual environment using the following command:

   ```
   conda activate <environment-name>
   ```

4. Execute the following command to obtain the path to your virtual environment:

   ```
   which python
   ```

   The obtained result is referred to as `<environment-abs-path>`

5. Compress your virtual environment using the following command:

   ```
   conda pack -n <environment-name> -o <environment-abs-
   path>/<environment-name>.tar.gz
   ```

11.2 Include a Virtual Environment in the Init Container

To include the virtual environment in the Init container, you must place the Virtual Environment in the same path as the Spark libraries. For information on how to create a new Init container, see Yarn Mode.

11.3 Update the Interpreter Properties

All the properties can either be configured in the interpreter JSON files or from the Interpreters page of the FCC Studio application UI after starting the FCC Studio application.

- In the Spark Interpreter Settings page of the FCC Studio application UI (or `spark.json` file), change the following values:
- Change the value of the `spark.yarn.dist.archives` property to `/var/olds-spark-interpreter/interpreter/spark/libs/<environment-name>/<environment-name>.tar.gz#<environment-name>`
- Change the value of the `spark.pyspark.python` property to `./<environment-name>/bin/python`
- In the PySpark Interpreter Settings page of the FCC Studio application UI (or `pyspark.json` file), change the value of the `zeppelin.pyspark.python` property to `/var/olds-spark-interpreter/interpreter/spark/libs/<environment-name>/bin/python.`

12 Appendix C – Additional Jars – PGX

PGX-Server doesn't include Hadoop-client for reading graph from HDFS. This section can be skipped if the deployer intend to use only ready to use sample-graph or PGX server without ETL.

When deploying Studio, you must obtain the following libraries. These libraries can be obtained from your existing big data cluster or from the internet. The following list of jars are for **Hadoop-client 3.0.0-cdh6.3.0**. These libraries are referred as '**hdfs-libs'**.

> **NOTE** The following Jar files for your reference. you can use the similar **hdfs-libs** jars based on your Big Data cluster.

List of libraries required are as follows:

accessors-smart-1.2.jar	jaxb-api-2.2.11.jar
aopalliance-1.0.jar	jaxb-impl-2.2.3-1.jar
asm-5.0.4.jar	jcip-annotations-1.0-1.jar
avro-1.8.2-cdh6.3.1.jar	jersey-client-1.19.jar
commons-beanutils-1.9.4.jar	jersey-core-1.19.jar
commons-cli-1.2.jar	jersey-guice-1.19.jar
commons-codec-1.11.jar	jersey-json-1.19.jar
commons-collections-3.2.2.jar	jersey-server-1.19.jar
commons-compress-1.18.jar	jersey-servlet-1.19.jar
commons-configuration2-2.1.1.jar	jettison-1.1.jar
commons-io-2.6.jar	jetty-security-9.3.25.v20180904.jar
commons-lang-2.6.jar	jetty-servlet-9.3.25.v20180904.jar
commons-lang3-3.7.jar	jetty-util-9.3.25.v20180904.jar
commons-logging-1.2.jar	jetty-webapp-9.3.25.v20180904.jar
commons-math3-3.1.1.jar	jetty-xml-9.3.25.v20180904.jar
commons-net-3.1.jar	jline-0.9.94.jar
curator-client-2.12.0.jar	json-smart-2.3.jar
curator-framework-2.12.0.jar	jsp-api-2.1.jar
curator-recipes-2.12.0.jar	jsr305-3.0.0.jar
gson-2.2.4.jar	jsr311-api-1.1.1.jar
guava-16.0.1.jar	kerb-admin-1.0.0.jar
guice-4.0.jar	kerb-client-1.0.0.jar
hadoop-annotations-3.0.0-cdh6.3.1.jar	kerb-common-1.0.0.jar
hadoop-auth-3.0.0-cdh6.3.1.jar	kerb-core-1.0.0.jar
hadoop-client-3.0.0-cdh6.3.1.jar	kerb-crypto-1.0.0.jar
hadoop-common-3.0.0-cdh6.3.1.jar	kerb-identity-1.0.0.jar
hadoop-hdfs-client-3.0.0-cdh6.3.1.jar	kerb-server-1.0.0.jar
hadoop-mapreduce-client-common-3.0.0-cdh6.3.1.jar	kerb-simplekdc-1.0.0.jar

hadoop-mapreduce-client-core-3.0.0-cdh6.3.1.jar	kerb-util-1.0.0.jar
hadoop-mapreduce-client-jobclient-3.0.0-cdh6.3.1.jar	kerby-asn1-1.0.0.jar
hadoop-yarn-api-3.0.0-cdh6.3.1.jar	kerby-config-1.0.0.jar
hadoop-yarn-client-3.0.0-cdh6.3.1.jar	kerby-pkix-1.0.0.jar
hadoop-yarn-common-3.0.0-cdh6.3.1.jar	kerby-util-1.0.0.jar
htrace-core4-4.1.0-incubating.jar	kerby-xdr-1.0.0.jar
httpclient-4.5.3.jar	log4j-1.2.17.jar
httpcore-4.4.6.jar	netty-3.7.0.Final.jar
jackson-annotations-2.9.9.jar	nimbus-jose-jwt-4.41.1.jar
jackson-core-2.9.9.jar	okhttp-2.7.5.jar
jackson-core-asl-1.9.13.jar	okio-1.6.0.jar
jackson-databind-2.9.9.3.jar	paranamer-2.8.jar
jackson-jaxrs-1.9.2.jar	protobuf-java-2.5.0.jar
jackson-jaxrs-base-2.9.9.jar	re2j-1.1.jar
jackson-jaxrs-json-provider-2.9.9.jar	slf4j-api-1.7.25.jar
jackson-mapper-asl-1.9.13-cloudera.1.jar	slf4j-log4j12-1.7.25.jar
jackson-module-jaxb-annotations-2.9.9.jar	snappy-java-1.1.4.jar
jackson-xc-1.9.2.jar	stax2-api-3.1.4.jar
javax.activation-api-1.2.0.jar	woodstox-core-5.0.3.jar
javax.inject-1.jar	xz-1.6.jar
javax.servlet-api-3.1.0.jar	zookeeper-3.4.8.jar

13 Appendix D – Additional Jars – Batch Service

When deploying Studio, you must obtain the following files for Batch Service.

NOTE The following Jar files for your reference. you can use the similar **hdfs-libs** jars based on your Big Data cluster.

List of files required are as follows:

accessors-smart-1.2.jar	jersey-server-1.19.jar
activation-1.1.jar	jersey-servlet-1.19.jar
asm-5.0.4.jar	jettison-1.1.jar
avro-1.8.2-cdh6.3.1.jar	jetty-http-9.3.25.v20180904.jar
commons-beanutils-1.9.4.jar	jetty-io-9.3.25.v20180904.jar
commons-cli-1.2.jar	jetty-security-9.3.25.v20180904.jar
commons-codec-1.11.jar	jetty-server-9.3.25.v20180904.jar
commons-collections-3.2.2.jar	jetty-servlet-9.3.25.v20180904.jar
commons-compress-1.18.jar	jetty-util-9.3.25.v20180904.jar
commons-configuration2-2.1.1.jar	jetty-webapp-9.3.25.v20180904.jar
commons-io-2.6.jar	jetty-xml-9.3.25.v20180904.jar
commons-lang-2.6.jar	jline-0.9.94.jar
commons-lang3-3.7.jar	jsch-0.1.54.jar
commons-logging-1.2.jar	json-smart-2.3.jar
commons-math3-3.1.1.jar	jsp-api-2.1.jar
commons-net-3.1.jar	jsr305-3.0.0.jar
curator-client-2.12.0.jar	jsr311-api-1.1.1.jar
curator-framework-2.12.0.jar	kerb-admin-1.0.0.jar
curator-recipes-2.12.0.jar	kerb-client-1.0.0.jar
gson-2.2.4.jar	kerb-common-1.0.0.jar
guava-16.0.1.jar	kerb-core-1.0.0.jar
hadoop-annotations-3.0.0-cdh6.3.1.jar	kerb-crypto-1.0.0.jar
hadoop-auth-3.0.0-cdh6.3.1.jar	kerb-identity-1.0.0.jar
hadoop-common-3.0.0-cdh6.3.1.jar	kerb-server-1.0.0.jar
hive-exec-1.1.0-cdh5.13.0.jar	kerb-simplekdc-1.0.0.jar
HiveJDBC4.jar	kerb-util-1.0.0.jar
hive-metastore-1.1.0-cdh5.13.0.jar	kerby-asn1-1.0.0.jar
hive-service-1.1.0-cdh5.13.0.jar	kerby-config-1.0.0.jar
htrace-core4-4.1.0-incubating.jar	kerby-pkix-1.0.0.jar
httpclient-4.5.3.jar	kerby-util-1.0.0.jar
httpcore-4.4.6.jar	kerby-xdr-1.0.0.jar
jackson-annotations-2.9.0.jar	log4j-1.2.17.jar

jackson-core-2.9.9.jar	netty-3.7.0.Final.jar
jackson-core-asl-1.9.13.jar	nimbus-jose-jwt-4.41.1.jar
jackson-databind-2.9.9.3.jar	paranamer-2.8.jar
jackson-jaxrs-1.9.2.jar	protobuf-java-2.5.0.jar
jackson-mapper-asl-1.9.13-cloudera.1.jar	re2j-1.1.jar
jackson-xc-1.9.2.jar	slf4j-api-1.7.25.jar
javax.activation-api-1.2.0.jar	slf4j-log4j12-1.7.25.jar
javax.servlet-api-3.1.0.jar	snappy-java-1.1.4.jar
jaxb-api-2.2.2.jar	stax2-api-3.1.4.jar
jaxb-impl-2.2.3-1.jar	stax-api-1.0-2.jar
jcip-annotations-1.0-1.jar	woodstox-core-5.0.3.jar
jersey-core-1.19.jar	xz-1.6.jar
jersey-json-1.19.jar	zookeeper-3.4.8.jar

14 Frequently Asked Questions (FAQs)

The FCC Studio installer performs all the pre-requisite validation checks during installation. The questions below help you resolve some issues that you may face during installation.

> **NOTE** This is not an official support document and just attempts to share the knowledge of problem resolution to a few of the known issues. If your issue is not resolved after performing the proposed solution, contact My Oracle Support (MOS).

1. **Why does my console show an unsuccessful message during wallet creation?**

   Please check if you have run the following commands correctly. For more information on wallet creation, see Setup_Password_Stores_with_Oracle_Wallet.

   a. `mkstore -wrl <wallet_location> -create` //creates a wallet in the specified location

   b. `mkstore -wrl <wallet_location> -createCredential <alias-name> <database-user-name>` //creates an alias in the studio schema

   c. `mkstore -wrl <wallet_location> -createCredential <alias-name> <database-user-name>` //creates an alias in the atomic schema

   d. `mkstore -wrl <wallet_location> -createCredential <alias-name> <database-user-name>` //creates an alias in the config schema

2. **Where can I find my created wallet?**

   Your wallet will be in the directory you have set as your wallet location.

3. **Can I run `./install.sh` again if I make updates to the `studio-env.yml` file?**

   Make updates to the `studio-env.yml` file and then trigger the installation by running the `./install.sh` command. If you have already triggered the installation, then you must do the following. For more information on the attributes you can configure, see Configure the studio-env.yml File.

   - Perform a backup of the `studio-env.yml` file.
   - Update the applicable attributes in the `studio-env.yml` file.
   - run `./install.sh`
   - run `./fcc-studio.sh`.

4. **When should I create a Database link, and if yes, how do I do it?**

   Create a Database link to connect the Atomic and Config database schemas to the Studio database schema if the databases are different . You must create the link in the Studio database.

   In the following example, a link has been created from the config schema to the atomic schema by running the following script:

   ```
   create public database link <studio database link>
   ```

```
connect to <Config Schema>

identified by password

using ' (DESCRIPTION = ADDRESS_LIST = (ADDRESS = (PROTOCOL = TCP) (HOST
=<host name> (PORT = <port number>)) (CONNECT_DATA = (SERVICE_NAME =
<service name>))) ';


Config schema : <Config Schema>/password

' (DESCRIPTION = ADDRESS_LIST = (ADDRESS = (PROTOCOL = TCP) (HOST
=<host name> (PORT = <port number>)) (CONNECT_DATA = (SERVICE_NAME =
<service name>))) ';
```

After running the script, run the FCDM connector and ICIJ connector jobs.

5. **Why does my installed studio setup not have any notebooks?**

   There are some default notebooks that are ready-to-use when you install FCC Studio. If you do not see any notebooks when you log in to the application, you may not be assigned any roles. Check the `<Studio_Installation_Path>/logs` directory to see if you have been assigned any roles, and if not, contact your administrator.

6. **What can I do if the schema creation fails?**

   If the Atomic schema creation fails, login to the BD and ECM Atomic schemas and run the following query:

```
select * from fcc_orahive_datatypemapping;
```

   The `fcc_orahive_datatypemapping` table must not have duplicate data types.

   I**f the Studio schema creation fails, l**ogin as a Studio user and run the following query:

```
select * from fcc_datastudio_schemaobjects
```

   Run the following query to replace all `Y` values with '':

```
update fcc_datastudio_schemaobjects set SCHEMA_OBJ_GENERATED=''
```

   After the schema creation is successful, the value of the `SCHEMA_OBJ_GENERATED` attribute changes to **Y**.

   You can also check for any errors in the applicable log file in the `<Studio_Installation_Path>/logs` directory.

7. **Why is the sqoop job not successful?**

   The Sqoop job may fail if some of the applicable values are null, or if the service name or SID value is not provided. Do one of the following:

   - Check if there are any null values for the applicable configurations in the `config.sh` and `FCC_DATASTUDIO_CONFIG` tables. If there are any null values, add the required value.
   - Check for any errors in the applicable log file in the `<Studio_Installation_Path>/logs` directory.

8. **Why am I getting the following error when I run the sqoop job?**

```
Error: Could not find or load main class
com.oracle.ofss.fccm.studio.batchclient
                                                     .client.BatchEx
ecute
```

Set the `FIC_DB_HOME` path in the `<Studio_Installation_Path>/ficdb` directory.

You can also check for any errors in the applicable log file in the `<Studio_Installation_Path>/logs` directory.

9. **Why is the PGX Server not starting?**

   The PGX server starts only after the FCDM tables are created, that is, after the FCDM connector job is run. Check if all FCDM tables are created and then start the PGX server. You can also check for any errors in the applicable log file in the `<Installed path>/logs` directory.

10. **Why is the ICIJ connector job failing?**

    This can happen because of a missing csv file path in the FCC_STUDIO_ETL_FILES table. Add the CSV file path. You can also check for any errors in the applicable log file in the <Installed path>/logs directory.

    .

OFSAA Support

Raise a Service Request (SR) in My Oracle Support (MOS) for queries related to the OFSAA applications.

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