

Oracle Financial Services Model Management and Governance

User Guide

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Financial Services

OFS Model Management and Governance User Guide

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1 Preface

This preface provides information for the Oracle Financial Services Model Management and Governance application (OFS MMG) User Guide.

1.1 Access to Oracle Support

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

1.2 Audience

This document is intended for the system administrators and users configuring the workspace and models in OFS MMG.

1.3 What is New in This Release

1. Workspace

- Workspace Population: Populate a subset of selected tables
- Simple Expression Builder provided for SQL Filters in the Workspace Population screen
- Added escape-delimiter-character parameter in File Data Store
- Data Population filters support custom and system runtime parameters
- Ability to use Import Archive and Templates to update Data Source schema without changing the selected database objects

2. UI/UX Enhancements

- Sidebar menu replaced with the all new Mega menu
- Data Studio menu options moved out from workspaces to the global menu
- Improved UI messages and logging
- Standardized layouts and controls on all screens
- UI/UX improvements in line with Redwood design

3. Model Pipelines

- New split Pipeline Builder UI for easier interaction with canvas and node configurations simultaneously
- New widgets for Feature Engineering, Model Training, and Stream Analytics
- Ability to create sub-pipeline containers
- Stitch already published Model Pipelines into a composite Pipeline

- Support for all kinds of dynamic forms like Data Picker and Sliders, in Parameter Sets and executions UIs
 - Automatic cleanup of “dummy node” or non-existence paragraphs in Pipeline
 - Support of Bulk edit of Parameters Set values
 - You can now customize number of approval and escalation levels
 - Integration of Model Deployment workflow with Notifications
 - Ability to view Pipeline or Notebook by default when a Model is opened in Sandbox. This is via a service level configuration
 - Breadcrumbs added to the Pipeline Details screen
 - Switch to different versions within the Canvas screen
 - API Registry access allowed from Model Pipelines screen
 - Introduction of new screen for the Deployment Workflow
 - Option to show Executed Only paragraphs introduced in Outputs/Compare of Pipeline Execution History
 - Option to attach Conda and Parameter Set dependencies from the Publish model screen
 - When adding a new paragraph, application automatically inherit the previous/ incoming paragraph's link type
- 4. Identity Management**
- JIT sync of username/email ID
- 5. Graphs**
- Out-of-the-box graphs analysis notebooks supported. Additionally, you can now create and manage notebooks for analyzing graphs directly from the Graphs details screen.
 - PGX upgraded to 23.4.3 version
 - Enhanced Data pipeline interface
 - Reset Graph metadata utility resets all metadata related to a particular graph ID
- 6. Model Catalog**
- Model builder optionally generates model evaluation metrics
 - Model builder supports scoring of external model
 - Ability to upload Model to the server from the client system
 - Access Model Catalog from Model Pipeline Details screen
 - Model Technique/Library – Support to Multi-line for all the Signatures
- 7. Kafka Support**
- Automatic discovery and listing of Topics in the registered Kafka clusters
 - New overview screen to see sample records and other details of a Topic
- 8. Datasets**

- New overview screen to view features, profile metrics, and sample records at a glance
- New data visualization and feature maintenance screen introduced
- Ability to download sample records of datasets in CSV format
- Create New Feature option to import any custom Python library introduced
- One-click Data Drift configuration by pre-filling all necessary fields enabled
- Support for attaching Conda environment during Dataset creation
- Ability to update Data elements with different Data sources and their database objects provided

9. Data Studio

- Data Studio upgraded to 23.4.3 version

10. Data Pipeline

- Data pipelines are now available as Standalone. With this enhancement, you can:
 - Define a Standalone pipeline to move data from one data source to the configured/mapped target data source
 - Create and manage data pipelines for efficient data flow and processing.

To execute this pipeline, you must create a batch/task with component as DATA_PIPELINE in the Scheduler Service component.

For more details, see *MMG User Guide*.

11. General

- By default, a Sample Workspace has been added which provides a demo view of the MMG concepts/features.

For more details, see *MMG User Guide*.

1.4 Additional Resources

This section identifies additional resources for the OFS MMG Application Pack. You can access the online documentation for the OFS MMG 8.1.2.4.0 from the [Oracle Help Center \(OHC\)](#).

- OFS Model Management and Governance Release Notes
- OFS Model Management and Governance Installation Guide

To find additional information about how Oracle Financial Services solves real business problems, see our website at www.oracle.com/financialservices.

1.5 Conventions Used

The following table lists the conventions used in this guide.

Table 1: Conventions Used in this Guide

Convention	Meaning
<i>Italics</i>	<ul style="list-style-type: none"> Names of books, chapters, and sections as references Emphasis
Bold	<ul style="list-style-type: none"> The object of an action (menu names, field names, options, button names) in a step-by-step procedure Commands typed at a prompt User input
Monospace	<ul style="list-style-type: none"> Directories and subdirectories File names and extensions Process names Code sample, including keywords and variables within the text and as separate paragraphs, and user-defined program elements within the text
Hyperlink	Hyperlink type indicates the links to external websites, internal document links to sections.

1.6 Acronyms Used

The following table lists the acronyms used in this guide.

Table 2: Acronyms Used in this Guide

Conventions	Description
BA	Business Analysts
Infodom	Information Domain
Navigation Tree Menu or Navigation Menu	Left-hand side menu
OFS AAI	Oracle Financial Services Analytical Application Infrastructure
OFSAA	Oracle Financial Services Analytical Applications
OFS MMG	Oracle Financial Services Model Management and Governance
Production Workspace	Production Information Domain
Sandbox Workspace	Sandbox Information Domain
SA	System Administrator
URL	Uniform Resource Locator
UI	User Interface
PGX	Parallel Graph AnalytiX

2 Getting Started

This section gives an introduction to OFS Model Management and Governance and the requirements to use the application.

2.1 About this Guide

This guide has information about configuring and publishing workspaces using the OFS Model Management and Governance (MMG) application. The further sections in this guide provide information for the creation and deployment of models into production. Use it for information about workspace and model management or help with the processes in the application.

2.2 About Oracle Financial Services Model Management and Governance

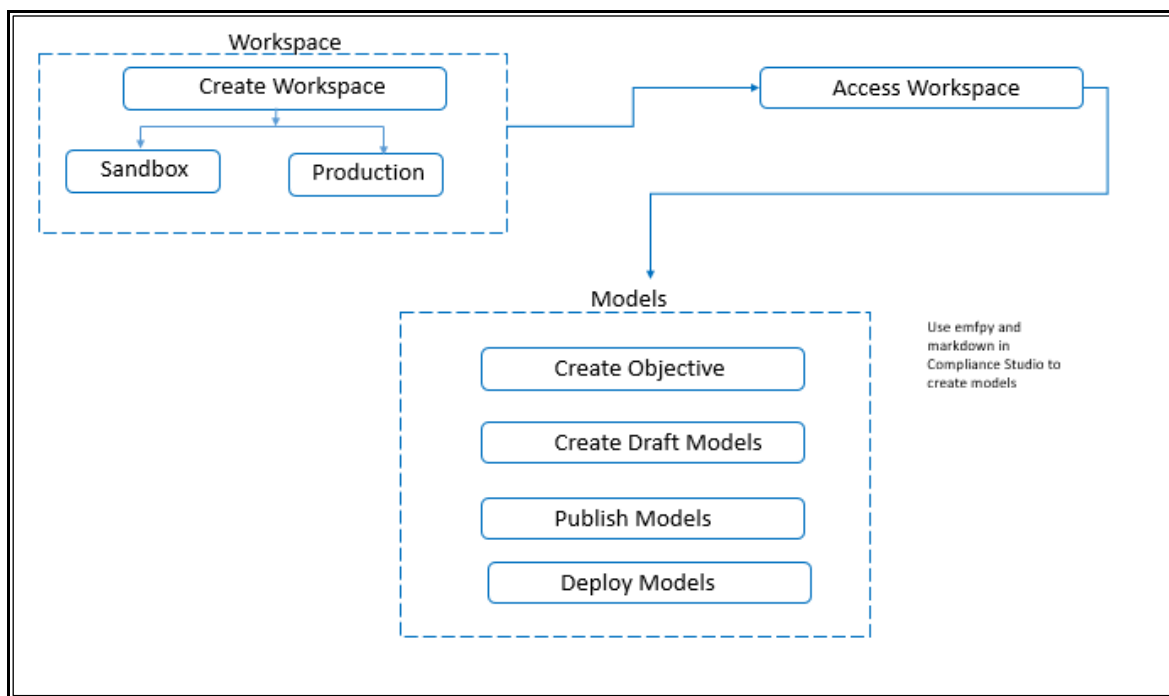
Financial institutions require models that work on traditional statistical techniques, modern machine-learning methods, computational and simulation models. Oracle Financial Services Model Management and Governance leverage the Data Studio environment to develop, deploy, and manage models at the enterprise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

The OFS Model Management and Governance application enables institutions to implement their IT policies while providing flexibility and freedom that Data Scientists and Statistical Modelers desire. OFS MMG's design facilitates financial institutions to manage external regulatory and internal governance policies by building testing models in a workspace environment. A workspace is provisioned and authorized for use (usually by an administrator) before making it available to modelers. Administrative users grant analysts and modelers access to workspaces along with a subset of production data to build models. Validated and approved models can then be promoted from workspaces to the enterprise model repository. Models in the repository can then be woven into analytical application flows crafted by mixing data management tasks, model execution, and deterministic business logic.

2.3 Workflow

The workflow involves the creation of workspaces and the creation of Models mapped to the Workspaces. Models are then configured as training models that you can use to perform model visualizations and test for the outcomes. You can then publish a model into production and make it available to users after you have determined that the models and the parameters used to construct the models meet the requirements of your business logic.

Figure 1: Oracle Financial Services Model Management and Governance Workflow



2.4 Components

The following are the components of Oracle Financial Services Model Management and Governance application:

- Workspace Management
- Model Management
- Dataset
- Model Pipelines
- Model Actions
- Graphs
- Scheduler Service
- Audit Trail
- Data Studio Options
- Object Migration
- Model Training

2.4.1 Workspaces

Workspace Management is where the workspace Administrators define datasets and make them available to modelers in Oracle Financial Services Model Management and Governance. It is an environment where the data is prepared for modelers to use in their modeling creation activity.

Workspaces are provisioned with the data required for modeling by administrators, who configure workspaces with subsets of production data. The data in the workspace is made available to modelers using datasets, who then build models. In effect, the data is ready for the modelers, and they do not have to undergo the arduous task of accessing and querying the database. See the [Using Workspaces](#) section for information on how to use Workspace Management in the application.

2.4.2 Datasets

Datasets allow for the creation of a dataframe, a data structure that captures the logic that organizes data into a 2-dimensional table of rows and columns. Datasets allow for the reuse of these dataframes across models, as well as the features derived from the data source(s).

The Dataset allows you to manage the entire operation related to data set. You can perform the following two things using the Dataset window:

- Define a metadata on how you want to create a dataset
- In addition, a mechanism where you can take a snapshot of real time data and store it. So, it can be used later in the pipeline.

For more information, see the [Dataset](#) section.

2.4.3 Model Pipelines

Modeling refers to the process of designing a prototype based on a structured data model, for statistical analysis and to simulate real events and processes. Models in a workspace can be created or modified by a user with access to the workspace. Model versions are preserved in the workspace along with execution and output histories. Once a model has been validated in the workspace and considered fit for use, modelers can request to push the model into the production environment.

See the [Using Model Pipeline](#) section to create models from pre-defined models to predict business trends and validate the existing models.

2.4.4 Model Actions

The Model Actions window allows you to view the list of models for which the Workflow action has been taken which requires review or approve across the workspace.

For more information, see the [Model Actions](#) section.

2.4.5 Graphs

Unlike traditional relational database management systems, the Graph Pipeline feature allows you to view the data relationships in a graphical format.

This feature uses the latest technology to harness the power of Graph Analytics to give Financial Institutions the ability to monitor the data financial institutions effectively. The data is organized as nodes, relationships, and properties (property data is stored on the nodes or relationships). The results of analytics algorithms are stored as transient properties of nodes and edges in the Graph.

For more information, see the [Graph Pipeline](#) section.

2.4.6 Scheduler Service

The Scheduler Service is a service in the Infrastructure system that automates behind-the-scenes work that is necessary to sustain various enterprise applications and functionalities. This automation helps the applications to control unattended background jobs program execution.

The Scheduler Service contains a graphical user interface and a single point of control for the definition and monitoring of background executions.

For more information, see the [Scheduler Service](#) section.

2.4.7 Audit Trail

The Audit Trail window provides the complete details of model. This shows the information such as, when Model was created, who created the Model, workflow of Model, for example when this Model became champion or deployed, and so on.

For more information, see the [Audit Trail](#) section.

2.4.8 Data Studio Options

MMG contains an underlying Notebook Server which has the following configurable options:

- Interpreters
- Tasks
- Permissions
- Credentials
- Templates

For more information, see the [Data Studio Options](#) section.

2.4.9 Object Migration

Object Migration is the process of migrating or moving objects between environments.

You may want to migrate objects for several reasons such as managing global deployments on multiple environments or creating multiple environments so that you can separate the development, testing, and production processes.

For more information, see the [Object Migration](#) section.

2.4.10 Model Libraries

The Model Library information is used to bind a particular technique and its details to one unique Model Library. The Starting point for the Model builder is to register a model library with MMG application after it is properly set up in the python environment to be used.

2.4.11 Model Techniques

Model Technique is the algorithm/technique used to create python model using the library/package which was created in the Model Library Screen. It is the actual information captured in the MMG application that helps in training the model (Upload and Build).

2.4.12 Model Catalog

The Model Catalog page allows you to add and manage the Model Technique, Model Library, and Model Objectives. You can either import the models from external sources or create, train and label it as champion model.

2.5 Manage User Groups

Users must be mapped to User Groups that are mapped to access OFS MMG. The following subsections provide information about the user groups and roles required in addition to the information about configuring the user groups.

2.5.1 User Groups

The following table gives details about the User Groups in the Oracle Financial Services Model Management and Governance application.

Table 3: User Groups

User Group Name	User Group Description
IDNTYADMN	Identity Administrator group
IDNTYAUTH	Identity Authorizer group
MDLREV	The Modeling Reviewer Group. Users mapped to this group have access to the menu items in the OFS MMG application that are related to model review activities.
MDLAPPR	The Modeling Approver Group. Users mapped to this group have the rights to approve models created by the users.
MDLBATCHUSR	The Modeling Batch User. Scheduler can use this Group for executing batches.
WKSPADMIN	The Workspace Administrator Group. Users mapped to this group have access to create and populate workspaces. For viewing the MMG landing page this group is required.
MDLUSR	The Modeling User Group. Users mapped to this group have access to all the menu items in the OFS MMG application that is related to model creation.
DSUSRGRP	Data Studio User Group This User Group provide access to modify Interpreter configurations.
DSREDACTGRP	Roles for applying redaction in graph. This group will be applicable to only those users for whom graph redaction is required.

User Group Name	User Group Description
OBJMIGADMIN	Users mapped to this group have access to Object Migration links and UI to perform import or export of objects.
GRPADMIN	The Graph Administrator Group. Users mapped to this group have access to all the menu items in the OFS MMG Application related to graph and Pipeline/Refresh graphs related health services.
GRPUSR	The Graph User Group. Users mapped to this group have access to all the menu items in the OFS MMG Application related to graph and Pipeline/Refresh graphs related health services.

NOTE

At the first-time login, User Group mappings are initialized from AAI/IDCS for the newly provisioned users. These will be reflected in MMG Admin Console in next MMG login.

If User Group mappings are deleted in AAI/IDCS, it would not delete in MMG Admin Console. Admin needs to delete this in MMG Identity screens too.

Only the group with MDLSUMM role will be displayed in the Workspace provisioning steps.

MDLSUMM function is mapped to the MDLACCESS role.

2.5.2 Role Mapping

Map the user groups in the application to the roles in the following table to enable access to the OFS MMG application.

Table 4: User Group to Role Mapping

Group Name	Role Name
DSREDACTGRP	DSREDACT
IDNTYADMN	Batch Advance Role
IDNTYADMN	Batch Write Role
IDNTYADMN	Admin Link Role
IDNTYADMN	User Advanced Role
IDNTYADMN	Group Advanced Role
IDNTYADMN	Role Advanced Role
IDNTYADMN	Function Advanced Role
IDNTYAUTH	Group Authorize Role
IDNTYAUTH	User Authorize Role
IDNTYAUTH	Group Read Role
IDNTYAUTH	Admin Link Role
IDNTYAUTH	Function Read Role

Group Name	Role Name
IDNTYAUTH	Role Read Role
IDNTYAUTH	Role Authorize Role
MDLAPPR	DSINTER
MDLAPPR	Model Authorize
MDLAPPR	Model Deployment
MDLAPPR	Workspace Read
MDLAPPR	Model Read
MDLAPPR	Model Access
MDLAPPR	Workspace Access
MDLAPPR	DSAPPROVER
MDLBATCHUSR	DSBATCH
MDLREV	Workspace Read
MDLREV	Model Review
MDLREV	Model Access
MDLREV	Workspace Access
MDLREV	DSUSER
MDLREV	Model Read
MDLUSR	Model Advanced
MDLUSR	Model Write
MDLUSR	Model Read
MDLUSR	Batch Advance Role
MDLUSR	Model Execute
MDLUSR	DSUSER
MDLUSR	Model Access
MDLUSR	Workspace Access
MDLUSR	Workspace Read
MDLUSR	Datasource Access
MDLUSR	Datasource Write
MDLUSR	Datasource Read
WKSPADMIN	Workspace Access
WKSPADMIN	DSADMIN
WKSPADMIN	Identity MGMT advanced
WKSPADMIN	Workspace Authorize

Group Name	Role Name
WKSPADMIN	Workspace Read
WKSPADMIN	Workspace Write
DSUSRGRP	DSADMIN
GRAPHUSER	Graph Administrator
GRAPHUSER	Graph Read Role
GRAPHUSER	Graph Read Role
GRAPHUSER	Graph Execute Role
GRAPHADMINISTRATOR	Graph Administrator Role

2.5.3 Function-Role Matrix For Conda CRUD operations

The following table provides details about the Functions and Roles required to perform CRUD operations for Conda in the Oracle Financial Services Model Management and Governance application.

For more information, see the [Conda Environments](#) section.

Table 5: Functions and Roles

Function	Role	Groups Mapped	Access
CONDAENVSUMM	CONDAENVACCESS	<ul style="list-style-type: none"> MDLUSR MDLREV MDLAPPR 	Summary view
CONDAENVVIEW	CONDAENVREAD	<ul style="list-style-type: none"> MDLUSR MDLREV MDLAPPR 	Read
CONDAENVEXP	CONDAENVREAD	<ul style="list-style-type: none"> MDLUSR MDLREV MDLAPPR 	Export yml file
CONDAENVEXP	CONDAENVWRITE	<ul style="list-style-type: none"> MDLREV MDLAPPR 	Export yml file
CONDAENVDEL	CONDAENVWRITE	<ul style="list-style-type: none"> MDLREV MDLAPPR 	Delete a registered Conda environment
CONDAENVEDIT	CONDAENVWRITE	<ul style="list-style-type: none"> MDLREV MDLAPPR 	Edit a Conda environment
CONDAENVADD	CONDAENVWRITE	<ul style="list-style-type: none"> MDLREV MDLAPPR 	Add a Conda environment

2.6 Sign in

After the application is installed and configured, you can access the Oracle Financial Services Model Management and Governance (MMG) application.

To access MMG:

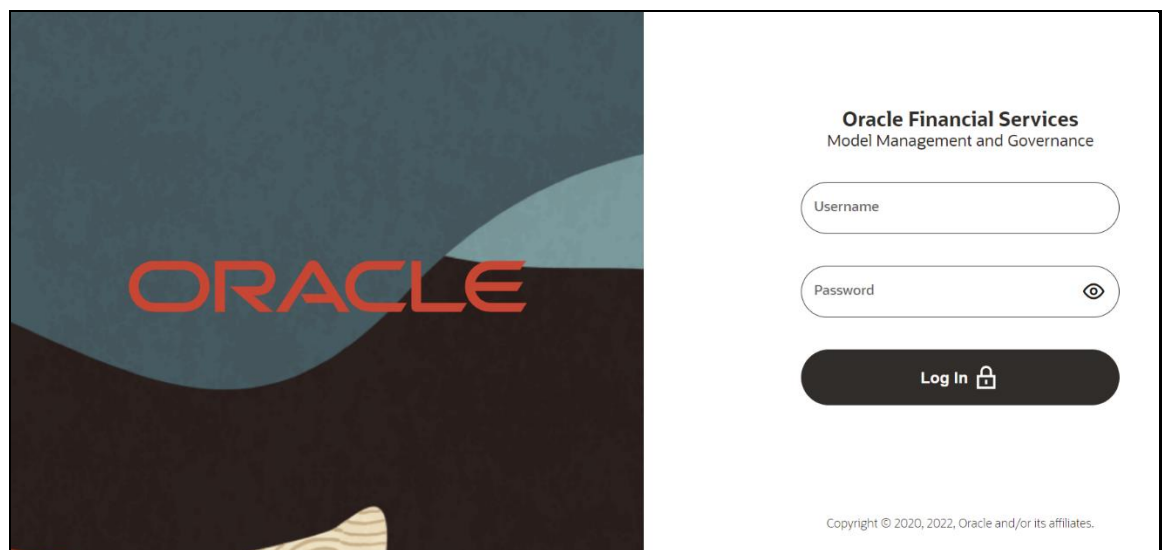
1. Enter the application URL in your browser.

The **Login** page is displayed.

NOTE

The below screen is an example of AAI type login. The log in page is different for saml type based on the configuration.

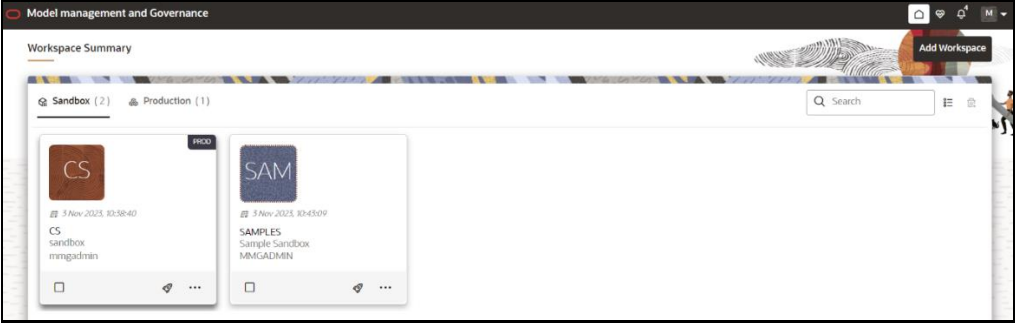
Figure 2: OFS Model Management and Governance Application Login Page



2. Enter your **Username** and **Password**.
3. Click **Log in**.

The **Home Page** is displayed.

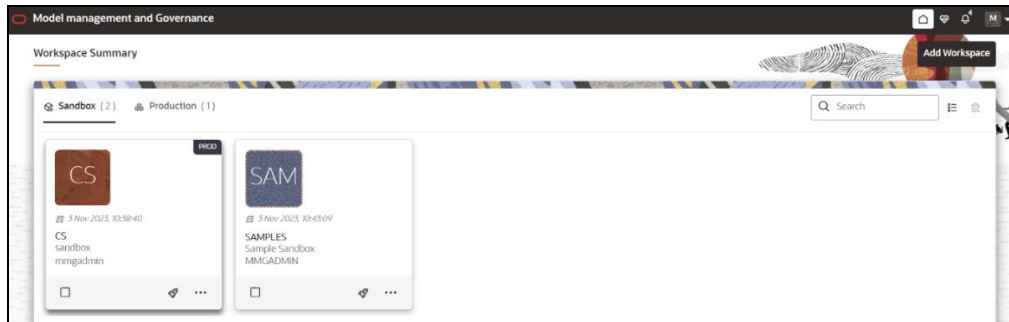
Figure 3: Home Page






3 MMG User Interface












Oracle Financial Services Model Management and Governance (MMG) provides a intuitive user interface (UI) for easy access to all features from the home page itself. Familiarize yourself with the menus, icons, and their location to quickly complete your tasks.

Figure 4: Workspace Summary Page




The following table provides descriptions for the fields and icons on the **Workspace Summary** page.


Field or Icon	Description
Search	<p>The field to search for Workspace.</p> <p>Enter specific terms in the field for which you want to search, and press Enter on the keyboard to display the results.</p> <p>You can search a Workspace using Workspace Code, Owner, Creation Date, or Workspace Type fields.</p> <p>The search list shows the Workspace details with Workspace Code, Owner, Creation Date and time, and Type.</p>
Card and Grid View	<p>Click the Card View  or Grid View  on the top-right corner of this pane to view the workspace as a block or a table, respectively.</p>
Delete	<p>Click Delete  to delete the Workspaces.</p>
Workspace Code	<p>The code of the Workspace.</p> <p>NOTE: Use up to 20 characters consisting of alphanumeric and space characters only. Do not use "ALL" as a workspace code.</p>
Description	The description for the Workspace.
Owner	The owner of the Workspace.
Creation Date	The date and time on which the Workspace was created.
Data Source Type	Shows the type of the Data Source.
Add Workspace	Click Add Workspace to create a new Workspace. See the Create a Workspace section for more information.

Field or Icon	Description
Launch Workspace	Click Launch  next to corresponding workspace to display the Workspace Dashboard with application configuration and model creation menu. See the Launch a Workspace section for more information.
View Workspace	Click Action  next to corresponding Workspace and select View  to view the workspace with dataset data. See the View a Workspace section for more information.
Populate Workspace	Click Action  next to corresponding Workspace and select Populate  to populate the workspace with dataset data. See the Populate a Workspace section for more information.
Edit Workspace	Click Action  next to corresponding Workspace and select Edit  to edit the Workspace.
Delete Workspace	Click Action  next to corresponding Workspace and select Delete  to delete the Workspace. See the Delete a Workspace section for more information.
Download Workspace	Click Action  next to corresponding Workspace and select Download  to download the Workspace. See the Download a Workspace section for more information. The file is downloaded in .cfg format.

3.1.1 Home

Click **Home**  icon to navigate to **Workspace Summary** page from any other window in MMG application. You can add and manage Workspaces from this page

3.1.2 Health

Click **Health**  icon to view the application status and version details. The Health page consists of four tabs:

Application Status (MMG Version 8.1.2.5.0)

Service Status | Environment | Log Trace | Connection Pool | Refresh

DB Connection Details ✓
Total DB Connections: 10
Thread Awaiting Connections: 0
100% (Active DB, Idle DB)
Hikari connection pool status: Current usage: 0.0%

Disk space details ✓
Total disk space: 1098974756864
Threshold disk space: 10485760
46% (Free disk, The nu...)
54%

Memory space details ✓
Total memory(Heap): 2051014656
Maximum memory (Heap): 16722690048
60% (Used m..., Free m...)
40%
Memory status of JVM. Current usage: 4.8764253%

Data Studio

Datstudio server status	Datstudio server is up	✓
Datstudio login	Datstudio login is successful	✓
Datstudio Interpreters health	Testing of datstudio interpreters is successful	✓ (+)

Data Pipeline

Data Pipeline service status	Data Pipeline service is up	✓
Pipeline service status	Pipeline service is up	✓

Graph Services

Graph refresh service status	Load to Graph service is up	✓
PGX server status	PGX service is up	✓

Close

- **Service Status:** The Database connection, Disk space, Memory allocation details are displayed in graphical chart format. Hover on the chart to view more details. In addition, the status information of the services that are running such as Data Studio, Data Pipeline, and Graph Services are displayed. Click on the + icon to view individual services status.
- **Environment:** The System and Application properties details are displayed.
- **Log Trace:** The individual logs are displayed that will help you during analysis and debugging of the issue. You can set the last lines of the log based on your requirements. For example, if you wish to see only 10 last lines of the log, enter 10 in the Show last lines text box. By default, the files are displayed in alphabetical order and **mmg-service.log** is displayed. Click on the required log file to view specific details.


NOTE

Access logs are available in the following location for UI and Services.


\$LOG_HOME/services/access/mmg-ui-access.log

\$LOG_HOME/services/access/mmg-service-access.log

- **Connection Pool:** The information of connections used for the data source are displayed. Select the data source from the drop-down list to view the connections and the maximum capacity. This will help you in monitoring the connections of the specific data source.

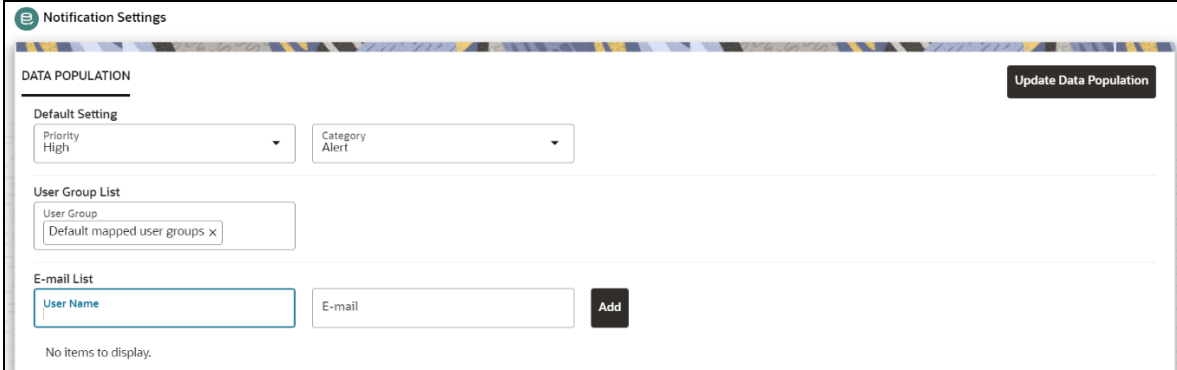
Clicking on the **Refresh**  icon will refresh the application status details.

3.1.3 Notification

Click **Notification**  icon to display the notifications from the application. In the current release, only data population and model approval related notifications are displayed. You can delete the notifications by clicking on the **Close** icon when no longer needed.

To add or modify the notification details, perform the following:

1. In the header of the home page, click on the **Notification** icon.
The Notifications are displayed.
2. In the Notifications screen, click **Notification Settings** icon.
The Notifications Settings page is displayed.
3. Select the required options from the **Notification Settings** page and click **Update Data Population**.
The selected User group will be notified via User Interface with the alerts under Notifications icon. If you wish to get the notifications in email, add the user name and email ID so that whenever a data population is triggered, an email notification is triggered to the user.



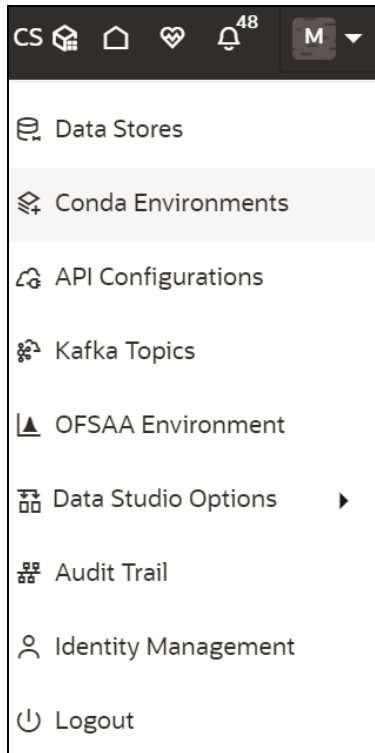
The notification alerts details are updated.

NOTE

An email notification is sent to the default email id added in AAICL_SMS_USER_PROFILE present in the config schema.

3.1.4 Profile

The Header displays icons, buttons, and text for generic information and access to the OFSAA application's features. The following user-interface elements are displayed.



- **User Name:** Displays the first letter of the logged-in user name. Hover over to view the complete name of the user. Click on this icon to select from the following options in the drop-down list:
 - **Data Stores:** Click to navigate to **Data Store Summary** page. You can add and manage data stores from this page.
 - **Conda Environments:** Click to navigate to **Environment Summary** page. You can configure and manage Conda environments from this page.
 - **API Configurations:** Click to navigate to **API Summary** page. You can configure and manage APIs from this page.
 - **Kafka Topics:** Click to navigate to **Kafka Topics** page. You can configure and manage Kafka topics and clusters from this page.
 - **OFSAA Environment:** Click to navigate to **OFSAA Environment** page. You can register OFSAA environments (Simulation and Production) from this page.
 - **Data Studio Options:** MMG contains an underlying Notebook Server which has the following configurable options:
 - Interpreters
 - Tasks
 - Permissions
 - Credentials
 - Templates

Clicking on the option will navigate you to the specific page. For more details, see [Data Studio Options](#) section.

- **Admin:** Navigates to IDCS page.
- **Audit Trail:** Click to navigate to **Audit Trail** page The details such as start and stop of UI and Service, add or delete of datasource, API configuration, Kafka topics, Conda Environments and so on are displayed. You can view the sequence of actions performed in table view or timeline view (graphical representation) by clicking on **Audit Table View**, and **Audit Timeline View** options respectively.
- **Identity Management:** Click to navigate to IDCS page. You can manage users, groups, roles, and functions from this page.
- **Logout:** Click to log out of the application.

3.2 Mega Menu Components

To view the Mega Menu components, launch a Workspace. The Dashboard page is displayed with menu options such as Modeling, Orchestration, More, and other sections of MMG application.

3.2.1 Modeling

The Modeling component contains the following features:

- **Datasets** : Explore data, engineer features and monitor data drifts.
- **Model Libraries** : Manage python libraries for model creation and usage.
- **Model Techniques** : Manage techniques and algorithms from registered model libraries.
- **Model Catalog** : Centralized hub for all your machine learning models.
- **Pipelines** : Design, deploy and govern end-to-end machine learning pipelines for seamless model development.
- **Graphs** : Analyze complex relationships within your data through interactive graph representations.

For more details, see [Modeling](#) section.

3.2.2 Orchestration

The Orchestration component contains the following features:

- **Scheduler Dashboard** : Get an overview of scheduled tasks and processes.
- **Define Batch** : Manage and configure batch definitions.
- **Define Taks** : Create tasks, configure parameters and set execution dependencies within a batch process.
- **Schedule Batch:** Set execution schedules for your batch processes.
- **Monitor Batch:** Track and monitor batch process executions.

For more details, see [Orchestration](#) section.

3.2.3 More

The More component contains the following features:

- **Export Objects** : Utilize Object Migration feature to efficiently export and save objects.
- **Import Objects** : Import previously exported objects into the system.
- **Model Actions** : Review and approve model deployments in bulk.
- **Audit Trail**: Monitor all system activities and changes.
- **Data Pipelines**: Create and manage data pipelines for efficient data flow and processing.

For more details, see [More](#) section.

3.3 Using the OFS MMG Application

The OFS MMG application displays windows and pages that are interconnected to the OFS AAI. Primarily, you will create Workspace. Within these Workspaces, you will create models, compare them for the best fit, and promote one to production.

Use the information in the following topics to create the workspaces and models:

- [Using Workspaces](#)
- [Using Model Pipelines](#)

The prerequisites for Workspace are as follows:

- To create a workspace, your user profile must be mapped to the Workspace Administrator role. For more information, see the [User Groups](#) section.
- To use a workspace to create models, your user profile must be mapped to the Model User role (such as a modeler). For more information, see the [User Group - Role Mapping](#) section.

3.4 Execute the Production Workspace Models from Analytical Applications Infrastructure

Prerequisites

- To execute the MMG Production Workspace Models from AAI, log in to [My Oracle Support](#), and search for patch number **35250055** under the **Patches & Updates** tab. Download and apply it on the OFSAAI server.
- Ensure the AAI Infodomain and MMG Workspace names are the same before you execute the Production Workspace Models.

To execute the MMG Production Workspace Models from the AAI application, perform the following steps:

1. In the AAI configuration schema, update the value for `MMG_SERVICE_URL` in the `nextgenemf_config` table with the values in the MMG installation.

Example:

```
MMG_SERVICE_URL :<FQDN/IP>:<mmg_be_port>/<mmg_context_name>
```

NOTE

If the target MMG is using secured connection, import the target server certificate to the AAI application Java keystore and restart the services.

2. Restart the AAI services.

A new component STUDIOMODEL will be available in ICC, RRF, and PMF modules for selecting the Production Workspace Models of MMG.

For more details, refer to the *Component: STUDIOMODEL* section of the [AAI User Guide](#).

4 Access MMG from Analytical Applications Infrastructure

You can now access the MMG application and its features from AAI.

Prerequisite

- To access the MMG application from AAI, log in to [My Oracle Support](#), and search for **35744607** patch under the **Patches & Updates** tab, download and apply it.
- A valid MMG setup should be up and running.

To access the MMG application, perform the following steps:

1. In the AAI configuration schema, update the value for `MMG_UI_URL`, and `MMG_SERVICE_URL` in the `nextgenemf_config` table with the values in the MMG installation.

Example:

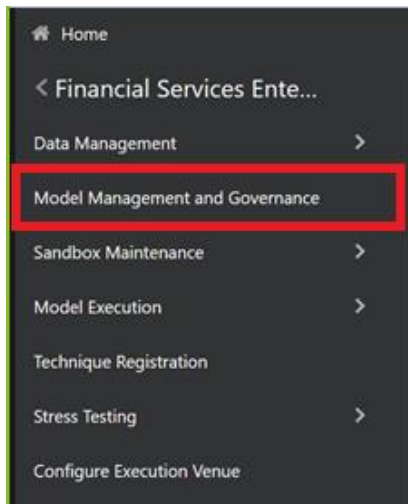
- `MMG_UI_URL:http(s)://<FQDN/IP>:<mmg_ui_port>/<mmg_context_name>/home`
- `MMG_SERVICE_URL :<FQDN/IP>:<mmg_be_port>/<mmg_context_name>`

NOTE

If the target MMG is using secured connection, import the target server certificate to the AAI application java keystore and restart the services.

2. You must map the **MMGACCR** role to the required user. In addition, **MMGACGRP** group is preseeded with the above role.
3. You must map the `OFS_MMG_HOME` Menu ID to the desired Parent ID in the `AAI_MENU_TREE` table in the AAI Configuration Schema.
4. Restart the AAI services.

After successful login to the AAI application, a menu named **Model Management and Governance** is displayed. Based on your menu tree configuration, the left pane is displayed as shown below.



5. When you click on Model Management and Governance, the MMG Login page is displayed, enter the credentials to access the MMG application.

5 Workspaces

Use the Dashboard to create and manage workspaces in the Financial Services Model Management and Governance application. By default, a Sample workspace is created, and you can provision and use it to understand the workspace workflow.

Workspaces can be in the production environment (deployed), or they can exist in a separate instance on their own (on local for testing purposes) with a copy of data that comes from the desired data source (production or external data source).

You can view the following details on Workspace Summary page:

- Number of Sandbox Workspaces
- Number of Production Workspaces

The Workspace Dashboard allows you to view the models of the launched workspace.

To access the Dashboard window, follow these steps:

1. Navigate to **Workspace Summary** page.

The page displays workspace records in a tile format.

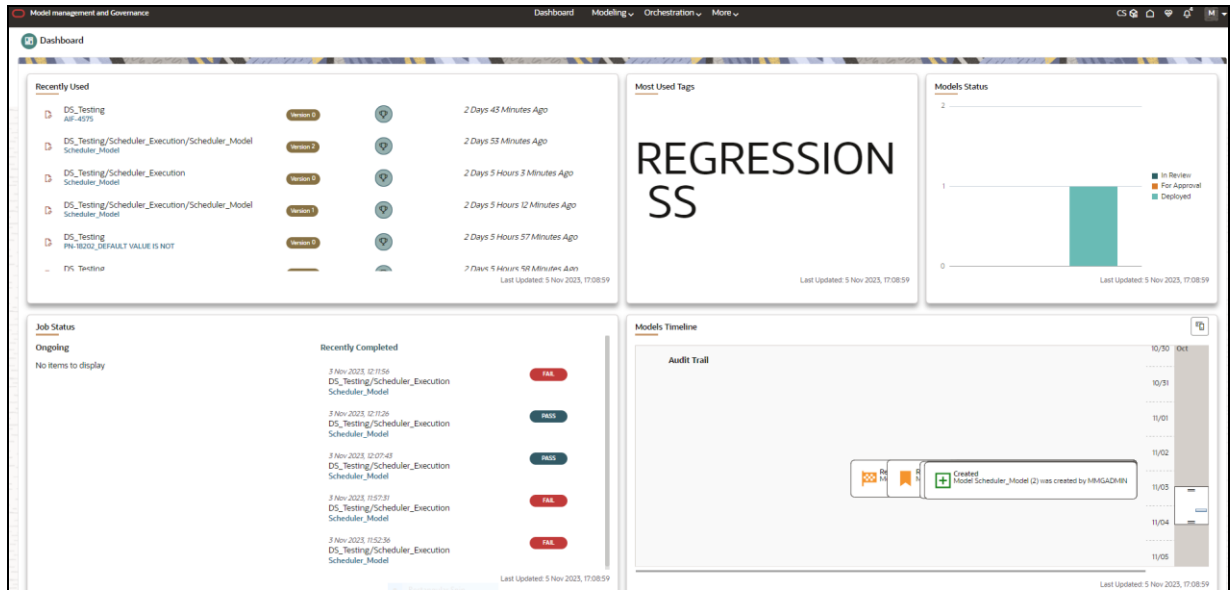


2. Click  next to corresponding Workspace to Launch Workspace.

The MMG **Dashboard** window is displayed with application configuration and model creation menu.

The Workspace Dashboard shows the following details of a launched workspace:

- Mega Menu
- Recently Used
- Most Used Tags
- Models Status
- Job Status
- Models Timeline



5.1 Create a Workspace

The Workspace creation requires entry of the source of dataset, validation, and deployment. Besides, the OFS MMG application may require users of different function groups to create and approve a Workspace. In other words, a user associated with the modeler function group creates a Workspace and the approval and deployment are done by a user associated with the modeling administrator function group. See the [Mapping User Groups](#) section for more information.

UGDOMMAP function should be mapped to the user performing sandbox creation operation. Otherwise, the create operation will fail.

To create a Workspace:

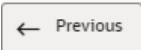
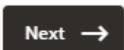
1. Navigate to **Workspace Summary** page.
The page displays workspace records in a table.
2. Click **Add Workspace**.
The **Create Workspace** page is displayed.

Figure 5: Create Workspace

The 'Create Workspace' form has a sidebar with steps: 1. Basic Details, 2. Workspace Schema, 3. Data Sourcing, 4. Metadata Sourcing, 5. Validate, 6. Summary. The 'Basic Details' section includes:

- Workspace Code**: Required field.
- Purpose**: Required field.
- User-group**: Required field.
- Type**: Radio buttons for Modeling (selected), Simulation, and Production Workspace.
- Subtype**: Radio buttons for Sandbox Workspace (selected) and Production Workspace.
- Production Workspace**: A toggle switch.

 There is also an 'Import Archive File' section with a 'Drag & Drop file here' instruction.

The window displays a progress indicator at the left that indicates the active window where you are entering details. Click **Previous**  to go back a step and click **Next**  to go to the next step.

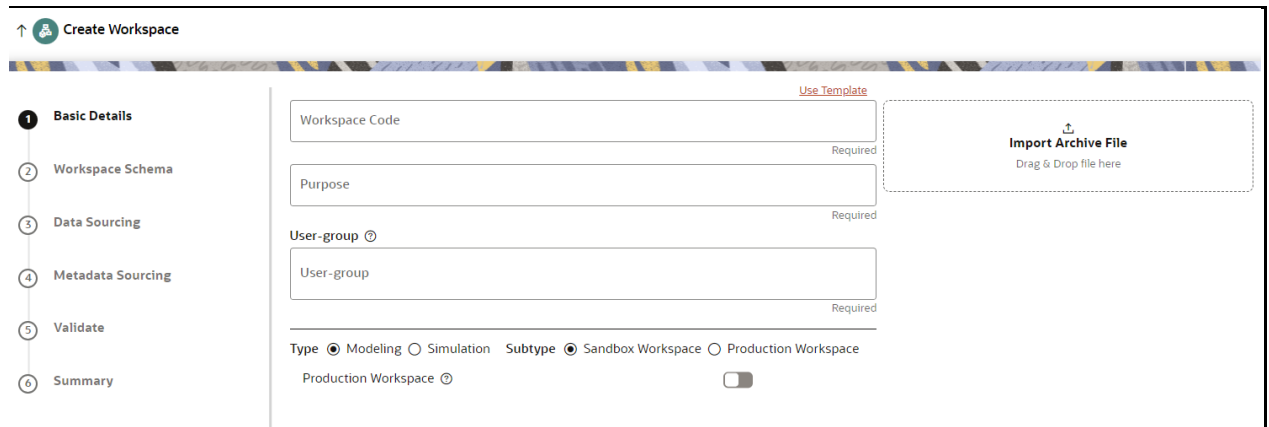
The following steps show the various phases from workspace creation to deployment:

- a. [Basic Details](#)
- b. [Workspace Schema](#)
- c. [Data Sourcing](#)
- d. [Metadata Sourcing](#)
- e. [Validate](#)
- f. [Summary](#)

5.1.1 Configure Basic Details

Enter basic configuration details in this window.

Figure 6: Basic Details



To configure the basic details for the workspace, follow these steps:

1. Enter the required details in the **Basic Details** pane as shown in the following table.

Field	Description
Use Template	Click on this field to create a workspace from a template. The zip files stored on the path: <MMG Installation path>/scratch/ofsaadb/ftpsahre/mmg/seeded/workspace-templates will be displayed in the Library drop-down. On selecting the template, any pre-filled values will be overridden with the template provided values.
Workspace Code	Enter the code of the workspace. NOTE: Use up to 20 characters consisting of alphanumeric and space characters only. Do not use "ALL" as a workspace code.

Field	Description
Purpose	Enter the purpose of the creation of the Workspace.
User-group	Click on this field to display a list of User-group values. Select the required value. For Example: Modeling Approver, Modeling Reviewer, and Modeling User.
Type	<ul style="list-style-type: none"> Select the type of Workspace as Modeling or Simulation. <p>Note: If Simulation is selected, fields to add the simulation data are displayed. The simulation option is displayed only when the user is mapped to SIMULATIONACCESS role.</p> <ul style="list-style-type: none"> Select the subtype of Workspace as Sandbox or Production.
Production Workspace	<p>Note: This option is not displayed when the Type field is selected as Production.</p> <p>Move the toggle switch to the right to enable this option.</p> <p>Enabling it attaches the production schema, which selects the Workspace being created for automatic model promotion. Based on the selection of the Source Workspace, the model is promoted to the environment.</p>
Import archive file	<p>If you use this feature, the other fields described in the preceding rows are auto populated.</p> <p>Click to open the file selector dialog and select the required configuration file or drag the file from its directory and drop it in the box.</p>

2. Click **Next** to go to the next step.

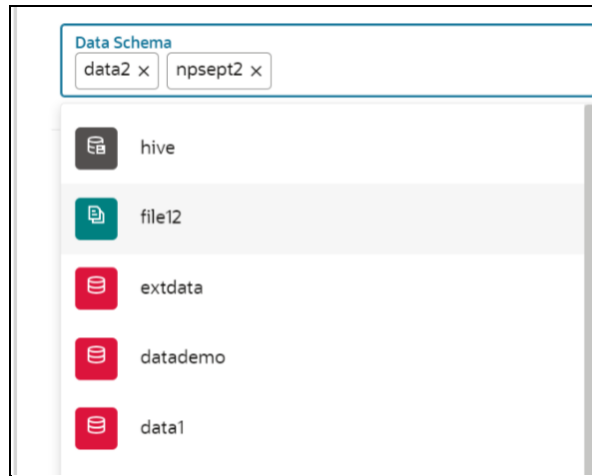
5.1.2 Configure Workspace Schema

Enter schema operation and connection details in this window.

Figure 7: Workspace Schema

To configure the Workspace schema, follow these steps:

1. Select the required schemas from the **Data Schema** drop-down list. This is the actual data used for model building. You can use multiple data schemas for one Meta Source. You can select an existing Schema or add a new Schema by clicking on **+** icon. The data source options such as Oracle, Hive, and File are displayed.



NOTE For details on adding a new data store, see [Data Stores](#) section.

2. Select the required options from the **Kafka Topics** list. The selected Kafka topics are listed in the right side menu with the order of selection. For more details, see [Kafka Topics](#).
 3. Select the required options from the **API Configurations** list. The selected API Configurations are listed in the right side menu with the order of selection. For more details, see [API Configurations](#).
 4. Select the required options from the **Conda Environments** list. The selected Conda Environments are listed in the right side menu with the order of selection. For more details, see [Conda Environments](#).
 5. Click **Next** to go to the next step.
- OR
- Click **Skip** to skip the step.

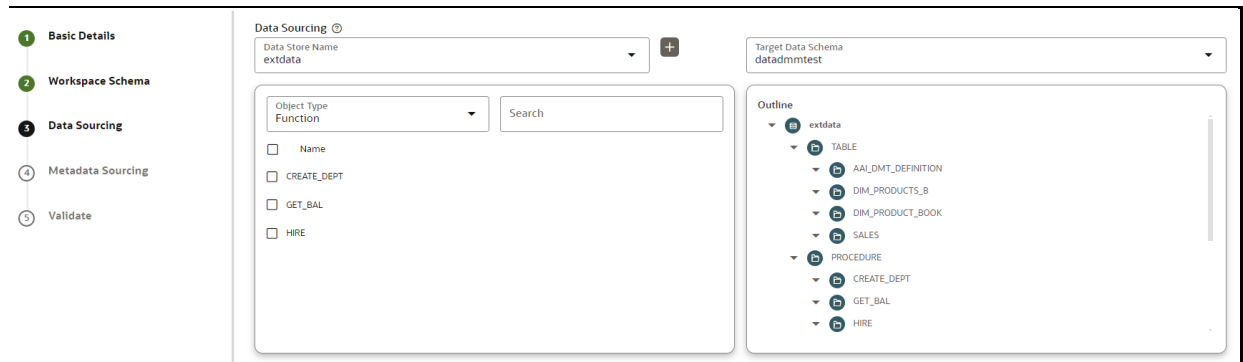
5.1.3 Configure Data Sourcing

The schema type selected in the previous step requires the definition of database objects to be used for model creation. Data sourcing step of Workspace provisioning allows to select tables from Oracle, Hive or Files based data sources from which data has to pulled into the Oracle based Workspace data schemas. However, unlike the data sourcing from RDBMS data sources, the tables will not get physicalized in the target schema and hence it is expected that the tables with compatible structures are already present in target RDBMS schema. You can also select DMM operations such as Procedures, Functions, Sequences, and Package while configuring Data Sourcing. Once a workspace has been provisioned using DMM , it is stored in ftpshare path- ftpshare/dmm/DATE.

In case any of the selected tables are not present in the target schema, those tables are included in the failed objects count in workspace provisioning summary.

This window shows the different icons for Oracle, File and Hive data sources.

Figure 8: Data Sourcing - External Data Source



To configure Data Sourcing, follow these steps:

1. You can select Data Source from Data Source Name drop-down list or create a new Data Source. To create a new Data Source, see the Configure Workspace Schema section.
2. Select the Target Data Schema. You can select multiple Data Sources for a Target Data Schema.
3. For example, if there are D1, D2 and D3 Data Sources, then you can select the tables from all these Data Sources, tables from two Data Sources, tables from one Data Source, or as required. Here, multiple combination of tables are possible with Data Source and Target Data Source.
4. If two Data Sources are having same tables (from different Data Sources), then the columns from the first selected table will be used. For example,
5. If Table A has columns C1, C2, C3 and Table B has columns C1, C2, and C4, then the data from the first table will be used.
6. During the data population, only columns C1 and C2 will be used and those will be marked in Green color.
7. Select the type of objects to be displayed in the pane that follows the drop-down list. The Object Type drop-down list will be enabled after selecting the Data Source from Data Source Name drop-down list. The following are the options in the drop-down list:
 - Table
 - View
 - Synonym
 - Function
 - Procedure
 - Package
 - Sequence
8. Click **Next** to go to the next step.
OR
Click **Skip** to skip the step.

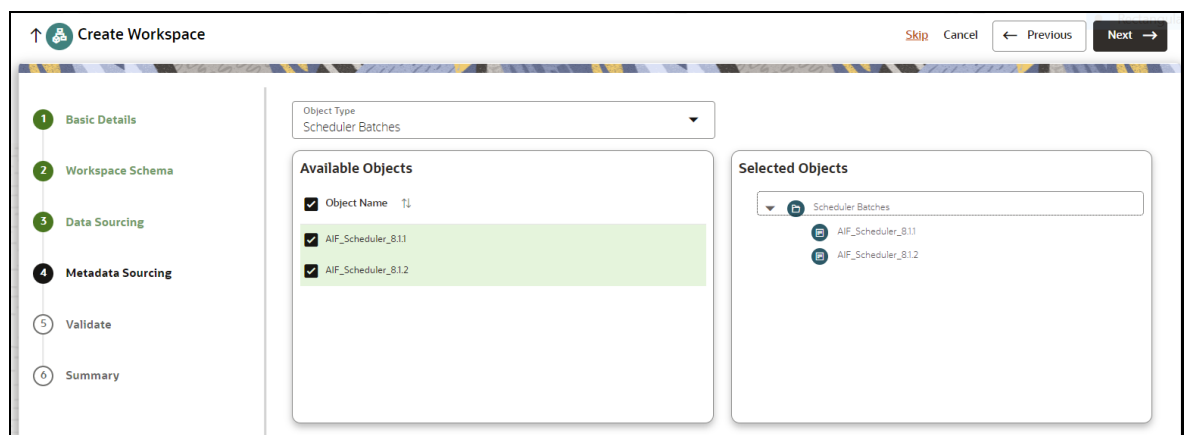
5.1.4 Configure Metadata Sourcing

The database objects selected in the previous step can be added with metadata for selected objects. Metadata Sourcing is a stage during Workspace provisioning to allow seeding of metadata like scheduler batches at the time of workspace provisioning.

Also, by default there will be seeded metadata. However, if you wish to seed the metadata, navigate to <installed path>/ftpsahre/mmg/seeded/batches and drag and drop the metadata in SQL format.

NOTE This step is optional.

Figure 9: Metadata Sourcing



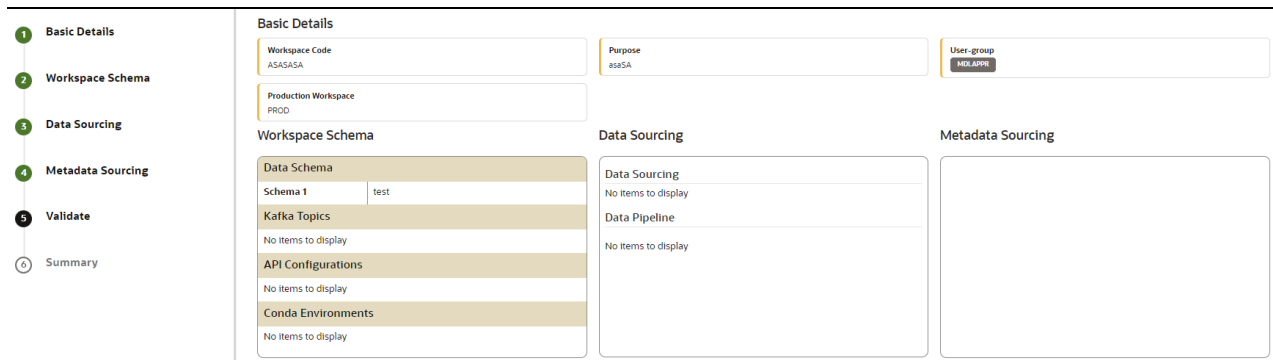
To configure Metadata Sourcing, follow these steps:

1. Select the required schema from the **Object Type (Optional)** drop-down list.
The **Available Objects** are displayed in **Selected Objects** pane.
2. Click **Next** to go to the next step.
OR
Click **Skip** to skip the step.

5.1.5 Validate Workspace

The **Validate** pane displays a preview of the configuration values entered in the previous panes.

Figure 10: Validate Workspace



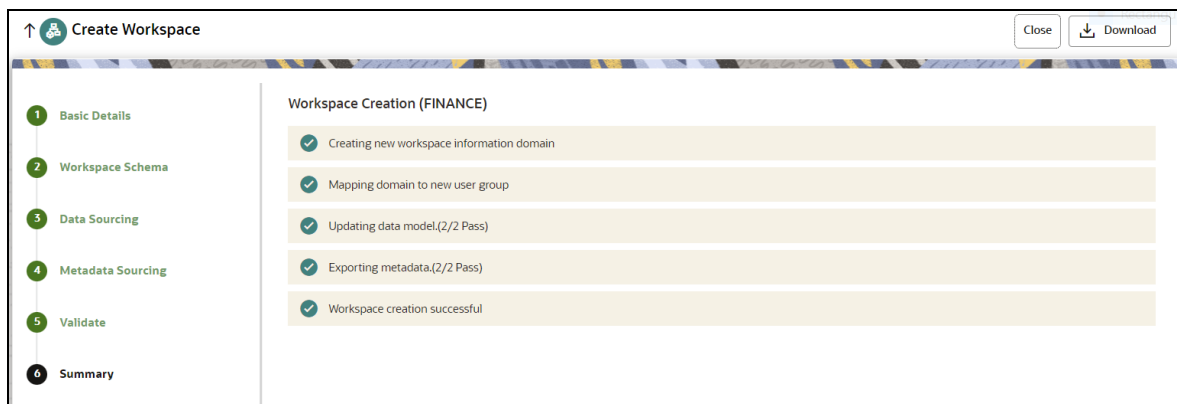
To validate the Workspace and deploy, follow these steps:

1. Review the details in the **Validate** pane.
2. Click **Finish** to creation of the Workspace using **Physicalize Workspace** option or **Download Configurable Archive**.
 - When you click **Download Configurable Archive**, it exports the metadata information of the workspace in .zip format which can be used later using the Import option.
 - When you click **Physicalize Workspace**, it creates actual workspace.

5.1.6 Display Summary

The **Summary** pane displays the status of the workspace creation.

Figure 11: Workspace Creation Summary



- Click **Download** to download the deployment report.

NOTE

During workspace creation, if any of the DMM operations such as Procedures, Functions, Packages, and so on fails, workspace creation will be rolled back. You can verify the details in MMG_SANDBOX_DETAILS, MMG_SANDBOX_MASTER, MMG_SANDBOX_SCHEMA tables.

5.2 View a Workspace

To view a workspace, follow these steps:



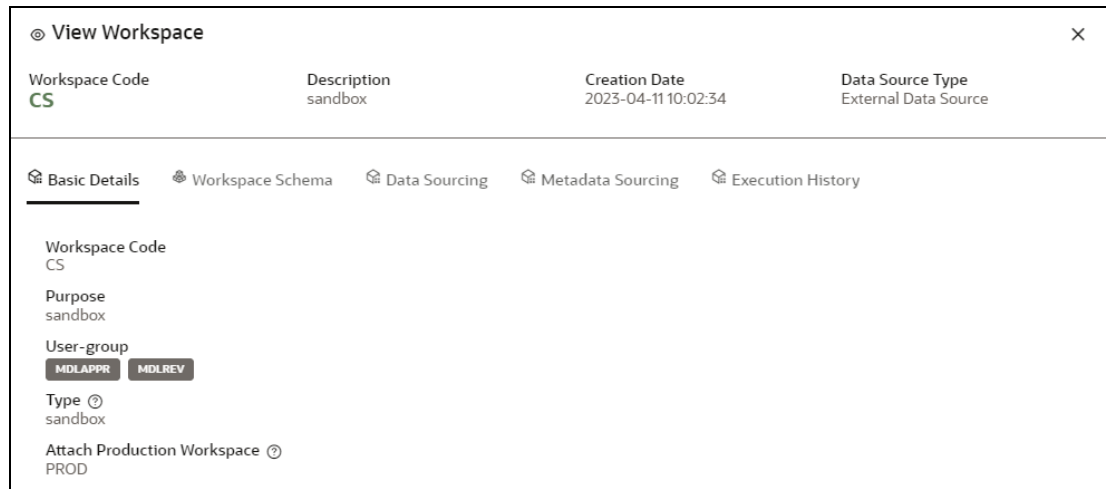
1. Navigate to **Workspace Management** to display the **Workspace Summary** page. The page displays workspace records in a table.
2. Click **Action**  next to corresponding workspace and select **View**  to view the workspace. The Basic Details of the Workspace is displayed.

Figure 12: View Workspace Window



3. Navigate to the Workspace Schema, Data Sourcing, Metadata Sourcing, and Execution History tab to view the respective details.

NOTE You can view the data population logs under the Execution History page.

5.3 Populate a Workspace

The workspace is populated with data from the datasets in External sources.

To populate the Workspace, follow these steps:



1. Navigate to the **Workspace Summary** page. The page displays Workspace records in a table.
2. Click Action  next to corresponding Workspace and select **Populate**  to populate the Workspace with data from a dataset in the **Populate Workspace** window.

Figure 13: Populate Workspace Window

Populate Workspace
✕

Workspace Code CS	Purpose sandbox	Creation Date 2024-02-12 14:46:15	Data Store Type External Data Source
----------------------	--------------------	--------------------------------------	---

Write Mode ⓘ

Write Mode
Append ▼

In this mode, the underlying tables will be populated in append mode.

Data Load SELECTIVE ALL

In this mode, only the tables filtered (selected in the Table level Data Filters) will be populated.

Data Filters - Global level ⓘ Use Template

Data Filters - Global

Data Filters - Table level ⓘ +

Tables

SQL Filter 🗑️

Data Filter - Hint ⓘ +

Tables ▼
Required

Source Hint

Target Hint 🗑️

Additional Parameters ⓘ

Source Prescript

Target Prescript

Fetch Size
10

Batch Commit Size
1,000

Select Unlimited or Customize the Rejection Threshold

Unlimited Custom Rejection Threshold

Rejection Threshold
UNLIMITED

Cancel

Populate Workspace ▼

The following table provides descriptions for the fields in the **Populate Workspace** window.

Field	Description
Workspace Code	The code of the Workspace.
Purpose	The description for the Workspace.
Creation Date	The date and time on which the Workspace was created.

Field	Description
Data Source Type	The source of data. The value can be the OFSAA Data Schema or an external data source.
Write Mode	<p>You can either overwrite the existing data (truncate and insert) or to append to the existing data.</p> <ul style="list-style-type: none"> • Overwrite: In this mode, the underlying tables will be populated in truncate and followed by insert operation. • Append: In this mode, the underlying tables will be populated in append mode. <ul style="list-style-type: none"> ▪ Selective: In this mode, only the tables filtered (selected in the Table level Data Filters) will be populated. ▪ ALL: In this mode, all the underlying tables mapped to the workspace will be populated along with the filters mentioned below for specific tables.
Data Filter - Global	<p>Enter the data filter that needs to be applied on all the tables selected for data sourcing. For example: If MISDATE is equal to Today, then it is applied to all tables (wherever it is available) for selected Data Sources during population. If this field is not found (MISDATE) in the tables, it is not updated.</p> <p>OR</p> <p>Click Use Template to select a library.</p> <p>On selecting the template, any pre-filled values will be overridden with the template provided values.</p>
Data Filter - Table level	<p>You can provide the data filters individually on the tables here.</p> <p>NOTE: You can provide multiple table names for the same SQL filter. For example, there are two tables called Student and Employee in the target data source, and below filters are applied.</p> <p>MISDATE as Today for Student and Employee tables</p> <p>ID as 1 for Student table</p> <p>Then, Student table will be populated with MISDATE and ID filters and Employee table will be populated with only MISDATE filter.</p> <p>Global Filters will not be applicable for those tables on which filters have been applied individually.</p> <p>If the same table name is provided in more than one rows here, then filter condition is generated as a conjunction of all the provided filters.</p>

Field	Description
<p>NOTE: You can also pass runtime values in workspace population for the user-defined parameters in Data Filter – Global/Table.</p> <p>Example: Table Filter /Global Filter</p> <pre>[{"id":1,"filter":"CUSTOMER_ID =\$CUSTID and INCOME =\$income and CUSTOMER_NAME =\$customerName","tables":["CUSTOMERS"]}]</pre> <p>Additional Parameters:</p> <pre>{"fetch_size" :10, "batch_commit_size" :1000, "rejection_threshold" : "UNLIMITED", "write_mode" : "APPEND", "dynamic_parameters": [{"key": "\$CUSTID", "value": "125"} , {"key": "\$income\$", "value": "30000"}, {"key": "\$customerName", "value": "Cust125"}]}</pre> <p>The Runtime parameters can be passed as part of additional parameters json .Key = "dynamic_parameters" .It will replace all the \$ values in Table filter /Global Filters.</p>	
Source Prescript	Enter the source prescript of JDBC properties for data upload.
Target Prescript	Enter the target prescript of JDBC properties for data upload.
Fetch Size	Enter the Fetch size of JDBC properties for data upload
Batch Commit Size	Enter the Batch Commit size of JDBC properties for data upload
Rejection Threshold	<p>Following two options are available:</p> <ul style="list-style-type: none"> • Custom Rejection Threshold Enter the maximum of number of inserts that may fail for any of the selected tables. You can provide the maximum number of inserts that can fail while loading data to a given table from all the sources. In case of threshold breach, all the inserts into the particular target schema will be rolled back. However, it will continue with populating the next target schema. • Unlimited Here, all the errors will be ignored during the data population.

3. Click **Populate Workspace** to start the process.

Here, you can create the batch using Create Batch, or create and execute using Create and Execute Batch option. On selecting either of these options, a workspace population task gets added to the batch.

- When you select **Create and Execute Batch** option, it allows you to create batch and triggers the batch as well.
- When you select **Create Batch** option, it allows you to prepare the batch and then execute or schedule the batch at a later time through Scheduler Service window.

The Workspace population task execution can be tracked in the 'Monitor Batch' window in the Scheduler Service.

Figure 14: Task Parameters

▼ Task Parameters

Parameter	\$BATCHDATE\$	Value	Batch Date	✓
Parameter	\$BATCHRUNID\$	Value	BATCHRUNID	✓
Parameter	Global Filter	Value	<input style="width: 100%;" type="text"/>	✓
Parameter	Table Filters	Value	<input style="width: 100%;" type="text"/>	✓
Parameter	Additional Parameters	Value	<input style="width: 100%;" type="text"/>	✓

4. Enter the following parameters for workspace population.

NOTE This step is optional.

- **Additional Parameters:** Enter the Additional Parameters in following format:

```
{ "fetch_size" :10, "batch_commit_size" :1000,
  "rejection_threshold" : "UNLIMITED", "write_mode" : "OVERWRITE" }
```

- **Global Filter**

Provided input will be applied as a data filter on all the tables selected for data sourcing.

- **Table Filter**

You can provide data filters individually on the tables here. You must provide multiple table names for the same SQL filter. Global Filters will not be applicable for those tables on which filters have been applied individually. In case the same table name is provided in more than one rows here, the filter condition will be generated as a conjunction of all the provided filters.

Enter the Table filters in following format:

```
[{"id":1,"filter": "<filter condition>", "tables": ["TABLE1",
"TABLE2"]}, {"id":2,"filter": "<filter condition>", "tables": ["TABLE2"]}]
```

NOTE You can run workspace population for a given workspace any number of times. New tables may be added to the definition. Any new table added to the definition, that is not present in the target schema will be physicalized on update of the workspace. Also, user can add new sources if required.

Any table that is deselected from the data sourcing definition will **NOT** be dropped.

5.4 Edit a Workspace

To edit a workspace, follow these steps:

1. Navigate to **Workspace Management** to display the **Workspace Summary** page. The page displays Workspace records in a table.

2. Click Action  next to corresponding workspace and select **Edit**  to edit the workspace.

Figure 15: Edit Workspace Window

NOTE You can modify the Workspace Type from Sandbox to Production or vice versa.

For more details on the Basic Details fields, see [Configure Basic Details](#) section.

NOTE While updating a workspace, if any of the DMM operations such as Procedures, Functions, Packages, and so on fails, DMM operations alone will be rolled back and workspace will not be rolled back. You can verify the details in MMG_SANDBOX_DETAILS, MMG_SANDBOX_MASTER, MMG_SANDBOX_SCHEMA tables.

3. Click **Save**.

5.5 Delete a Workspace

NOTE When you delete a Workspace, all the underlying objects such as Dataset, Scheduler service metadata and so on from the associated tables are deleted.

To delete a Workspace, follow these steps:

1. Navigate to **Workspace Management** to display the **Workspace Summary** page. The page displays workspace records in a table.



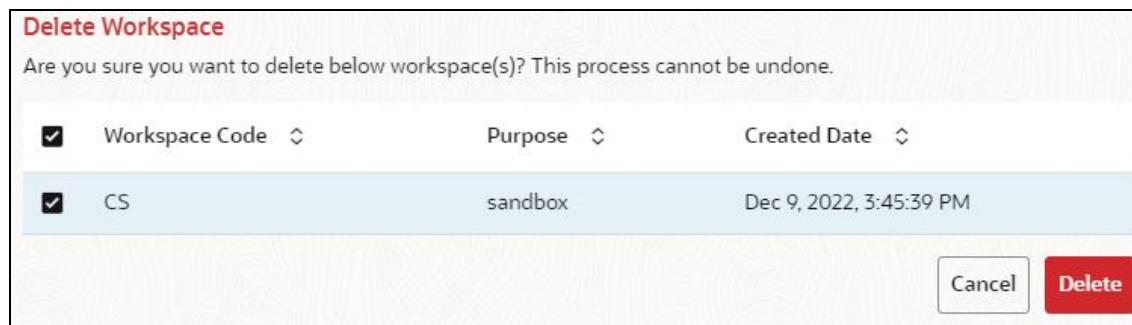
- Click Action  next to corresponding Workspace and select **Delete**  to delete the workspace.

Figure 16: Delete Workspace Window



The following table provides descriptions for the fields in the **Delete Workspace** window.

Field	Description
Workspace Code	The code of the workspace.
Purpose	The description for the workspace.
Created Date	The date on which the workspace was created.



- Click **Delete**.
- Click **OK** on the confirmation dialog box to confirm or click **Cancel** to cancel.

NOTE You must de-link the Sandbox workspaces from Production Workspace before deleting the Production Workspace

5.6 Download a Workspace

Downloading a workspace allows you to export the workspace metadata definition (without underlying objects such as Models, Pipeline, Graphs, and so on) in a zip format. Further, the same can be used to re-create the workspace.

To download a workspace, follow these steps:

- Navigate to **Workspace Management** to display the **Workspace Summary** page. The page displays Workspace records in a table.
- Click Action  next to corresponding workspace and select **Download**  to download the workspace.

OR

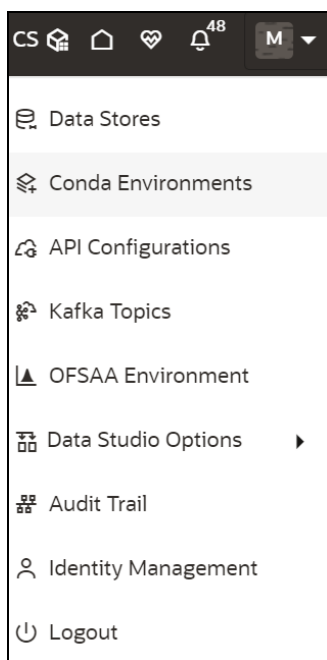
Navigate to the Summary screen during the creation of a Workspace and click Finish and select **Download Configuration Archive** option.

NOTE

The file is downloaded in .cfg format.

6 Administration

The Header displays icons, buttons, and text for generic information and access to the OFSAA application's features. The following user-interface elements are displayed.



- **User Name:** Displays the first letter of the logged-in user name. Hover over to view the complete name of the user. Click on this icon to select from the following options in the drop-down list:
- **Data Stores:** Click to navigate to **Data Store Summary** page. You can add and manage data stores from this page.
- **Conda Environments:** Click to navigate to **Environment Summary** page. You can configure and manage Conda environments from this page.
- **API Configurations:** Click to navigate to **API Summary** page. You can configure and manage APIs from this page.
- **Kafka Topics:** Click to navigate to **Kafka Topics** page. You can configure and manage Kafka topics and clusters from this page.
- **OFSAA Environment:** Click to navigate to **OFSAA Environment** page. You can register OFSAA environments (Simulation and Production) from this page.
- **Data Studio Options:** MMG contains an underlying Notebook Server which has the following configurable options:
 - Interpreters
 - Tasks
 - Permissions
 - Credentials
 - Templates

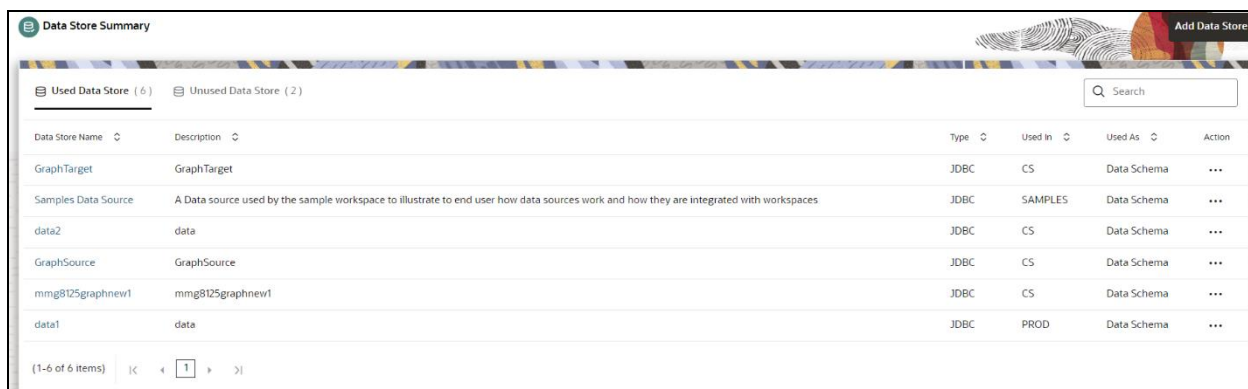
Clicking on the option will navigate you to the specific page. For more details, see [Data Studio Options](#) section.

- **Admin:** Navigates to IDCS page.
- **Audit Trail:** Click to navigate to **Audit Trail** page The details such as start and stop of UI and Service, add or delete of datasource, API configuration, Kafka topics, Conda Environments and so on are displayed. You can view the sequence of actions performed in table view or timeline view (graphical representation) by clicking on **Audit Table View**, and **Audit Timeline View** options respectively.
- **Identity Management:** Click to navigate to IDCS page. You can manage users, groups, roles, and functions from this page.
- **Logout:** Click to log out of the application.

6.1 Data Stores

This feature allows you to manage the Data Schemas registered with MMG. The Data Store Summary window shows the list of Data schemas registered with MMG. These Data schemas can be used either for workspace or for sourcing data. Click **Data Stores** to navigate to Data Source Summary window.

This window also allows you to manage these registered external sources.



The screenshot shows the 'Data Store Summary' window with a search bar and two tabs: 'Used Data Store (6)' and 'Unused Data Store (2)'. The table below lists the data sources.

Data Store Name	Description	Type	Used In	Used As	Action
GraphTarget	GraphTarget	JDBC	CS	Data Schema	...
Samples Data Source	A Data source used by the sample workspace to illustrate to end user how data sources work and how they are integrated with workspaces	JDBC	SAMPLES	Data Schema	...
data2	data	JDBC	CS	Data Schema	...
GraphSource	GraphSource	JDBC	CS	Data Schema	...
mmg8125graphnew1	mmg8125graphnew1	JDBC	CS	Data Schema	...
data1	data	JDBC	PROD	Data Schema	...

The Data Store Summary consists of two sections: Used Data Source and Unused Data Source.

- **Used Data Source:**
This shows the list of Data Sources registered with any workspace. Here, you can only view the Data Source details. The count of Used Data Sources also displayed at the top of Data Source Summary page.
- **Unused Data Source:**
This shows the list of Data Sources those are not registered with any workspace. Here, you can only view, edit, or delete the Data Source details. The count of Unused Data Sources also displayed at the top of Data Source Summary page.

6.1.1 Adding a Data Store

To add a Data store, follow these steps:

1. Navigate to **Workspace Summary** window.

2. Click **Profile** icon and select **Data Stores**.
The **Data Store Summary** page is displayed.
3. Click **Add Store**.
The Add **Data Store** window is displayed.

Figure 17: Add Data Store with Type File

Add Data Store

Data Store Name Required

Description Required

Type
File

File Availability
 Global Workspace-limited

Upload Data File
Drag & Drop file here

File Location
/scratch/ofsaadb/ftpshare/mmg/Data Sources/datasources/##Data Source Name##/datafiles/##MI

File Type
Text

Escape Delimiter

Record Delimiter Required

Field Delimiter Required

Physical Name Logical Name Data Type Field Order Action

No data to display.

Figure 18: Add Data Store with Oracle Database

Add Data Store

Data Store Name Required

Description Required

File Availability
JDBC

Database Type
Oracle

Wallet Alias Required

Table Owner

Figure 19: Add Data Source with Hive Database

Add Data Store

Data Store Name Required

Description Required

File Availability
JDBC

Database Type
Hive

User Name Required

Table Owner Required

JDBC Connection String Required

JDBC Driver Required

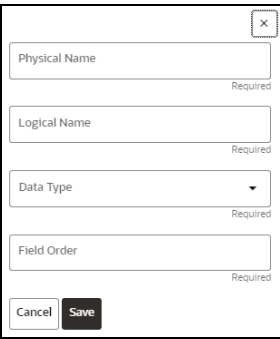
Keytab File Name Required

Realm File Name Required

4. Enter the required details as shown in the following table.

Field	Description
Data Store Name	Enter the connection URL to the database for the data schema.
Description	Enter the description of database connection.

Type	<p>Enter the type of the database connection. The supported types are JDBC and File.</p> <ul style="list-style-type: none"> • JDBC : If selected, the Database type options Oracle and Hive are displayed. • File: If selected, the following options are displayed. <ul style="list-style-type: none"> ▪ Global: Select this option if you want to fetch the global level datasource details. You need to place the file with the datasource details in JSON format in the following location: <code><installed path>/ftpshare/mmg/Data Sources/datasources/##Data Source Name##/datafiles/##MISDATE##/*</code> ▪ Workspace-limited: Select this option if you want to fetch the workspace level datasource details. You need to place the file with the datasource details in JSON format in the following location: <code><installed path>/ftpshare/mmg/##Workspace##/datasources/##Data Source Name##/datafiles/##MISDATE##/*</code> ▪ File Type : Select the Type as Text or csv format. ▪ Escape Delimiter: An escape delimiter is simply a sequence that is recognized and ignored during parsing. Its purpose is to allow the use of escape sequences to embed byte sequences in data that would otherwise be seen as delimiter occurrences. This option differentiates multiple records in one single column from second column. Escape delimiter (eg. "\"), added in from of multiple records will treat it as multiple records for one single column. For example, if there is a normal delimiter "+" at a given level, and you define an escape delimiter "\+" as shown in the following figure, then aaa+b\+c+ddd will parse as three fields: aaa, b\+c, and ddd. If the escape delimiter were not defined, the sequence would then parse as four fields: aaa, b\, c, and ddd. ▪ Record Delimiter: There is a separation of the records using a delimiter character like a comma, semicolon, hyphen, and so on for the rows. Enter the delimiter in the Record Delimiter field. This is a mandatory field and limited to two characters. ▪ Field Delimiter: There is a separation of the records using a delimiter character for the columns. Enter the delimiter in the Field Delimiter field. This is a mandatory field. <p>You can either add the file details using data template or manually. Click Data File Template icon to select the Data Source entities and click Save.</p> <div data-bbox="565 1438 1412 1795" style="border: 1px solid black; padding: 5px;"> <p>Data file Template ✕</p> <p>Data Source extdata</p> <table border="0"> <tr> <td style="vertical-align: top;"> <p>Available entity</p> <ul style="list-style-type: none"> ▶ <input type="checkbox"/> AAL_DMT_DEFINITION ▶ <input type="checkbox"/> CONTACTS ▶ <input type="checkbox"/> DIM_BANDS ▶ <input type="checkbox"/> DIM_BASEL1_ISSUER_TYPE ▶ <input type="checkbox"/> DIM_BASEL1_PRODUCT_TYPE ▶ <input type="checkbox"/> DIM_BASEL_ASSET_CLASS </td> <td style="vertical-align: top;"> <p>Selected entity</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> N_BAND_UPPER_BOUND_VALUE ✕ <input checked="" type="checkbox"/> N_BAND_CODE ✕ <input checked="" type="checkbox"/> N_BAND_LOWER_BOUND_VALUE ✕ </td> </tr> </table> </div> <p>OR</p>	<p>Available entity</p> <ul style="list-style-type: none"> ▶ <input type="checkbox"/> AAL_DMT_DEFINITION ▶ <input type="checkbox"/> CONTACTS ▶ <input type="checkbox"/> DIM_BANDS ▶ <input type="checkbox"/> DIM_BASEL1_ISSUER_TYPE ▶ <input type="checkbox"/> DIM_BASEL1_PRODUCT_TYPE ▶ <input type="checkbox"/> DIM_BASEL_ASSET_CLASS 	<p>Selected entity</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> N_BAND_UPPER_BOUND_VALUE ✕ <input checked="" type="checkbox"/> N_BAND_CODE ✕ <input checked="" type="checkbox"/> N_BAND_LOWER_BOUND_VALUE ✕
<p>Available entity</p> <ul style="list-style-type: none"> ▶ <input type="checkbox"/> AAL_DMT_DEFINITION ▶ <input type="checkbox"/> CONTACTS ▶ <input type="checkbox"/> DIM_BANDS ▶ <input type="checkbox"/> DIM_BASEL1_ISSUER_TYPE ▶ <input type="checkbox"/> DIM_BASEL1_PRODUCT_TYPE ▶ <input type="checkbox"/> DIM_BASEL_ASSET_CLASS 	<p>Selected entity</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> N_BAND_UPPER_BOUND_VALUE ✕ <input checked="" type="checkbox"/> N_BAND_CODE ✕ <input checked="" type="checkbox"/> N_BAND_LOWER_BOUND_VALUE ✕ 		

Field	Description
	<p>Click Add icon to add the details such as Physical Name, Logical Name, Data Type, and Field Order manually and click Save.</p>  <p>Click Reorder Grid option to reorder the field orders.</p>
Database Type	<p>If the Type field is selected as JDBC, the following options are displayed. Select the Database Type as Oracle or Hive.</p> <p>Note: Selected tables during Hive sourcing should be preexisting in the RDBMS data schema before the workspace population.</p> <p>If you select Database Type as Oracle (see Figure 10), then following additional fields are displayed to enter details:</p> <ul style="list-style-type: none"> • Wallet Alias : Enter the Wallet Alias. This value should be same as configured using Oracle Wallet. For more information, see the Oracle Financial Services Model Management and Governance Installation Guide • Table Owner: Enter the Oracle Database schema name. This is an optional field. <p>If you select Database Type as Hive (see Figure 11), then following additional fields are displayed to enter details:</p> <ul style="list-style-type: none"> • User Name: User Name / Principal is used for Kerberos authentication. Example: mmg/hostname@ORACLE.COM. • Table Owner: Enter the Hive schema. • JDBC Connection String: Enter the JDBC Connection String. Example: jdbc:hive2://hostname:10000/default;principal=hive/hive-service-hostname@ORACLE.COM. • JDBC Driver: Supports org.apache.hive.jdbc.HiveDriver and com.cloudera.hive.jdbc4.HS2Driver. • Keytab File Name: Enter the Name of the keytab file present in conf directory. Example: mmg.keytab • Realm File Name: Enter the Name of the configuration file present in conf directory. Example: krb5.conf <p>NOTE:</p> <ul style="list-style-type: none"> • Schema population for Hive as target is not supported. • This is applicable only for Sandbox Workspace. <p>For more information on setting the environment, see the Oracle Financial Services Model Management and Governance Installation Guide.</p>

5. Click **Create**.

The Data Store is created.

NOTE Click **Test Connection** to check the connection. A success message is displayed.

6.1.2 Viewing the Data Store details

To view the Data Store details, Click **Action** icon next to corresponding Workspace and select **View**

The screenshot shows a dialog box titled "View Data Store" with a close button (X) in the top right corner. The dialog contains several input fields and dropdown menus:

- Data Store Name:** GraphTarget
- Description:** GraphTarget
- File Availability:** JDBC (dropdown menu)
- Database Type:** Oracle (dropdown menu)
- Wallet Alias:** graph_als
- Table Owner:** mmg8125graphnew1

6.2 Conda Environments

Conda as a package manager helps you find and install packages. As an environment manager, you can set up a totally separate environment to run different versions of Python. In addition, you can continue to run your usual version of Python in your normal environment.

NOTE The supported version of Conda is 3.9.x.

You must add the `miniconda/bin` directory in the following path variable as shown below:

PATH=/scratch/ofsaadb/miniconda3/bin:\$PATH

For proxy support, you need to manually configure the `.condarc` file present in the root directory.

Limitation: Conda support currently does not include linking externally created environments to the MMG application.

To configure:

Add the below in the `.condarc` file.


proxy_servers:

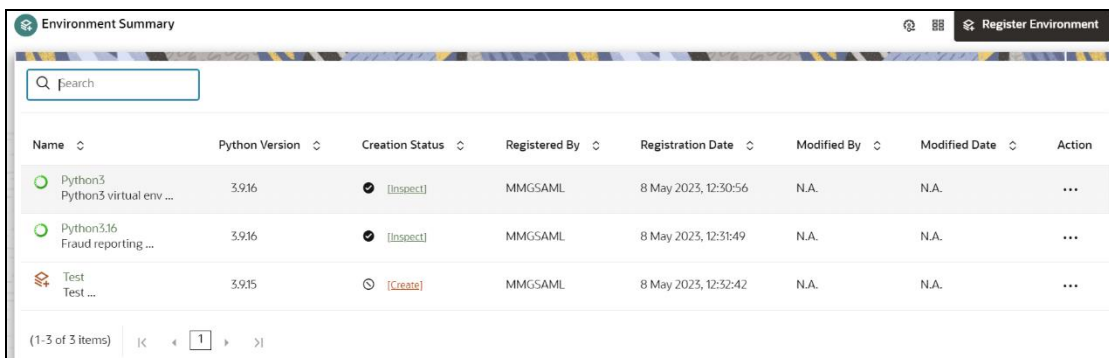
- http: http://www-proxy.idc.oracle.com:80
- https: http://www-proxy.idc.oracle.com:80

NOTE

- Conda package search is restricted only to the package name and does not include versions.
- Python version is displayed in the Register Conda UI.



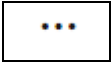
For more details on user roles, and permissions, see the [Functions and Roles required to perform CRUD operations for Conda](#) section.

Click the **Conda Environments**  icon to navigate to the **Environment Summary** page from any other window in the MMG application. You can register and manage Conda environments from this page.




The following table provides descriptions for the fields and icons on the **Environment Summary** page.

Field or Icon	Description
Search	The field to search for a Conda environment. Enter specific terms in the field for which you want to search, and press Enter on the keyboard to display the results. NOTE: Conda package search is restricted only to the package name and does not include versions.
Name	The name of the Conda environment.
Python Version	The python library version of the Conda environment.
Creation Status	The status of the Conda environment. The status can be either Inspect or Create. <ul style="list-style-type: none"> • Inspect: The environment is registered and created. You can perform functions such as Edit/View/Inspect/Clone/Export/Remove for the Inspect status environments. • Create: The environment is registered but not created. You can perform functions such as Create/Edit/View/Deregister for the Create status environments
Registered By	The User Id of the User who registered the Conda environment.
Registration Date	The date on which the Conda environment has been registered.

Field or Icon	Description
Modified By	The ID of the Last Modified by user who has modified the Conda environment.
Modified Date	The date on which the Conda environment was modified.
Register Environment	Click to register a new Conda environment.
Conda Settings 	Click to add or modify the Conda components settings.
Conda Properties 	Click to view the Conda properties.
Action 	Click the three dots to perform Edit/View/Inspect/Clone/Export/Remove functions on selected Conda environment. The functions might vary based on the selected Conda environment.

6.2.1 Register a Conda Environment

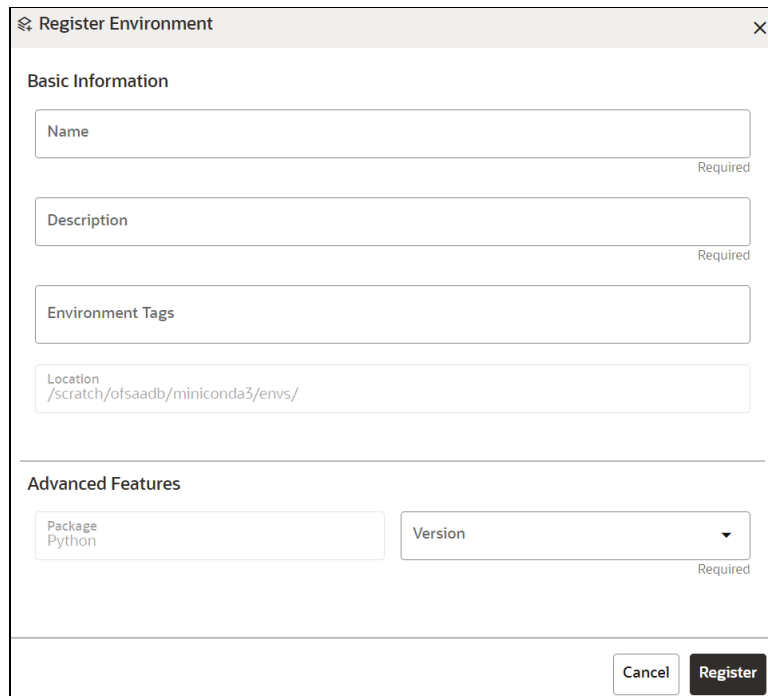
To register a Conda environment:

1. Click the **Conda Environments**  icon to navigate to the **Environment Summary** page from any other window in the MMG application.

This page displays the Conda environments in a tabular format.

2. In the **Environment Summary** screen, click **Register Environment**.

The **Register Environment** page is displayed.



3. Enter the **Name** for the environment. This field is mandatory.

4. Enter a **Description** of the environment. This field is mandatory.
5. Enter a tag in the **Environment Tags** field. You can add multiple tags.

NOTE

The **Location** of the Conda environment is displayed. This field is grayed out and cannot be modified.


6. In the **Advanced Features** drop-down list, select the required Python package for the Conda environment. Python as a package is the default selection.
7. Click **Register**.

The Conda environment is registered and displayed in the Environment Summary page.

After the environment registration is complete, you must create the Conda environment. For more details, see the [Creating a Conda Environment](#) section.

6.2.2 Create a Conda Environment

To create a Conda environment:

1. Click the **Conda Environments**  icon to navigate to **Environment Summary** page from any other window in the MMG application.

This page displays the Conda environments in a tabular format.

2. Click **Action**  and select **Create**  to create the Conda environment.

NOTE

The **Create** option is not displayed for Conda environments whose creation status is **Inspect**.

A confirmation message is displayed.

3. Click **Create**.


The Conda environment is created.

These environments can be selected while creating a Workspace. For more details, see the [Workspace Schema](#) section.

In addition, these environments can be selected when executing the Model pipeline.

6.2.3 Edit a Conda Environment

To edit a Conda environment:

1. Click the **Conda Environments**  icon to navigate to the **Environment Summary** page from any other window in the MMG application.

This page displays the Conda environments in a tabular format.

2. Click **Action**  and select **Edit**  to edit the details.

The **Edit Environment** page is displayed.

For more details on the Edit environment fields, see [Registering a Conda Environment](#) section.


NOTE The **Name** of the Conda environment is grayed out and cannot be modified.

3. Click **Update**.

The details of the Conda environment are updated.

6.2.4 View a Conda Environment

To view a Conda environment details:

1. Click the **Conda Environments**  icon to navigate to the **Environment Summary** page from any other window in the MMG application.

This page displays the Conda environments in a tabular format.

2. Click **Action**  and select **View**  to view the details.


The details of the Conda environment are displayed.

The screenshot shows a 'View Environment' dialog box with the following fields:

- Name:** Python3
- Description:** Python3 virtual env
- Environment Tags:** conda, python
- Location:** /scratch/ofsaadb/miniconda3/envs/Python3
- Advanced Features:**
 - Package:** Python
 - Version:** 3.9.16 (Recommended)

6.2.5 Deregister a Conda Environment

To deregister a Conda environment:

1. Click the **Conda Environments**  icon to navigate to the **Environment Summary** page from any other window in the MMG application.

This page displays the Conda environments in a tabular format.

2. Click **Action**  and select **Deregister**  to deregister the Conda environment.

NOTE The **Deregister** option is not displayed for Conda environments whose creation status is **Inspect**.


A confirmation message is displayed.

3. Click **Deregister**.

The registered Conda environment is deregistered and removed from the Environment Summary page.

6.2.6 Inspect a Conda Environment

To inspect a Conda environment:

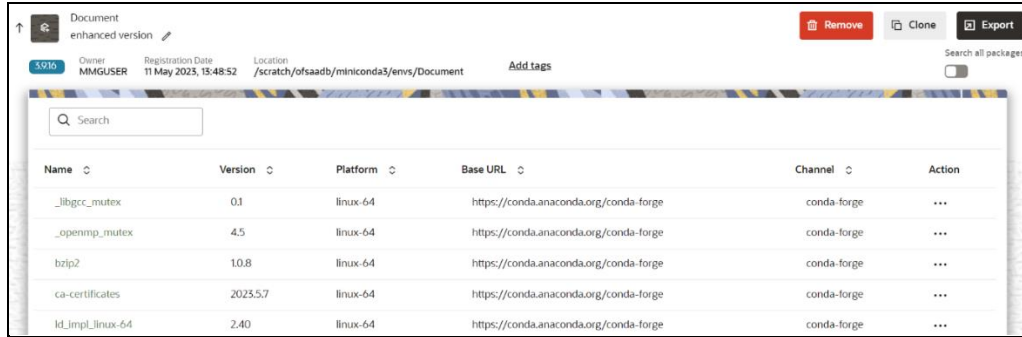
1. Click the **Conda Environments**  icon to navigate to the **Environment Summary** page from any other window in the MMG application.

This page displays the Conda environments in a tabular format.

2. Click **Action**  and select **Inspect**  to edit the details.

NOTE The **Inspect** option is not displayed for Conda environments whose creation status is **Create**.

The Conda environment details are displayed.



You can perform the following actions:

- [Remove Environment](#)
- [Clone Environment](#)
- [Export Environment](#)
- [Edit a Conda Environment Description](#)
- [Add or Remove the Environment Tags](#)
- [Search All Packages](#)
- [View Package Properties](#)
- [Update a Package](#)
- [Remove a package](#)

6.2.6.1 Remove Environment

To remove a Conda environment:

1. In the Conda details page, click **Remove**.
A confirmation message is displayed.
2. Click **Remove**.


The Conda environment is deregistered and removed from the **Environment Summary** page.

6.2.6.2 Clone Environment

To clone a Conda environment:

1. In the Conda details page, click **Clone**.
The **Clone Environment** page is displayed.


🏠 Clone Environment
✕

All packages of "Python3" will be cloned into the target environment. 

Required

Required

Show Command ⓘ

NOTE You can preview the packages of the current Conda environment by clicking the **Preview**  icon.

2. Enter the **Target Environment Name** to which the current environment needs to be cloned.
3. Enter the **Target Environment Description**.
4. Enter a tag in the **Environment Tags** field. You can add multiple tags.
5. Click **Clone**.

The Conda environment is cloned to the targeted environment.

6.2.6.3 Export Environment


To export a Conda environment:

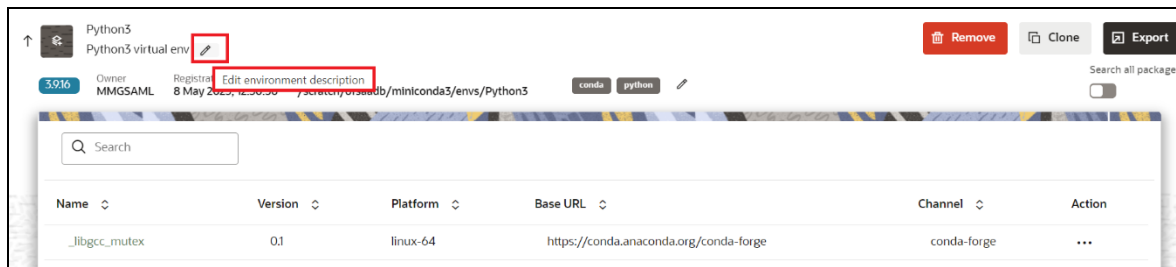
1. In the Conda details page, click **Export**.

The Conda environment is exported in **yml** format.

6.2.6.4 Edit a Conda Environment Description

To edit a Conda environment description:

1. In the Conda details page, click the **Edit**  icon.



2. Modify the description and click **Save**.


NOTE

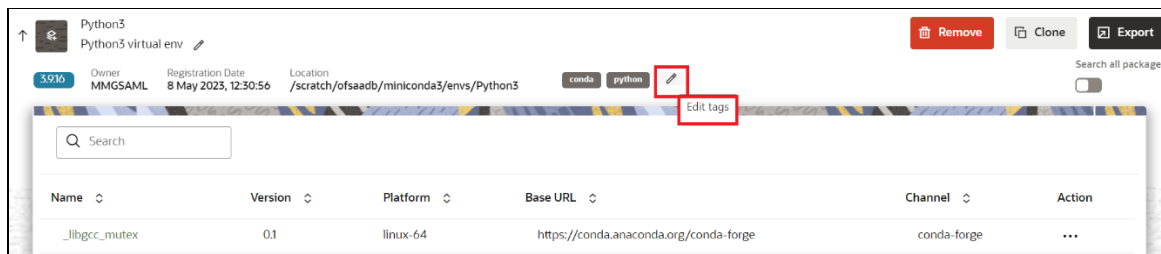
The **Name** of the Conda environment cannot be modified.

The details of the Conda environment are updated.

6.2.6.5 Add or Remove Environment Tags

To add or remove Environment Tags:

1. In the Conda details page, click **Edit** .



2. Add or remove the environment tags, and click **Save**.

The environment tag details of the Conda environment are updated.

6.2.6.6 Search All Packages

To search all the packages:

1. In the Conda details page, enable the **Search all packages** option.
2. If you want to search the packages in cache, enable the **Look up in cache** option.



This option is set to true by default for faster processing. The searched package is looked up in the cache and the result published, if found. If not, a new search in the conda-forge channel is performed. You can toggle this option if you expect more recent versions to be available.

3. Enter the package name in the search bar and press **Enter**.

All the packages meeting your search criteria are displayed.

Click the **Action** icon to view and install packages.

6.2.6.7 View Package Properties

To view package properties of the Conda environment, on the Conda details page, click **Action**  and select **View** .



The details of the package are displayed.



Key	Value
build_string	<i>conda_forge</i>
dist_name	<i>_libgcc_mutex-0.1-conda_forge</i>
base_url	<i>https://conda.anaconda.org/conda-forge</i>
channel	<i>conda-forge</i>
name	<i>_libgcc_mutex</i>
version	<i>0.1</i>
platform	<i>linux-64</i>


6.2.6.8 Update Package

To update the package of the Conda environment:

1. In the Conda details page, click **Action**  and select **Update** . A confirmation message is displayed.
2. Click **Update**. The selected package is updated.


6.2.6.9 Remove a package

To remove a package from the Conda environment:



1. In the Conda details page, click **Action**  and click **Remove**. A confirmation message is displayed.
2. Click **Remove**. The selected package is removed.

6.2.7 Clone Environment

To clone a Conda environment:


1. Click the **Conda Environments**  icon to navigate to the **Environment Summary** page from any other window in the MMG application.

This page displays the Conda environments in a tabular format.

2. Click **Action**  and select **Clone** .

The **Clone Environment** page is displayed.


🔗 Clone Environment
✕

All packages of "Python3" will be cloned into the target environment. 

Required

Required

Show Command ⓘ
Cancel
Clone


NOTE You can preview the packages of the current Conda environment by clicking the **Preview**  icon.

3. Enter the **Target Environment Name** to which the current environment has to be cloned.
4. Enter the **Target Environment Description**.
5. Enter a tag in the **Environment Tags** field. You can add multiple tags
6. Click **Clone**.



The Conda environment is cloned to the targeted environment.

6.2.8 Export Environment

To export a Conda environment:

1. Click the **Conda Environments**  icon to navigate to the **Environment Summary** page from any other window in the MMG application.


This page displays the Conda environments in a tabular format.

2. Click **Action**  and select **Export** .



The Conda environment is exported in **yml** format.

6.2.9 Remove Environment

To remove the Conda environment:

1. Click the **Conda Environments**  icon to navigate to the **Environment Summary** page from any other window in the MMG application.

This page displays the Conda environments in a tabular format.

2. Click **Action**  and select **Remove** .


A confirmation message is displayed.

3. Click **Remove**.

The Conda environment is deregistered and removed from the **Environment Summary** page.

6.2.10 Modify Conda Settings

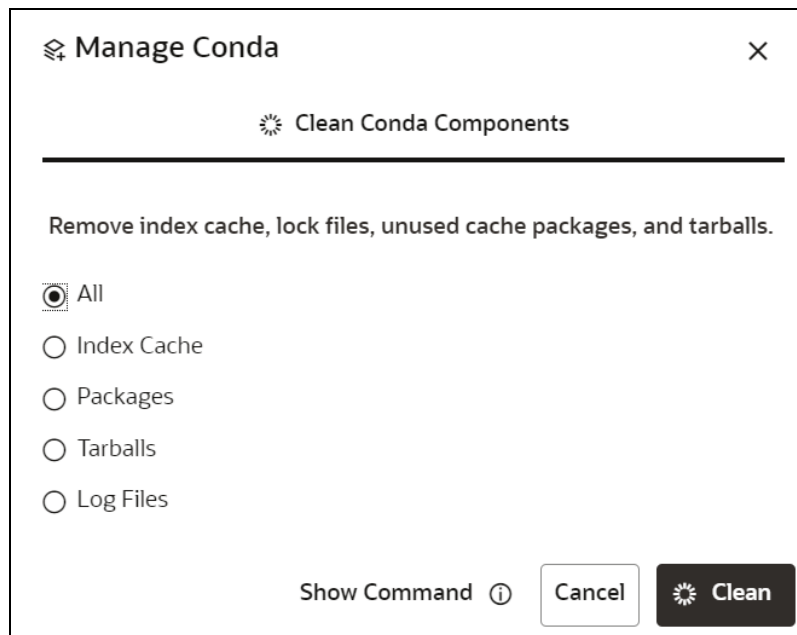
To modify the Conda settings:

1. Click the **Conda Environments**  icon to navigate to the **Environment Summary** page from any other window in the MMG application.

This page displays the Conda environments in a tabular format.

2. Click the **Conda Settings**  icon.

The **Manage Conda** screen is displayed.




3. Select the required option and click **Clean**.

- **All** : Removes index cache, lock files, unused cache packages, and tarballs.
- **Index Cache** : Removes index cache.
- **Packages** : Removes unused packages from writable package caches. **WARNING:** This does not check for packages installed using symlinks back to the package cache.
- **Tarballs** : Removes cached package tarballs.
- **Log Files** : Removes log files.

This will clean up the Conda components based on the selection.

6.2.11 View Conda Properties

To view Conda properties:

1. Click the **Conda Environments**  icon to navigate to the **Environment Summary** page from any other window in the MMG application.

This page displays the Conda environments in a tabular format.

2. Click the **Conda Properties**  icon.

The Conda properties are displayed in a key-value format.

Key	Value
conda_version	23.3.0
conda_env_version	23.3.0
pkgs_dirs	/scratch/ofsaadb/miniconda3/pkgs, /scratch/ofsaadb/.conda/pkgs
av_data_dir	/scratch/ofsaadb/miniconda3/etc/conda
platform	linux-64
default_prefix	/scratch/ofsaadb/miniconda3
site_dirs	~/local/lib/python3.9, ~/local/lib/python3.10
sys.executable	/scratch/ofsaadb/miniconda3/bin/python
rc_path	/scratch/ofsaadb/.condarc
python_version	3.9.16.final.0

6.3 API Configurations

Using API configurations, you will be able to register APIs above workspace level. Configured APIs can be mapped to multiple workspaces and the mapped APIs will be available for use in model pipelines.

Currently, only token-based and noAuth authentications are supported. Additionally, body parameters can only be provided with text data. All values that need to be replaced during run time can be given in the format '<<placeholder variable name>>'.

Configured APIs can be viewed, edited (API code is not editable) and deleted. APIs that are not mapped to any workspace can only be deleted.

Integrating API with Model Pipelines

Mapped APIs will be available for use in model pipelines for the workspace. By selecting a specified API from the drop-down, you can link a node with an API. Additionally, you can provide an output variable name which will be assigned with the response from the API when that node is executed.


NOTE API configurations are available only for %python interpreters. Output variable will be a python variable accessible only for paragraphs with %python interpreters.

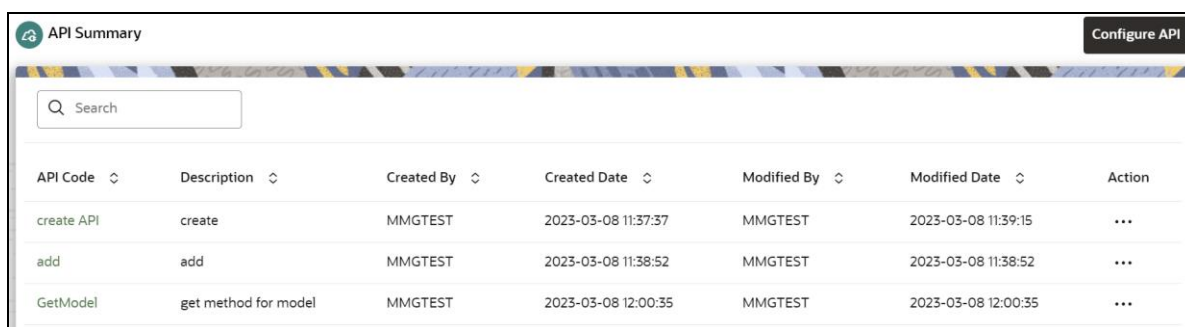
In the Pipeline Execute screen, values can be entered for all the placeholder variables during run time.

NOTE Since variables are fetched during run time, they will be available in notebook or execute screen only after the first execution. This is the default behavior of all programmatic dynamic forms in Datastudio.

On executing the node/pipeline, the result of the API executed can be accessed from the variable given under 'Output_variable_name'.

When the pipeline is imported to another workspace, it will seamlessly use the API that is mapped with the target workspace in the same order as that of the API mapped in the source workspace.

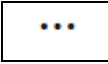
Click the **API Configurations**  icon to navigate to the **API Summary** page from any other window in the MMG application. You can configure and manage APIs from this page.



API Code	Description	Created By	Created Date	Modified By	Modified Date	Action
create API	create	MMGTEST	2023-03-08 11:37:37	MMGTEST	2023-03-08 11:39:15	...
add	add	MMGTEST	2023-03-08 11:38:52	MMGTEST	2023-03-08 11:38:52	...
GetModel	get method for model	MMGTEST	2023-03-08 12:00:35	MMGTEST	2023-03-08 12:00:35	...


The following table provides descriptions for the fields and icons on the **API Summary** page.

Field or Icon	Description
Search	Search for an API. Enter specific terms for which you want to search, and press Enter on the keyboard to display the results.
API Code	The code of the API.
Description	The description for the API.

Field or Icon	Description
Created By	The User ID of the user who created the API.
Created Date	The date on which the API was created.
Modified By	The ID of the user who has last modified the API.
Modified Date	The date on which the API was modified.
Configure API	Click Configure API to create a new API.
Action 	Click this icon to View, Edit, or Delete the selected API.

6.3.1 Configure an API

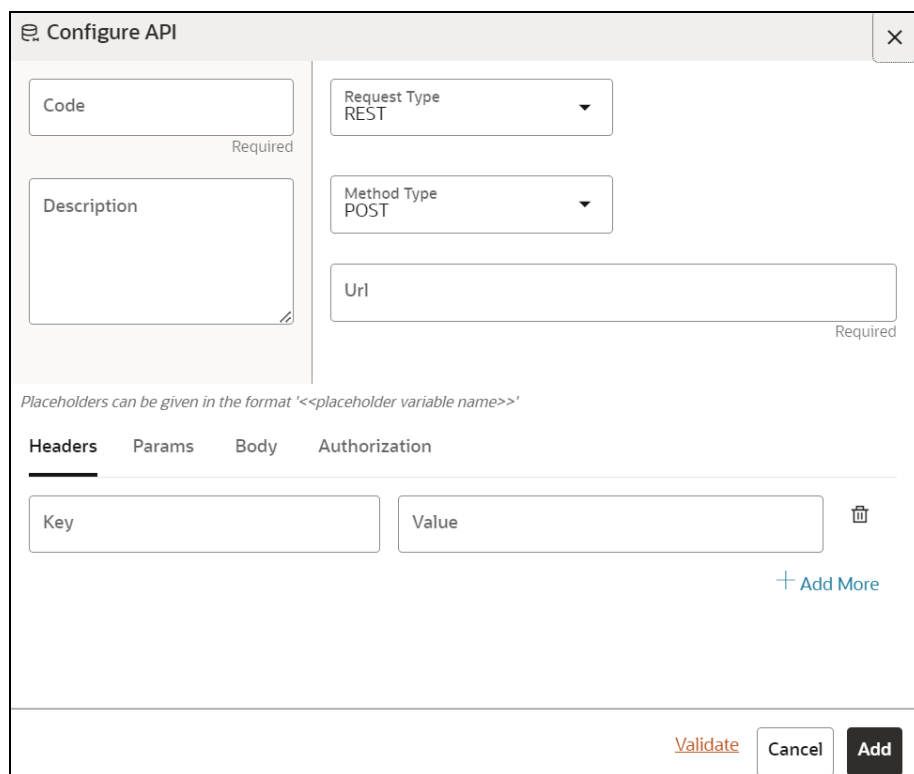
To configure an API:

1. Click the **API Configurations**  icon to navigate to the **API Summary** page from any other window in the MMG application.

This page displays the API records in a tabular format.

2. Click the **Configure API** button.

The **Configure API** page is displayed.



3. Enter the **Code** for the API. This field is mandatory.
4. Enter the **Description** for the API.

5. In the **Request Type** drop-down list, select the required option. Currently, REST type is supported.
6. In the **Method Type** drop-down list, select the required option. The supported types are GET, POST, PUT, and DELETE.
7. Enter the **URL** for the API. This field is mandatory.
8. You can provide the details such as Headers, Params, Body, and Authorization under the respective fields.
9. Click **Validate** to validate the API details.


You are prompted to add the values for all the placeholder variables. After entering the values for placeholders, click the **Validate** button to view the API responses.

10. Click **Add**.

The API is added and displayed in the **API Summary** page. These APIs can be selected while creating a Workspace. For more details, see the [Workspace Schema](#) section.

6.3.2 View an API Configuration

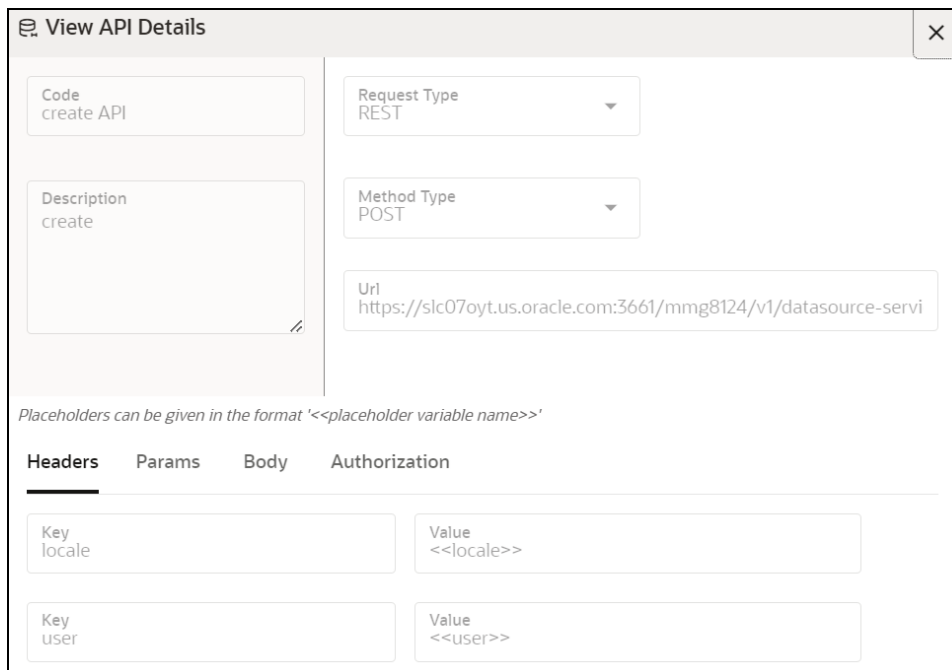
To view an API configuration:

1. Click the **API Configurations**  icon to navigate to the **API Summary** page from any other window in the MMG application.

This page displays the API records in a tabular format.

2. Click **Action**  and select **View** .

The details of the API are displayed.



View API Details

Code
create API

Description
create

Request Type
REST

Method Type
POST

Uri
https://slc07oyt.us.oracle.com:3661/mmg8124/v1/datasource-servi

Placeholders can be given in the format '<<placeholder variable name>>'


Headers Params Body Authorization

Key	Value
locale	<<locale>>
user	<<user>>



3. Navigate to the Headers, Params, Body, and Authorization tabs to view the respective details.

6.3.3 Edit an API Configuration

To edit an API configuration:

1. Click the **API Configurations**  icon to navigate to the **API Summary** page from any other window in the MMG application.

This page displays the API records in a tabular format.

2. Click Action  and select the **Edit**  icon.


The **Edit API Details** page is displayed.

For more details on the available fields, see the [Configuring an API](#) section.



3. Click **Save**.

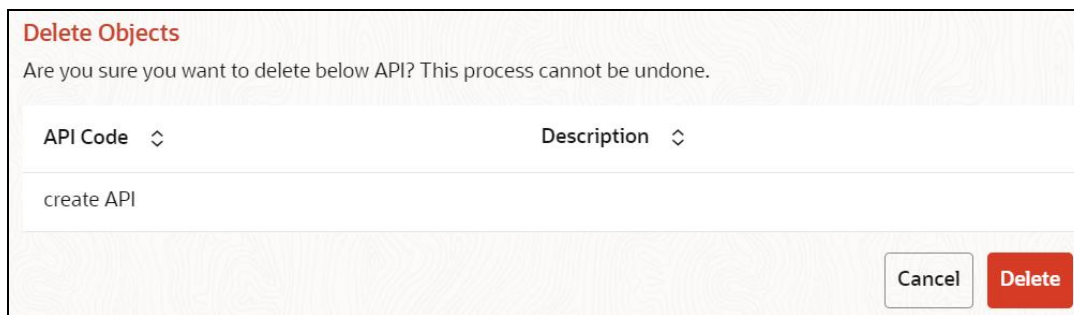
6.3.4 Delete an API Configuration

To delete an API configuration:

1. Click the **API Configurations**  icon to navigate to the **API Summary** page from any other window in the MMG application.

This page displays the API records in a tabular format.

2. Click Action  and select **Delete**  .




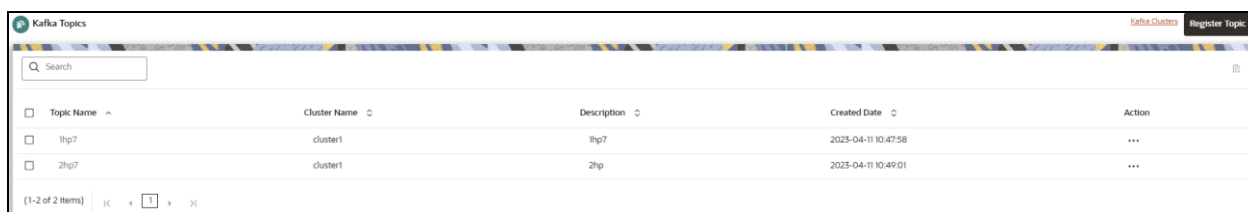
3. Click **Delete**.

The API configuration is deleted.

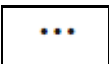
6.4 Kafka Topics

Kafka is a distributed data source which is used to create real-time data pipelines and enables you to decouple data streams and systems.

Click the **API Configurations**  icon to navigate to the **API Summary** page from any other window in the MMG application. You can configure and manage Kafka topics and clusters from this page.




The following table provides descriptions for the fields and icons on the **Kafka Topics** page.

Field or Icon	Description
Search	Search for Kafka topics and clusters. Enter your search criteria and press Enter on the keyboard.
Topic Name	The topic name of the Kafka.
Cluster Name	The cluster name of the Kafka.
Description	The description of the Kafka.
Created Date	The date on which the Kafka was created.
Kafka Clusters	Click Kafka Clusters to view, create, or delete Kafka clusters.
Register Kafka	Click Register API to create a new Kafka topic.
Action 	Click this icon to view, edit, or delete a selected Kafka topic.

6.4.1 Create a Kafka Cluster

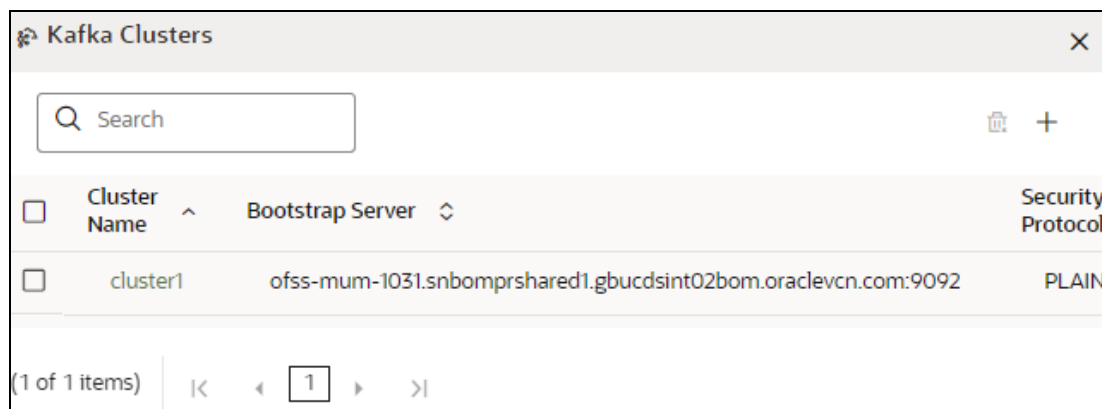
To create a Kafka Cluster:

1. Click the **Kafka Topics**  icon to navigate to the **Kafka Topics** page from any other window in the MMG application.

This page displays the Kafka Topics in a tabular format.

2. Click the **Kafka Clusters** option.

The **Kafka Clusters** page is displayed.



3. Click the **Add** icon.
- The Add Cluster window is displayed.
4. Enter the **Cluster Name**. This field is mandatory.
5. Enter the **Bootstrap server** details. This field is mandatory.

NOTE

In the current release:


- The Kafka feature is not supported in the Solaris OS.

6. Click **Save**.

The Kafka cluster is created and will be displayed while registering the Kafka Topic.

6.4.2 Delete a Kafka Cluster

To delete a Kafka Cluster:

1. Click the **Kafka Topics**  icon to navigate to the **Kafka Topics** page from any other window in the MMG application.

This page displays the Kafka Topics in a tabular format.

2. Click the **Kafka Clusters** option.

The **Kafka Clusters** page is displayed.

3. Select the Kafka Cluster which you want to delete and click **Delete**.


A confirmation message is displayed.

4. Click **Delete**.

The Kafka Cluster is deleted.

6.4.3 Register a Kafka Topic

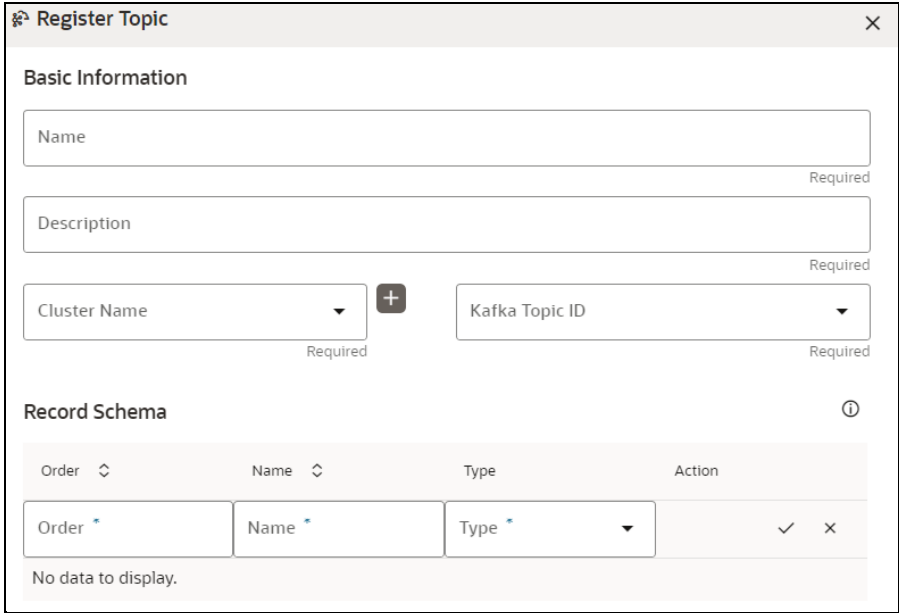
To register a Kafka Topic:

1. Click the **Kafka Topics**  icon to navigate to the **Kafka Topics** page from any other window in the MMG application.

This page displays the Kafka Topics in a tabular format.

2. Click the **Register Topic** button.

The **Register Topic** page is displayed.



The screenshot shows the 'Register Topic' form with the following fields and sections:

- Basic Information:**
 - Name (Required)
 - Description (Required)
 - Cluster Name (Required) with a '+' icon to add a new cluster.
 - Kafka Topic ID (Required)
- Record Schema:**
 - Order (Required)
 - Name (Required)
 - Type (Required)
 - Action (Contains checkmark and close icons)

At the bottom of the Record Schema section, it says 'No data to display.'

3. Enter the **Kafka Topic Name**. This field is mandatory.
4. Enter the **Description** for the Kafka Topic. This field is mandatory.
5. In the **Cluster Name** list, select the required cluster or click + to add a new cluster. This field is mandatory.
6. Based on the selected cluster, the associated **Kafka Topic IDs** are displayed. Select the required Kafka Topic ID. This field is mandatory.
7. In the **Record Schema** field, enter the order, name, and the data type for the Kafka topic.


NOTE Currently, **PyFlink**, **Python**, and **Java** schema types are supported. For more details, click the icon next to Record Schema field.

8. Click **Register**.



The Kafka topic is added and displayed in the Kafka Topics page. These topics can be selected while creating a Workspace.

6.4.4 View a Kafka Topic

To view a Kafka Topic:

1. Click the **Kafka Topics**  icon to navigate to the **Kafka Topics** page from any other window in the MMG application

This page displays the Kafka Topics in a tabular format.

2. Click **Action**  and select **View** .

The details of the Kafka Topic are displayed.

View Topic
✕

Basic Information

Topic Name
1hp7

Topic Description
1hp7

Cluster Name
cluster1

Kafka Topic ID
1hp7


Record Schema Schema Type ⓘ

pyflink



Order ↕	Name ↕	Type
1	account_id	Types.STRING()
2	atm	Types.STRING()
3	amount	Types.INT()
4	transaction_id	Types.STRING()

6.4.5 Edit a Kafka Topic

To edit a Kafka Topic:

1. Click the **Kafka Topics**  icon to navigate to the **Kafka Topics** page from any other window in the MMG application.

This page displays the Kafka Topics in a tabular format.

2. Click Action  and select **Edit** .

The **Edit Topic** page is displayed.

🔗 Edit Topic
✕

Basic Information

Topic Name
lhp7

Topic Description
lhp7

Cluster Name
cluster1

Kafka Topic ID
lhp7

Record Schema

Schema Type ⓘ
 pyflink


Order	Name	Type	Action
			✓ ✕
1	account_id	Types.STRING()	✎ 🗑
2	atm	Types.STRING()	✎ 🗑
3	amount	Types.INT()	✎ 🗑
4	transaction_id	Types.STRING()	✎ 🗑

For more details on the Kafka Topic fields, see the [Registering a Kafka Topic](#) section.



3. Click **Update**.

6.4.6 Delete a Kafka Topic

To delete a Kafka Topic:

1. Click the **Kafka Topics**  icon to navigate to the **Kafka Topics** page from any other window in the MMG application.

This page displays the Kafka Topics in a tabular format.

2. Click Action  and select **Delete** .

A confirmation message is displayed.

NOTE You cannot delete a Kafka Topic mapped to a workspace.

Click **Delete**. The Kafka Topic is deleted.

6.5 OFSAA Environment

NOTE The user must be mapped to ENVACCESS role to view the OFSAA Environment option.

You can register OFSAA environment (Simulation and Production) from this page.

To register a OFSAA environment:

1. Navigate to the OFSAA environment page.
This page displays the OFSAA environments in a tabular format.
2. Click **Register Environment** button.

The **Register Environment** page is displayed.

The screenshot shows a web form titled "Register Environment". It includes the following fields and elements:

- Name:** A text input field containing "Production".
- Description:** A text area containing "Development".
- Type:** A dropdown menu with "Production" selected.
- Properties:** A section containing a table with two columns: "Key" and "Value".
 - The "Key" column has a dropdown menu and a "Required" label below it.
 - The "Value" column has an input field, a "Required" label below it, and a trash icon to its right.
- + Add More:** A button at the bottom right of the form.

3. Enter the environment **Name**. This field is mandatory.
4. Enter the **Description** for the environment. This field is mandatory.
5. In the **Type** field, select the environment as either **Production** or **Simulation**.
6. In the **Key** field, select the required option from the drop-down and enter value for the selected property. You can add more properties by clicking **Add More** icon.
7. Click **Create**.

The OFSAA Environment is added and displayed in the OFSAA Environment page.



You can view, edit, and delete OFSAA environments by clicking **Actions** icon.

6.6 Data Studio Options

MMG contains an underlying Notebook Server which has the following configurable options:

- Interpreters
- Tasks
- Permissions
- Credentials
- Templates

To access the Data Studio Options page:

1. Click **Launch Workspace**  to launch the workspace to display the **MMG Dashboard** window with the application configuration and model creation menu.
2. Hover your mouse over the Data Studio Options widget . The following options are available:
 - Interpreters
 - Tasks
 - Permissions
 - Credentials
 - Templates

6.6.1 Configure Interpreters

An interpreter is a program that directly executes instructions written in a programming or scripting language without requiring they previously be compiled into a machine language program. Interpreters are plug-ins that enable you to use a specific language to process data in the backend. Examples of Interpreters are jdbc-interpreter, spark-interpreters, python-interpreters, etc. Interpreters help you define customized drivers, URLs, passwords, connections, SQL results to display, etc.

In OFS Compliance Studio, Interpreters are used in Notebooks to execute code in different languages. Each Interpreter has a set of properties that are adjusted and applied across all notebooks. For example, using the python-interpreter makes it possible to change between versions, whereas the jdbc-interpreter offers customization of the URL, schema, or credentials. In MMG, you can either use a default interpreter variant or create a new variant for an interpreter. You can create more than one variant for an interpreter. The benefit of creating multiple variants for an Interpreter is to connect different versions of interpreters (Python ver:3, Python ver:2, etc.). This helps connect a different set of users and database schema. For example, Compliance Studio schema, BD schema, etc. Compliance Studio provides secure and safe credential management such as Oracle Wallet (jdbc wallet), Password (jdbc password), or KeyStores to link to interpreter variants to access secured data.

MMG has ready-to-use interpreters such as fcc-python, jdbc Interpreter, etc. You can configure them based on your need. Additional variants of interpreters are created as multiple users might require different settings to access the database securely. The jdbc Interpreters use the credentials to enable secure data access.

NOTE fcc-python, Pyspark, spark, and ore are a few other available interpreters.

Interpreters are configured when you want to modify URL, data location, drivers, enable or disable connections, etc.

To configure ready-to-use interpreters:

1. Click the Interpreter that you want to view from the list displayed on the LHS. The default configured interpreter variant is displayed.
2. Modify the values in the fields as required. For example, to modify a parameter's limit, connect to a different schema, PGX server, etc.
3. Click Update. The modified values are updated in the Interpreter.

For more information on Interpreters, see the *Interpreter Configuration and Connectivity* section in the OFS Compliance Studio Administration and Configuration Guide.

6.6.2 Manage Tasks

Tasks are created when notebooks or paragraphs are executed by the Notebook users. It is important to know the status of the execution: are the tasks created, rejected, canceled, etc. On the Tasks page you can view the status of the task and associated notebooks, paragraphs, interpreters, etc. By default, all the tasks are listed on the Task page. You can view a specific task using filters such as task status, date of creation, and notebook name.

For more information on tasks, see the *Monitoring Tasks on Notebook Server* section in the OFS Compliance Studio Administration and Configuration Guide.

6.6.3 Manage Permissions

You can view the logged-in users and view, add, or modify ready-to-use permissions granted to the users, roles, or groups. You can create groups, roles, and permission templates (actions).

NOTE You can only view users and their details.

See the *User Access and Permissioning Management* section in the OFS Compliance Studio Administration and Configuration Guide.

6.6.4 Manage Credentials

Compliance Studio provides secure and safe credential management. Examples of credentials are passwords, Oracle Wallets, or KeyStores. This section links credentials (a wallet and a password) to the jdbc interpreter variant to enable secure data access. This linking enables the jdbc interpreter to securely connect to the specified Oracle Database. You can also create new credentials based on your requirement to connect to the new interpreter variants.

For more information on Credentials, see the *Link Credentials* section in the OFS Compliance Studio Administration and Configuration Guide.

NOTE You can link credentials only to the jdbc interpreter. The Credentials section is enabled if an Interpreter variant can accept credentials.

6.6.5 Configure Templates

To create, import, and set the default FCGM template in the Template Dashboard:

1. Click CS Launch Workspace to display the CS Production Workspace window.
2. Click Templates from Design Studio Options.

Compliance Studio offers different formats to view the result after a paragraph's execution. Templates enable you to define parameters to customize the result formats. You can customize the visualization of the result by defining parameters in a template and then applying that template to a notebook.

NOTE

- Compliance Studio comes with a default template, but you can not only customize this at the template level but also override any global template settings in each notebook paragraph.
- It is recommended you use the template that is available out-of-the-box in Compliance Studio.

For more information, see the *Interpreter Configuration and Connectivity* section in the OFS Compliance Studio Administration and Configuration Guide.

7 Modeling

Modeling covers the following:

- **Datasets:** Explore data, engineer features, and monitor data drifts.
- **Model Libraries:** Manage python libraries to create and use models.
- **Model Techniques:** Manage techniques and algorithms from registered model libraries.
- **Model Catalog:** A centralized hub for all your machine learning models.
- **Pipelines:** Design, deploy and govern end-to-end machine learning pipelines for seamless model development.
- **Graphs:** Analyze complex relationships within your data through interactive graph representations.

7.1 Datasets

You can define a metadata about how you want to create a dataset and also take a snapshot of real time data and store it, which you can later use in the pipeline.



This is like T2Ts, where you can select data from Data Source, such as file, table or another dataset and so on. The data can be imported from one column of one table, and another column from another table, or any file. After extracting the data from tables or files, provide the name to Target Dataset.

The Dataset is a trail-based UI that allows you to configure the dataset details.

7.1.1 Access Dataset Summary

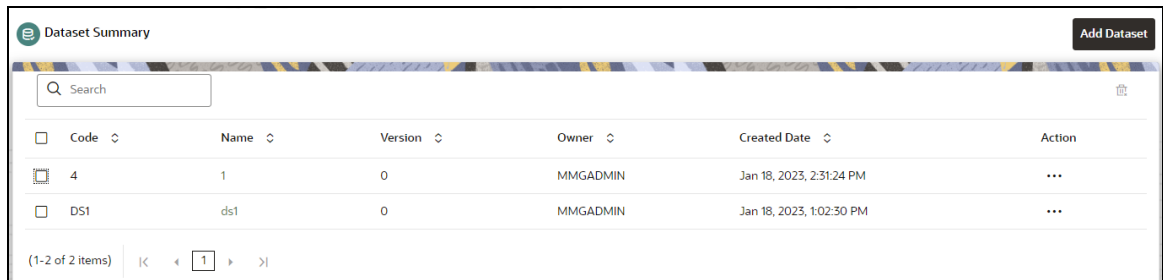
The Dataset Summary page gives access to the various Dataset functions such as create, view, and delete.

To access the Dataset Summary page:

1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. In the LHS menu, click **Dataset**  to display the **Dataset Summary** window.


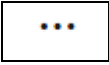
This window displays the dataset records in a table.

Figure 20: Dataset Summary Page



Code	Name	Version	Owner	Created Date	Action
4	1	0	MMGADMIN	Jan 18, 2023, 2:31:24 PM	...
DS1	ds1	0	MMGADMIN	Jan 18, 2023, 1:02:30 PM	...

The following table provides descriptions for the fields and icons on the **Dataset Summary** page.

Field or Icon	Description
Search	The field to search for Dataset. Enter specific terms in the field for which you want to search, and press Enter on the keyboard to display the results.
Code	The code of the dataset.
Name	The name of the dataset.
Description	The description for the Workspace
Version	Version of dataset
Created Date	The date on which the Dataset was created.
Owner	The owner of the dataset.
Add Dataset	Click Add Dataset to create a new Dataset.
Delete 	Click Delete to delete multiple Datasets.
Action 	Click the three dots to perform View/Edit/Delete/ Profile functions on selected dataset.

7.1.2 Create a Dataset

The Dataset creation requires entry of the source of dataset and validation. These datasets are required for schema creation.

7.1.2.1 Creating a Dataset

To create a Dataset:

1. On the Dataset Summary page, click **Add Dataset**.

Figure 21: Dataset Creation Window



The screenshot shows a progress bar at the top with four steps: 1. Define Pipeline Characteristics (active), 2. Source Selection, 3. Dataset Creation, and 4. Dataset Transformation. Below the progress bar, there are three input fields: 'Code' (with a 'Required' label), 'Dataset Name' (with a 'Required' label), and 'Description'. In the top right corner, there is a link for 'Advanced Settings'.

Provide the following information to create a Dataset:

- Define Pipeline Characteristics
- Source Selection
- Dataset Creation
- Dataset Transformation

7.1.2.2 Define Pipeline Characteristics

Enter basic configuration details in this window.

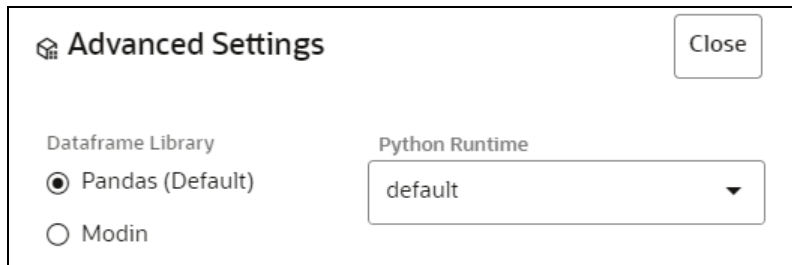
To configure the basic details for the dataset:

1. Enter the required details in the **Define Pipeline Characteristics** window as shown in the following table.

Field	Description
Code	Enter the identification code of the dataset. This field is limited to 30 alphanumeric characters.
Dataset Name	Enter the name of dataset. This field is limited to 30 alphanumeric characters. Space not exceeding 30 characters. You cannot keep this field blank.
Description	Enter the purpose of the creation of the dataset. This field is limited to 150 alphanumeric characters. Space not exceeding 150 characters.

2. Click **Advanced Settings** to select the dataframe library.

The Advanced Settings window is displayed.



3. Select either **Pandas (Default)** or **Modin** as the dataframe library and select **Python Runtime** from the drop-down and click **Close**.

- **Pandas:** An open-source data manipulation library for Python. It provides data structures such as Series (1-dimensional) and DataFrame (2-dimensional) that allow for easy manipulation and analysis of data. It also provides tools for reading and writing data to various file formats, including CSV, Excel, and SQL databases.

Pandas is the default selection.

- **Modin:** An open-source library that allows for faster operations on DataFrames using distributed computing which can lead to significant speed improvements, particularly for large datasets or computationally expensive operations.

4. Click **Next** to go to the next step.

7.1.2.3 Source Selection

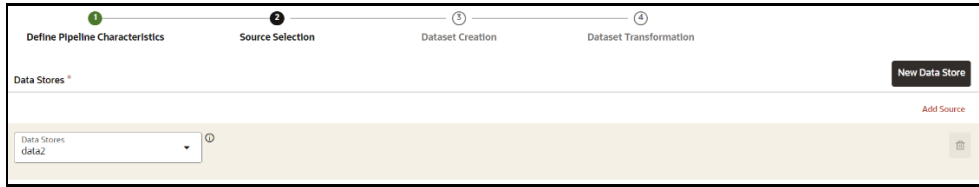
Define the source of data next. Here, you can choose the data structures from an existing datasources. Click on the icon next to Data Source field to view the tables/data source information associated with the data source.

To configure the source for the dataset:

1. Select the required **Data Store** from the drop-down.

OR

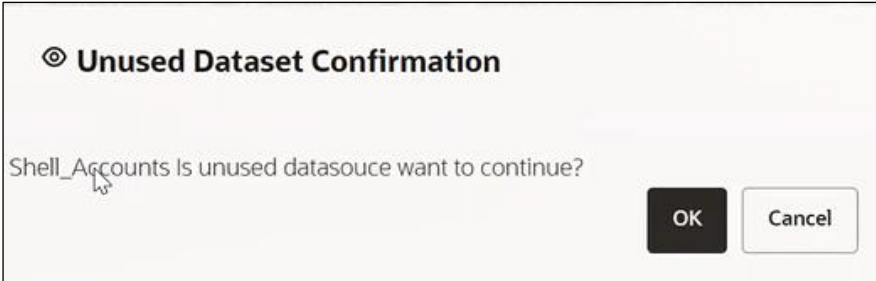
Click **New Data Store** to create a data source. For more details, see [Adding a Data Store](#).



NOTE

The MISDATE feature is displayed only when the Data Source field is selected as a **File Type**.

If enabled, you need to add the Physical and Feature name for the Data Source.




Field	Description
New Data Store	<p>The Data Stores drop-down list shows all the data sources and the data forms that are tagged with the corresponding workspace. In addition, this lists all the available unused data sources that can be used. You can search the data sources by clicking on Data Store information icon. A confirmation message is displayed if you try to tag an unused datasource with a workspace.</p>  <p>Here, either use the unused or create a new datasource using the New Datasource button. When you create a new datasource, it becomes as unused. You can add more Data Sources using Add Source link. Click the delete icon to delete an added Data Source.</p>

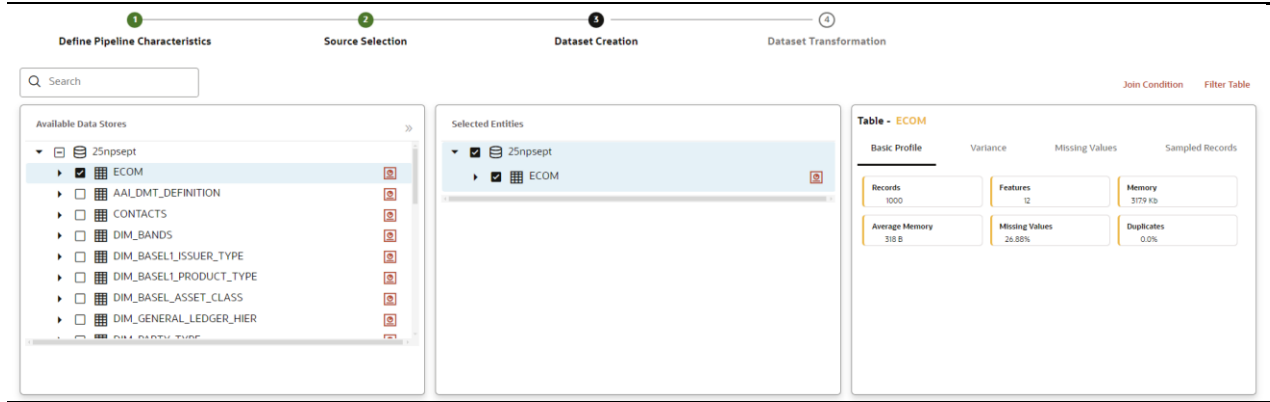
2. Click **Next** to go to the next step or click **Previous** to go back to the previous step.

7.1.2.4 Dataset Creation

This window allows you to select entity part (for example, column of table) of the datasource. The data source selected in the previous step requires the definition of database objects to be used.

To configure the Dataset Creation:

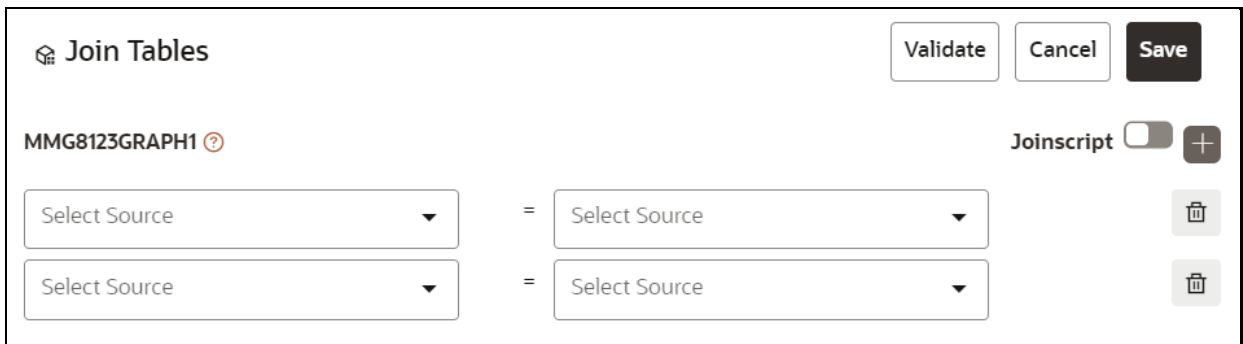
1. Select the required data source from the **Available Data Sources pane** and click >> to move the selected data to **Selected Entities** pane. The **Available Data Sources** section shows the high-level data sources. You can select data from multiple data source entities. The selected Data Sources are displayed in **Selected Entities** pane. You can use  to select or use  to de-select the data in the **Selected Entities** pane. Also, clicking on  **View Profile** icon displays the profile details in the **Basic Profile** tab.



2. For more information on Joins, see [Joining Tables](#) section.
For more information on Filtering, see [Filtering Tables](#) section.
3. Click **Next** to go to the next step or click **Previous** to go back to the previous step.


7.1.2.4.1 Joining Tables

Use Join Condition to combine the data source details. Each data sources have multiple tables and multiple columns, so you can join them using Join Condition window. Joins can be applied only when user has selected more than one table.




You can join Tables either using drop-down or using the Joinscript option.

Using drop-down

Select the Column name of Table from the drop-down list. You can use multiple join conditions by using  icon

NOTE: In the current release, only INNER JOIN is present.

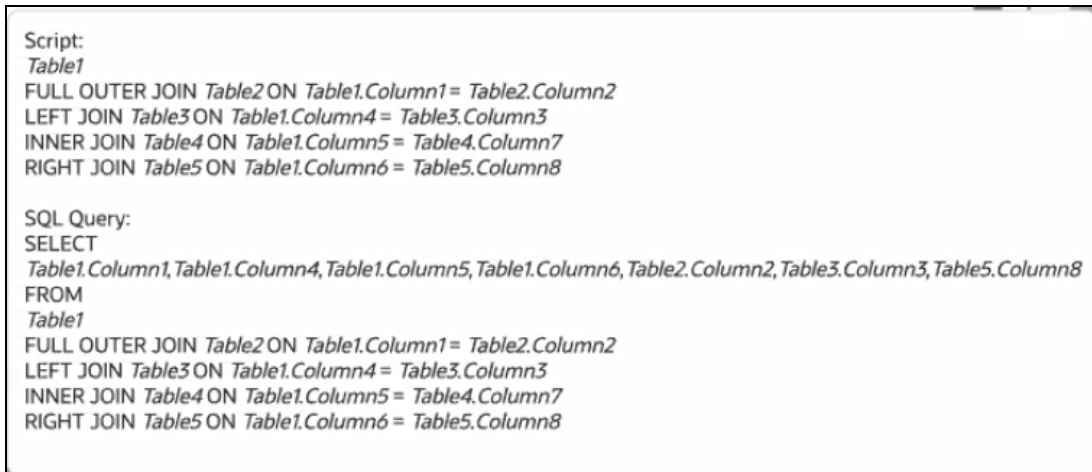
Using Script

1. To use script, enable  option.

The Join Tables window is displayed to add scripts:



You must provide the script in below format:



2. Click **Validate** to check the Join conditions.
3. Click **Save**.

7.1.2.4.2 Filtering Tables

You can also use the filters in dataframe creation from entity.

1. Click  to navigate to Filter Tables window.



There are certain rules to be followed when adding filters

I. Filter values will not be applied in tables from datasources joined using joinscript.

II. Only one filter value entry is allowed for one table. If multiple entries are present, the last filter value entry will be used for that table.


III. Example for non-file datasource: SQL Format
Filter : `Column1=1234`
SQL script: `SELECT * FROM tablename WHERE Column1=1234`

IV. For file source, script follows python syntax

V. Always assign the output dataframe as 'df_out='

VI. Use 'df_prev' to access the original dataframe

VII. Example for file source: Python
Filter : `df_out=df_prev.loc[df_prev['Column1'] == 1]`

2. Multiple filters can be added by using  icon.
3. Click **Validate** to check the Filter conditions.
4. Click **Save**.

7.1.2.4.3 View Profile


The Profile section from RHS shows the report based on Selected Objects (complete dataset) section. For example, Missing Values report shows the details of missing data in selected table in Selected Objects section.


Basic Profile	Variance	Missing Values	Sampled Records
Profile - DATABASECHANGELOGLOCK_MMG			
Records 1	Features 4	Memory 176 B	
Average Memory 176 B	Missing Values 50.0%	Duplicates 0.0%	


7.1.2.5 Dataset Transformation

This window allows you to transform the data source information. This complete grid displays the Table like structure, which helps you to make the data better using many methods, such as by remove all the missing values, performing scaling and so on.

This window shows the following columns:

- **Physical Name:** Shows the Physical Name of column.
- **Feature Name:** Shows the Feature Name of column along with its data type. You can edit the Feature Name.
- **Observations:** The Observations field shows the value of column. For example, if any column is missing any value, you can easily identify missing value columns. Use Transformation button to fix these values.
-  **Create Feature** icon: To create a new feature/column by doing operations on the existing features.

- **View Report:** To view the complete report of the sampled data
-  **Re-Validate** icon: To re validate all the transformations.

You can also revalidate an individual transformation by clicking the More Action  icon and select **Re-Validate** option.

-  **Add Transformation** icon: To add new transformations

The profile button helps you to view profile the final data frame that you have selected. For more information, see the Viewing Profile section.

Here, you can perform following actions

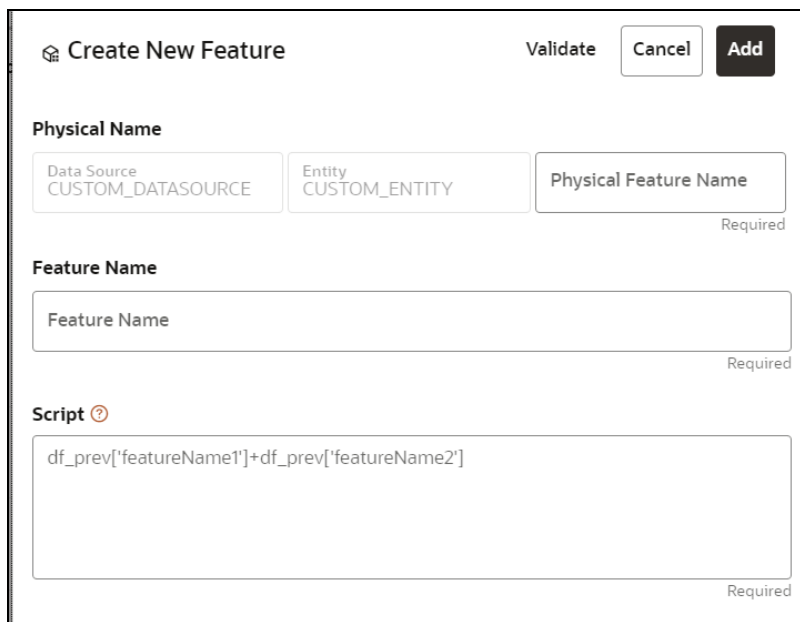
- Re-ordering of transformations
- Insertion of transformation

7.1.2.5.1 Create New Feature

The Create New Feature window allows you to create a new feature. This is used to add a new column to dataset. This is useful, if you want to add a new column based on derived T2Ts (from data source).

To create a New Feature:

1. Click Create Feature on Dataset Transformation of Dataset UI.




Create New Feature Validate Cancel Add

Physical Name

Data Source: CUSTOM_DATASOURCE Entity: CUSTOM_ENTITY Physical Feature Name (Required)

Feature Name

Feature Name (Required)

Script 

df_prev['featureName1']+df_prev['featureName2'] (Required)

2. Enter the following details:
 - **Physical Feature:** Name of Physical feature
 - **Feature Name:** Logical Name of feature
 - **Script:** Update the script
3. Click Add after validating the feature.

The new feature will be added at end of LHS section.

4. You can also edit or delete a newly added feature.

7.1.2.5.2 Add Data Transformation

To add the data transformation:

1. Click **Add**.

The Transform window is displayed.

2. Select the Transformation Type.

Following types are available:

- **Dataframe Transform:** This is used to transform entire dataframe. For example, if you want to remove all missing values from all the columns of entire sampled data.
- **Feature Transform:** This is used to transform a particular column of dataframe.

The screenshot shows a 'Transformation' window with the following elements:

- Buttons: 'Validate', 'Cancel', and 'Add'.
- 'Type' dropdown menu: 'Feature Transform'.
- 'Select Transform' dropdown menu: 'Custom Transform'.
- Expanded 'Custom Transform' list:
 - Data Cleaning**
 - Duplicates Removal
 - Impute Missing Data
 - Outlier Removal
 - Filter Features
 - Data Transformation**
 - Encode Categorical Features
 - Encode Datetime Features
 - Encode Cyclical Features

3. **Select Transform:** Here you either enter values using Method and Argument fields, or script.
4. Click **Validate** to validate the details.
5. Click **Add** to add the new transformation.
The New Transform is created and displayed at RHS section.
6. Click **Finish** to navigate to Dataset Summary window.

This saves the metadata of dataset.

Example:

If there is a “missing value” for one of the columns, then perform following steps to add the transform.

1. Click Add on Dataset Transformation window.
2. Select Type as Feature Transform.
3. Select Transform as Impute Missing Value
4. Select the Physical Name from Physical Name drop-down list.
5. Select the Method and enter parameter in Argument field. The Method is updated on selected Column type. For example, if the selected column type is numerical, then following methods will be available: Simple, Constant, KNN, and Mice

OR

Enter the script

Below are Sample Custom Scripts

- Directly pass input data frame to output: `df_out=df_prev`
- Drop first row of data frame: `df_out=df_prev.drop(0,axis=0)` if not `df_prev.empty` else `df_prev`
- Drop column from data frame: `df_out = df_prev.drop('colname',axis=1)`

7.1.2.5.3 Sample Custom Scripts

Below are few sample scripts which the users can refer to create transformations.

Function	Script	Comments
Directly pass input data frame to output	<code>df_out=df_prev</code>	
Drop first row of data frame	<code>df_out=df_prev.drop(0,axis=0)</code> if not <code>df_prev.empty</code> else <code>df_prev</code>	
Drop column from data frame	<code>df_out= df_prev.drop('colname',axis=1)</code>	FEATURE TRANSFORMATION

7.1.2.5.4 Transformations

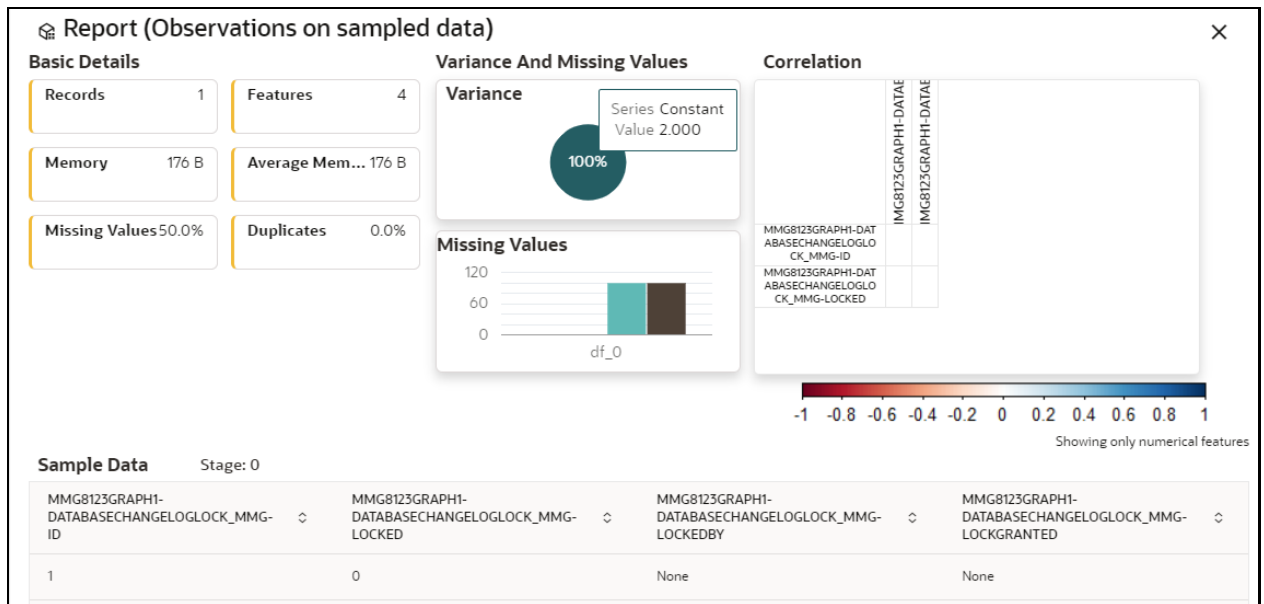
These are the various transformations which can be done from the UI.

No.	Transformation	Function
1.	Add New Feature	A new feature can be added to the dataset which could be derived from the existing features using Script. Physical Feature Name and Feature Name are the names of the new feature. Script can be used to create a pandas Series for the new feature
2.	Encode Categorical Features	This function performs One Hot Encoding on a categorical feature and replaces it with multiple numerical features in the dataset.

No.	Transformation	Function
3.	Encode Datetime Features	This function encodes a datetime feature and replaces it with multiple numerical features having the following information derived from the datetime feature - year, month, week, day, hour, minute, dayofweek
4.	Encode Cyclical Features	This function encodes a cyclical feature having hour, minute data, and so on and returns two features carrying the sine and cosine transformation of the cyclical data. 'fmax ' denotes the maximum possible value of the cyclical feature data.
5.	Impute Missing Data	This function imputes missing data within a feature. For numerical features, there are 4 methods for imputing missing data. simple - imputes with mean, median, most_frequent values based on chosen arg value using the SimpleImputer in sklearn. const - fills the missing values with the value given in the arg knn - imputes using the KNNImputer in sklearn with k value given in arg mice - imputes using the IterativeImputer in sklearn For non-numerical data, missing values can be imputed using the 'const' method by replacing all missing values with the value given in arg
6.	Feature Scaling	This function is used to scale multiple selected numerical features using the StandardScaler in sklearn
7.	Dimensionality Reduction	This function performs PCA on selected numerical features to reduce the dimensionality using sklearn.decomposition.PCA module. The number of output features can be specified using dim field. The names of the output features' names can be specified in the fields 'Physical Feature Name' and 'Feature Name'
8.	Outlier removal	This function is used to remove outliers present in a feature based on the specified zscore value. Non-numerical features are label encoded before removing the outliers.
9.	Duplicates Removal - Data Frame	This function removes all duplicate rows in the dataframe.
10.	Duplicates Removal - Feature	This function removes all duplicate rows within a specified subset of features and consequently removes those rows from the data frame
11.	Filter Features	This function is used to filter the data frame based on conditions specified on features Operations allowed : >, >=, !=, <, <=, isin When the chosen operation is 'isin', the input to 'Filter Value' is a list of values that should be present in the output data frame

7.1.2.5.5 View Reports

This report shows the Observation on Sampled data, profiles, Variance, Correlation Matrix (correlation between columns), Sample Data. This report is based on sampled data.





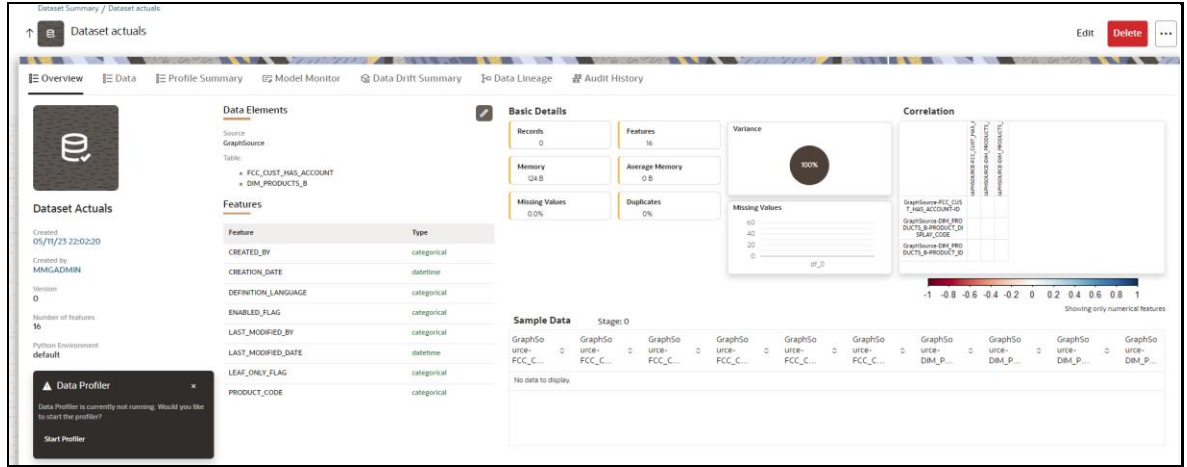
7.1.2.5.6 Re-ordering Transformations

You can re-order the transformations using the drag-drop. During the transformation re-order, you can compare the profile of transformations. The transformation order gets adjusted accordingly.

7.1.3 View a Dataset

To view a Dataset, follow these steps:



1. Navigate to **Dataset Summary** page.
2. Click  next to corresponding Dataset and select View  .
The Dataset details are displayed.



7.1.3.1 Overview

The details such as Data Elements, Features, Basic Details, Correlation, and Sample Data are displayed in graphical format.

To view the Overview of a Dataset, follow these steps:

1. Navigate to **Dataset Summary** page.
2. Click  next to corresponding Dataset and select View  .
OR



Click on the Dataset **Name** column which you want to view.

The Overview page is displayed.

You can update the data mapping details by clicking on Edit icon in Data Elements group.




7.1.3.2 Data

To view the data of a Dataset, follow these steps:

1. Navigate to **Dataset Summary** page.
2. Click  next to corresponding Dataset and select View  .
The Overview page is displayed.
3. Navigate to **Data** tab.

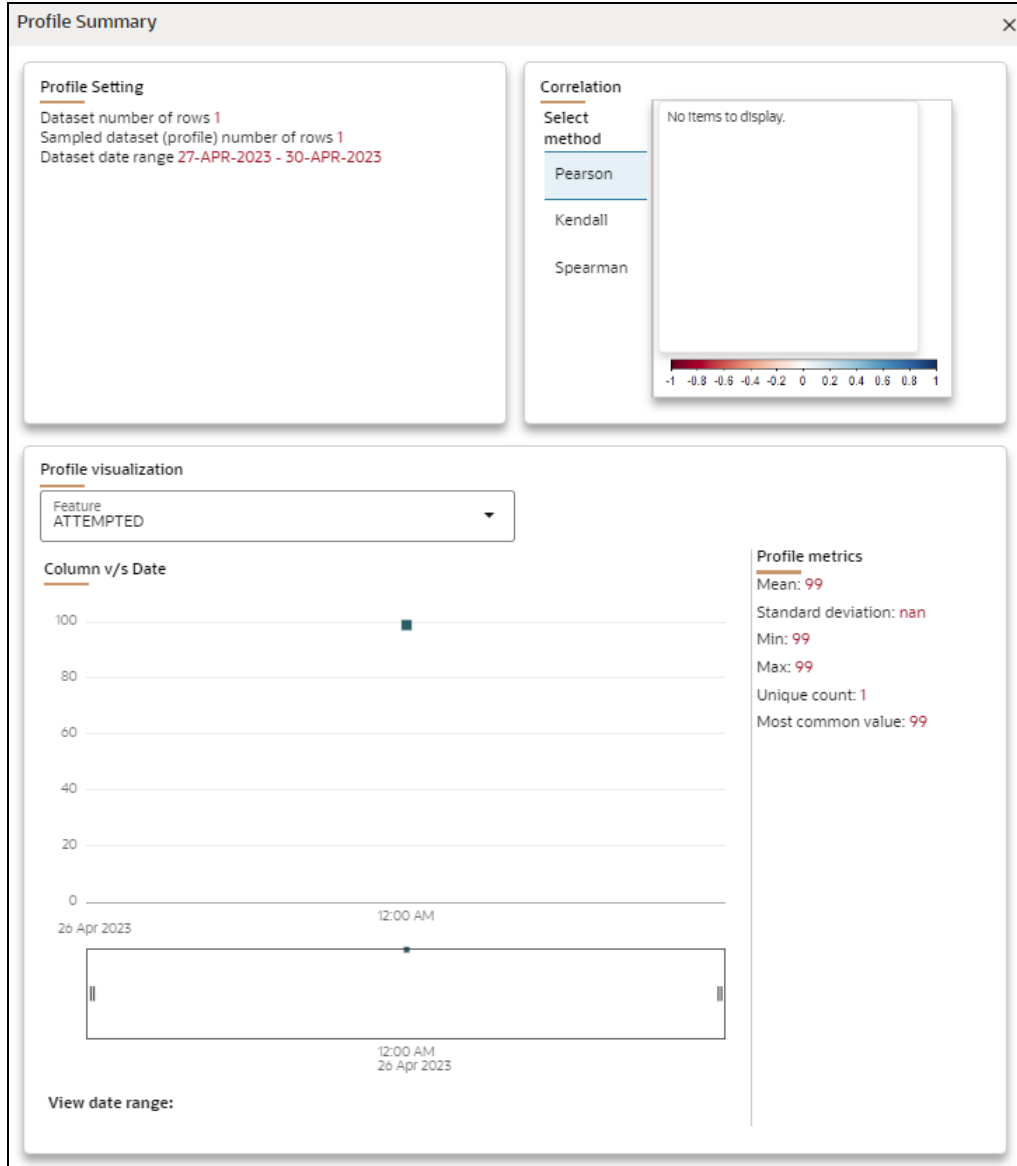
7.1.3.3 Profile Summary

To view the profile summary, perform the following steps:

1. In the Profiler Summary screen, click  next to corresponding data profile and select View  summary  .

This window displays the following details in graphical format.

- Profile Setting
- Correlation
- Profile visualization along with the metrics





7.1.3.3.1 Start Profiling

To start a Profile, follow these steps:

Prerequisite:

You must create a Dataset with a datasource having columns with **DATA_TYPE** as **DATE**.

1. Navigate to Dataset Summary Page.
2. Click  next to corresponding Dataset and select View .

This window displays the Dataset profiles in a table.

Data Profile Id	Creation Datetime	Dataset Range	Action
<input checked="" type="checkbox"/> 1_DATAPROFILER	26-APR-2023 07:42:22 AM	START - 26-APR-2023	...
<input type="checkbox"/> 2_DATAPROFILER	26-APR-2023 07:48:29 AM	26-APR-2023 - 26-APR-2023	...
<input type="checkbox"/> 3_DATAPROFILER	26-APR-2023 01:00:04 PM	26-APR-2023 - 26-APR-2023	...
<input type="checkbox"/> 4_DATAPROFILER	27-APR-2023 05:27:42 AM	26-APR-2023 - 27-APR-2023	...

3. Click **Start Profiling** or click **Settings** icon.
The Profiler Settings page is displayed.

Profiler Settings

Basic Information

Columns Required

Threshold ?

[+ Add Column](#)

Filter Column ? Required

Generate First Profile

[Schedule](#)

4. Under Basic Information section, enter the following details:
 - a. Select the required columns from the drop-down. All the numeric options are displayed under the Columns drop down. You can select multiple columns by clicking on + icon.
 - b. Enter the threshold for the columns. Threshold defines the Drift detection threshold for each column and only numerical columns can be selected for profiling.
 - c. Select the required filter column from the drop-down. Filter column contains date column of the dataset to filter.
 - d. Enable **Generate First Profile** option if you want to generate a profile.
5. Under Schedule section, enter the following details:
 - a. Enter a Schedule Name.
 - b. Select the Schedule Type as required:
 - **Daily** : Select to run the schedule everyday
 - **Weekly**: Select to run the schedule once in a week or the selected days in a week
 - **Monthly** : Select to run the schedule once in a month or the selected days in a month.
 - c. Click **Save**.

The Data Profiling has been started and Stop Profiling option is displayed in the Profile Summary screen.

For more details on disabling dataset profile, see [Stop Profiling](#) section.

6. Click **Generate Profile.**

The Data Profile is created.

Schedule Daily

To schedule the profiler to run daily, perform the following steps:

1. In the Profiler Settings screen, select the Schedule Type as Daily.
2. Select the start date on which you want to run the profiler.
3. Select the end date on which you want to stop your schedule.
4. Enter the time at which you want to run the profiler.
5. Click Save.

Schedule Weekly

To schedule the profiler to run weekly, perform the following steps:

1. In the Profiler Settings screen, select the Schedule Type as Weekly.
2. Select the start date on which you want to run the profiler.
3. Select the end date on which you want to stop your schedule.
4. Enter the time at which you want to run the profiler.
5. Select the day on which you want to run the profiler. You can select multiple days to run the profiler.
6. Click Save.

Schedule Monthly

To schedule the profiler to run monthly, perform the following steps:

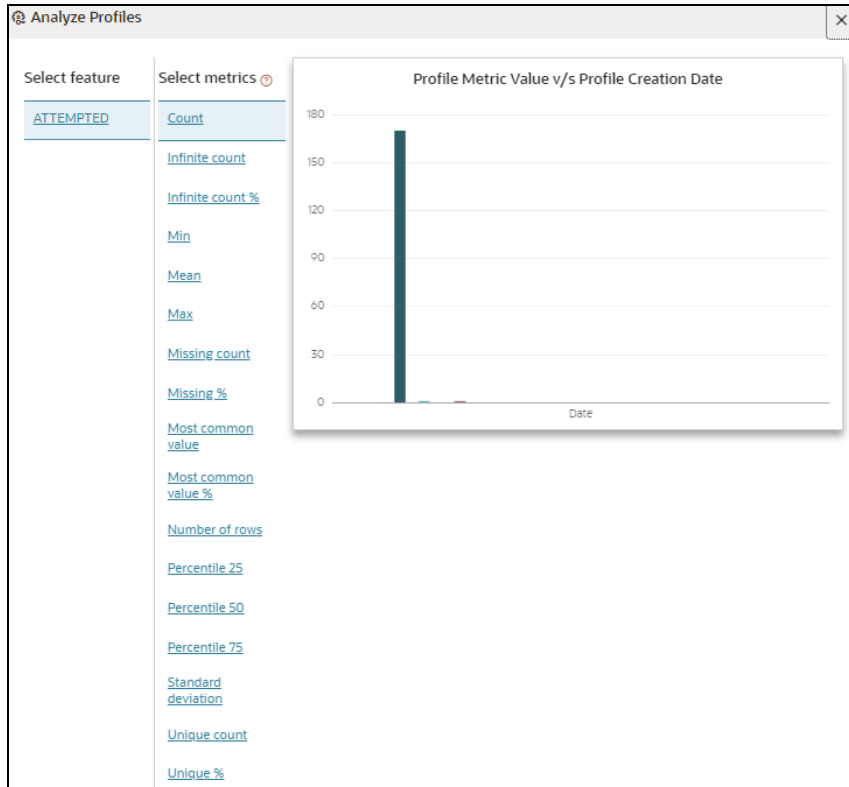
1. In the Profiler Settings screen, select the Schedule Type as Daily.
2. Select the start date on which you want to run the profiler.
3. Select the end date on which you want to stop your schedule.
4. Enter the time at which you want to run the profiler.
5. Select the month on which you want to run the profiler. You can select multiple months to run the profiler.
6. Select the date on which you want to run the profile of the selected month to run.
7. Click Save.

7.1.3.3.2 Analyze Profiles

To analyze multiple data profiles, perform the following steps:


1. In the Profiler Summary screen, select the data profiles that you want to analyze profiles. You can select multiple data profiles.
2. Click **Analyze Profiles**.

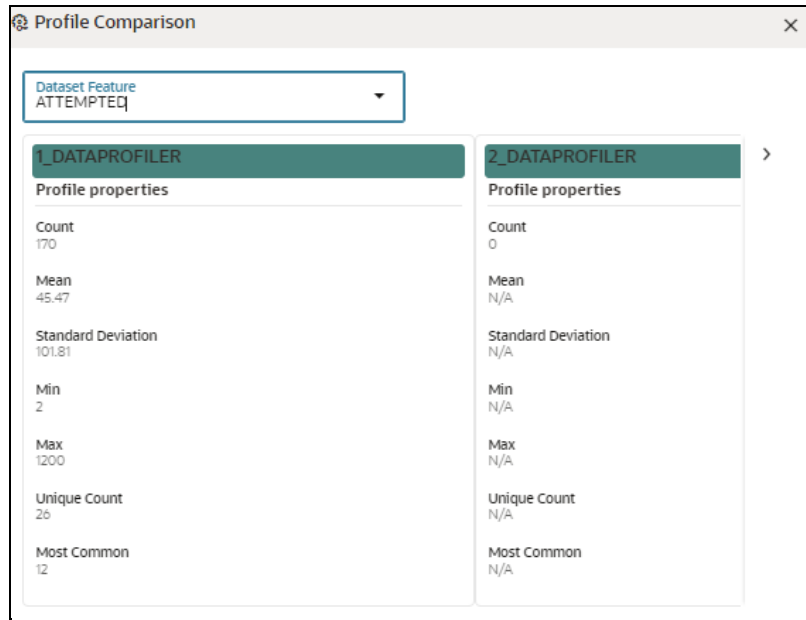
A window is displayed with multiple metrics of the selected profiles. Click on each metric to view the data in graphical format.



7.1.3.3.3 Compare Profiles

To compare the data between two data profiles, perform the following steps:

1. In the Profiler Summary screen, select two data profiles that you want to compare.
2. Click Compare Profiles  .
The Profile Comparison is displayed.
3. In the Dataset Feature drop-down, select the feature that you want to compare.
The properties of both the profiles is compared and displayed in a tabular format.



7.1.3.3.4 Stop Profiling

To stop the profiling, perform the following steps:

1. In the Profiler Summary screen, select the data profiles that you want to stop profiling. You can select multiple data profiles.
2. Click Stop Profiling.
A confirmation pop-up window is displayed.
3. Click Yes to disable the dataset profile.

The dataset profiling has been disabled and Start Profiling option is displayed. For more information on profile, see [Create a Profile](#) section.

7.1.3.4 Model Monitor



Model Monitoring refers to the process of closely tracking the performance of models in production and helps you to frequently monitor the distribution of the model and provides alerts in case of any exceptions

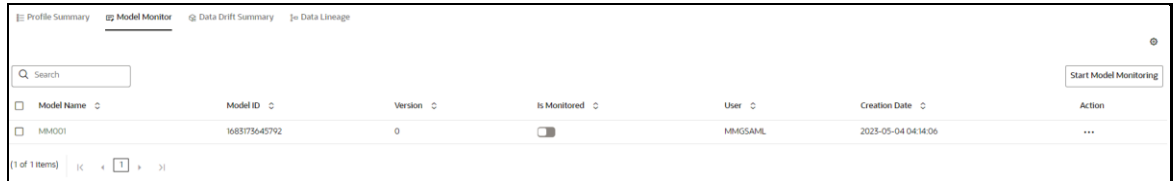
In addition , it enables you to identify and eliminate bad quality predictions and poor technical performance of the models.

The model's robustness depends not only on the training of the feature-engineered data but also on how well the model is monitored after deployment. Typically a model's performance degrades over time, and it essential to detect the cause of the decrease in performance of the model. The main cause of the decline in performance can be drift in the independent or/and dependent features which may violate the model's assumption and distribution about the data. When models are built, the model builder will create a snapshot of the dataset used for training the model and save it in a file which is later used for calculating drift with the current snapshot of the dataset.

To start the model monitoring, perform the following steps:

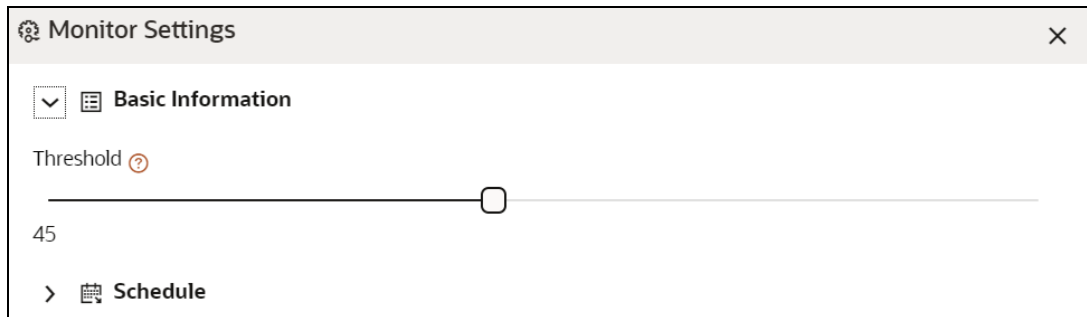
1. Navigate to **Dataset Summary** page.

2. Click  next to corresponding Dataset and select View  .
The Profile Summary screen is displayed.
3. Navigate to **Mode Monitor** page.
All the models associated with the selected dataset will be displayed.




Model Name	Model ID	Version	Is Monitored	User	Creation Date	Action
MM001	168373645792	0	<input checked="" type="checkbox"/>	MHGSAML	2025-05-04 04:14:06	...

4. Click **Start Model Monitoring** or **Monitor Settings** icon.
The Monitor Settings page is displayed.



Monitor Settings

Basic Information

Threshold 

45

Schedule

5. Drag the slider and set the threshold settings. Threshold is the value in percentage, beyond which it is labelled as drifted.
6. Select the Schedule Type as required:
 - **Daily** : Select to run the schedule everyday
 - **Weekly**: Select to run the schedule once in a week or the selected days in a week
 - **Monthly** : Select to run the schedule once in a month or the selected days in a month

The monitoring for the model is started and **Is Monitored** option is enabled by default and you can disable it if you do not want to monitor.

7.1.3.4.1 Stop the Model Monitoring

To stop the model monitoring, perform the following steps:



1. Navigate to **Model Monitor** page.
All the models associated with the selected dataset will be displayed.
2. Click **Stop Model Monitoring**.
A confirmation pop-up window is displayed.
3. Click **Yes**.
The Model Monitoring is stopped.

7.1.3.4.2 Viewing the Model Summary

To view the Model Summary, perform the following steps:

1. Navigate to **Model Monitor** page.

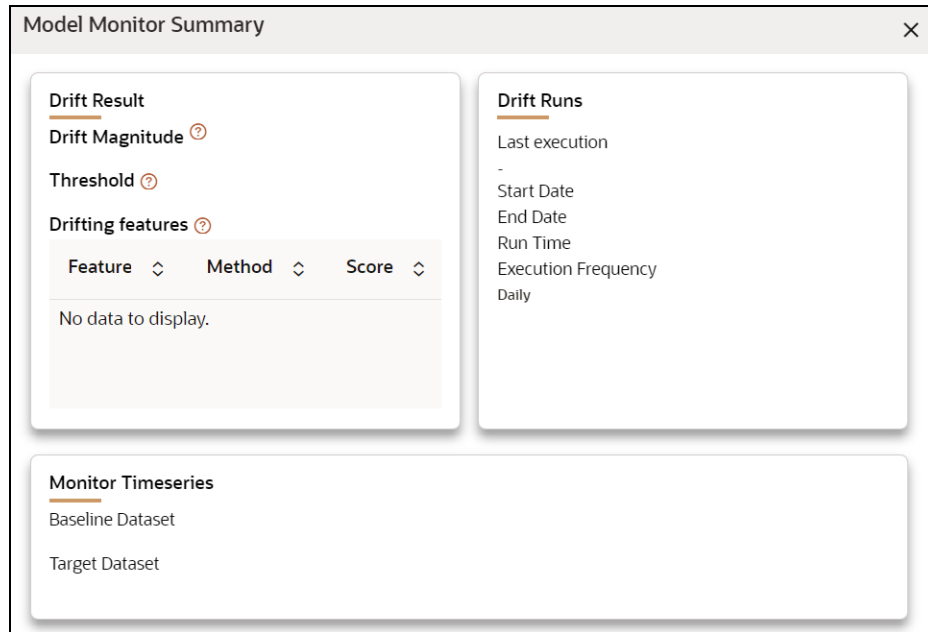
All the models associated with the selected dataset will be displayed.

2. Click **Action**  next to corresponding model and select **View Summary** .

This window displays the following details in graphical format.

- Drift Result
- Drift Runs
- Monitor Timeseries

Figure 22: Model Monitor Summary



7.1.3.4.3 Viewing the Model Latest Report

To view the Model Latest Report, perform the following steps:

1. Navigate to **Model Monitor** page.

All the models associated with the selected dataset will be displayed.

2. Click **Action**  next to corresponding model and select **View Latest Report** .

The execution details of the model are displayed.

Report Id	Creation Datetime	Data Drift	Action
1	2023-05-06 00:00:04		...



To view the report of each execution, click **Action**  next to corresponding report and select **View Report**.

7.1.3.4.4 Viewing the Model Execution History

To view the Model Execution History, perform the following steps:

1. Navigate to **Model Monitor** page.

All the models associated with the selected dataset will be displayed.

2. Click **Action**  next to corresponding model and select **View Execution History** .

This window displays the details such as Baseline Distribution, Target Distribution, Drift Method, Drift Score, and Data Drift of the models.

7.1.3.5 Data Drift Summary

A Data Drift Summary report summarizes the changes in a dataset over time. It typically includes information for any changes in the data distribution of the selected features over the selected baseline and target date ranges.

The report is used to help identify potential issues with data quality which helps the users to take necessary actions further.

To calculate the data drift, perform the following steps:

1. In the Data Drift Summary screen, click Calculate Drift.

The Data drift Analysis window is displayed.

2. Select the data range (From and To) dates for the baseline.
3. Select the data range (From and To) dates for the target.
4. Select the drift method from the drop-down.

The available drift methods are:

- Kolmogorov–Smirnov (K-S) test
 - Only for numerical features
 - Output: p_value, drift detected when p_value < threshold.
- Kullback-Leibler divergence
 - For numerical and categorical features
 - Output: divergence, drift detected when divergence >= threshold.
- Wasserstein distance (normed)
 - Only for numerical features
 - Output: distance, drift detected when distance >= threshold.
- Population Stability Index (PSI)
 - For numerical and categorical features
 - Output: psi_value, drift detected when psi_value >= threshold.
- Jensen-Shannon distance
 - For numerical and categorical features
 - Output: distance, drift detected when distance >= threshold.

5. Click Calculate.

The drift analysis report is displayed.

6. Click Save.

The reports are displayed under Data Drift Summary screen.

7.1.3.5.1 Disabling the Data Drift Monitoring

To stop the Data Drift monitoring, perform the following steps:

1. Navigate to **Data Drift Summary** page.
The data drift summary reports are displayed in a table.
2. Click **Stop Data Monitoring**.
A confirmation pop-up window is displayed.
3. Click **Yes**.
The Data Drift Monitoring is disabled.

7.1.3.5.2 Start the Data Drift Monitoring

To start the Data Drift monitoring, perform the following steps:

1. Navigate to **Data Drift Summary** page.
The data drift summary reports are displayed in a table.
2. Click **Start Data Monitoring** or **Data Drift Settings** icon.
The Data Drift Settings window is displayed.

3. Enter the basic information and schedule details and click **Save**.

For more details, see [Data Drift Summary](#) section

The Data Drift Monitoring is started.

7.1.3.5.3 Viewing the Data Drift Summary Report

To view the Data Drift Summary Report, perform the following steps:



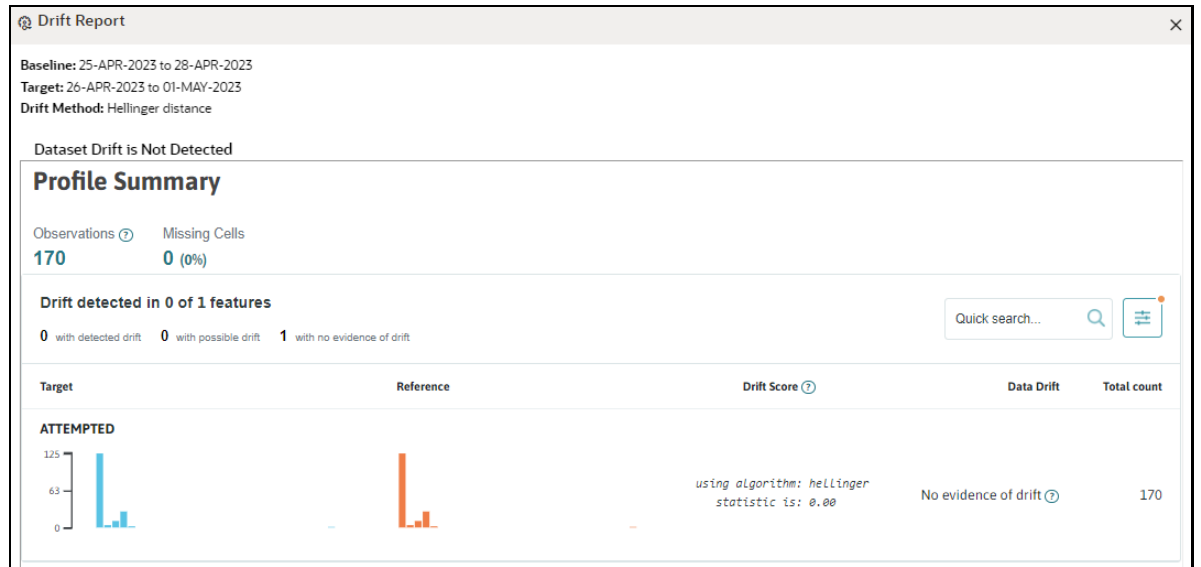
1. Navigate to **Data Drift Summary page**.
The data drift summary reports are displayed in a table.
2. Click **Action**  next to corresponding drift report Id and select **View**  .
The drift report is displayed in a graphical format.

Figure 23: Drift Report



7.1.3.5.4 Deleting the Data Drift Summary Report

To delete the Data Drift Summary Report, perform the following steps:

1. Navigate to **Data Drift Summary** page.

The data drift summary reports are displayed in a table.

2. Click **Action** ⋮ next to corresponding drift report Id and select **Delete** 🗑️.

OR

If you wish to delete multiple data drift reports, select reports and click 🗑️.

A confirmation pop-up window with report details is displayed.

3. Click **Delete**.

The Data Drift Report is deleted.

7.1.3.6 Data Lineage

Data Lineage provides a summary view or visualization of Data Sources and its associated dataset and features in a graphical format. Also displays the complete data flow from start to finish.

To view the data lineage, perform the following steps:

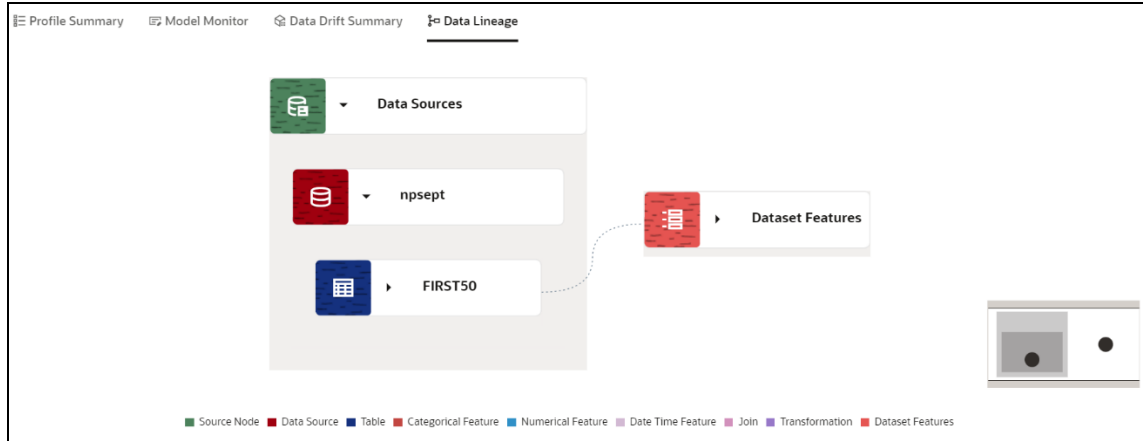
1. Navigate to **Dataset Summary** page.

2. Click ⋮ next to corresponding Dataset and select View 🔍.

The Profile Summary screen is displayed.

3. Navigate to **Data Lineage** page.

A summary view of Data Sources and its associated dataset and features in a graphical format.



Click the drop-down of the respective features to view granular details and its workflow.

7.1.3.7 Audit History

At any time, you can audit the datasets from the Audit History page. The Audit Trail window provides the complete details of datasets. The sequence of actions performed in the dataset lifecycle is listed in the table view and the timeline view (graphical representation).

To audit datasets:




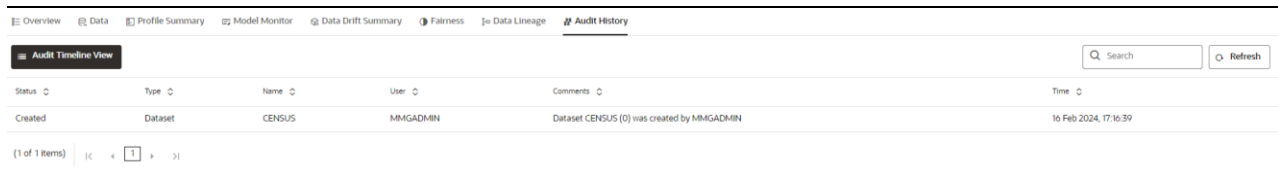
1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Navigate to **Dataset Summary** page.
3. Click  next to corresponding Dataset and select View  .
The Overview screen is displayed.
4. Navigate to **Audit History** page.
A summary view of dataset details is displayed.

Figure 24: Audit Trail Window





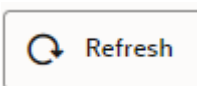
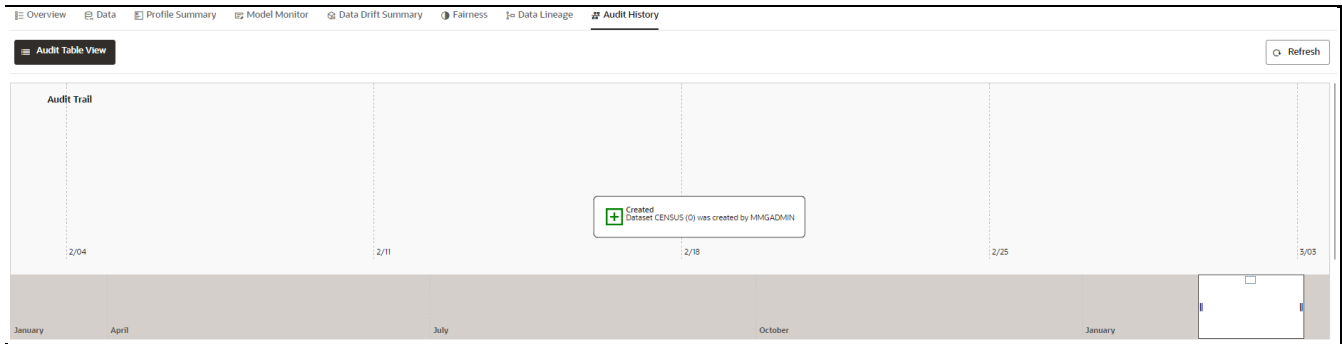
5. Click  **Audit Timeline View** for Timeline View. Click  **Audit Table View** to switch to the regular view.
Click  to refresh the Audit Trail window.




Figure 25: Audit Trail Window Timeline View with Horizontal Time Axis



7.1.4 Create a cache snapshot

You can create a cache snapshot of the Dataset from this page.

To create a cache snapshot, follow these steps:

1. Navigate to **Dataset Summary** page.
2. Click  next to corresponding Dataset and select View  .
The Overview page is displayed.
3. Click  on the header and select **Create a cache snapshot**.
4. Enter the **Snapshot Name** having alphanumeric character, underscore and hyphen not exceeding 30 characters and click Create.

This screen additionally allows users to cache a snapshot of the current state of data. The cached snapshots can be accessed later in Model Pipelines without any recompilation or re-read from data sources.

To use the dataset in model pipeline or data pipeline, the actual data is fetched using the Cache option. For example, to take the data from dataset on As of Date, create the data frame and provide the name to cache. Only Cache pulls the data from dataset.

This helps the things to work faster when you have millions of records, and you want to use intermediate data for use. For example, if you have 1 million records and want to use only 10,000 out of that, then perform the sampling for that 10,000 entries. This increases the speed of processing, validation of information.

- Once the metadata is created, the original data can be cached. A snapshot of the actual data in the dataset at the current time can be stored referenced by a tag name.
- The location for caching is in the datastudio server location `$DS_HOME/work/ftpshare/mmg/workspace_name/dscode/tag`. The dataset will be saved as a parquet file with name `dscode_tag.parquet`
- When executing all APIs from notebook, workspace has to be attached.
- Caching can be performed in 2 ways
 - From UI, immediately after saving the metadata

Or the users will have to fetch(create) a new snapshot/dataframe of the dataset using the API 'Fetch New Snapshot of dataset' and manually cache using the 'Caching Data Frame' API.

The following table provides information on the error and the troubleshooting procedure in case of dataset failure.

Error	Troubleshooting procedure
ModuleNotFoundError: No module named '_bz2'	Install the package 'libbz2-dev' before building python.
ModuleNotFoundError: No module named '_sqlite3'	Install the package 'libsqlite3-dev' before building python.
Python-env-health-check fails if pandas version is less than 1.4.1. NOTE: modin dataframe library is supported only from pandas version 1.4.1 and higher.	You can switch between the options modin[dask] and pandas for the underlying dataframe library if pandas version 1.4.1 is installed.
"Not a valid file" error while profiling the Hive Data sources.	Copy the following required files : kbank.keytab , krb5.conf , hive-jdbc-driver.jar into the path : \$SDS_HOME/conf folder of datastudio

7.1.5 Edit a Dataset

To edit a Dataset, follow these steps:

1. Navigate to Dataset Summary Page.
2. Click on the Dataset **Name** column which you want to edit.

The Overview page is displayed.

3. Click **Edit**.

You can edit the Dataset fields except Code and Dataset Name.


7.1.6 Delete a Dataset

To delete a Dataset, follow these steps:

1. Navigate to Dataset Summary Page.

2. Click  next to corresponding Dataset and select **Delete**.

OR

- Click  next to corresponding Dataset and select **View**. You can delete a Dataset from this page.

7.1.7 Python functions for accessing Dataset from Model Pipelines/Notebooks

7.1.7.1 List tags of Datasets Cached from UI

To get a list of all snapshots/tags of a dataset cached from UI, use the API below:

API	Notebook Script	Notes/Input
List Tags of a Dataset	<pre>from mmg.datasets import list_tags list_tags(dscore)</pre>	dscore = dataset code - string tag = tag with which the dataset was cached - string

7.1.7.2 Delete Cached Dataset

A cached dataset can be deleted by using the API below where tag refers to a particular snapshot/timestamp of the dataframe

API	Notebook Script	Notes/Input
Delete Dataset	<pre>from mmg.datasets import delete_df delete_df(dscore, tag)</pre>	dscore = dataset code - string tag = tag with which the dataset was cached - string

7.1.7.3 List all Datasets with Metadata saved from UI

API	Notebook Script	Notes/Input
List Datasets	<pre>from mmg.datasets import list_datasets list_datasets()</pre>	

7.1.7.4 Fetch Dataset in Notebook

Dataset whose metadata has been saved from UI can be fetched in two ways:

1. Dataset that has already been cached from UI can be fetched using first API below by providing the dataset code and tag.(DataFrame will not be recalculated. It will be read from cache.)
2. A new data frame for a dataset can be calculated/fetched using data from the present time with the metadata saved for that dataset as given in second API.

API	Notebook Script	Notes/Input
Fetch Dataset Cached from UI	<pre>from mmg.datasets import fetch_ds df = fetch_ds(dscore,tag)</pre>	dscore = dataset code - string tag - string

API	Notebook Script	Notes/Input
Fetch New Snapshot of dataset	<pre>from mmg.datasets import fetch_ds df = fetch_ds(dscore)</pre>	dscore = dataset code - string

7.1.7.5 Cache User's Dataframe from Notebook

A user-made data frame can also be cached using the below API. It will be stored in the datastudio server in location : \$DS_HOME/work/ftpshare/mmg/workspace_name/cached/tag. The dataset will be saved as a parquet file with name cached_tag.parquet.

Note: This dataframe is not related to dataset created from UI. This is independent of dataset metadata.

API	Notebook Script	Notes/Input
Caching Data Frame	<pre>from mmg.datasets import cache_df path=cache_df(df, tag) path</pre>	df = dataframe to be cached - pandas dataframe tag - string

7.1.7.6 Fetching Data Frame Cached from Notebook

The data frame cached from notebook can be fetched using the below API.

API	Notebook Script	Notes/Input
Fetch dataset cached manually	<pre>from mmg.datasets import fetch_ds df = fetch_ds("cached",tag)</pre>	tag - string

7.1.7.7 List Tags of all Data frames Cached from Notebook

API	Notebook Script	Notes/Input
List Tags of Manually Cached Datasets	<pre>from mmg.datasets import list_tags list_tags()</pre>	

7.2 Model Libraries

The Model Library information is used to bind a particular technique and its details to one unique Model Library. The Starting point for the Model builder is to register a model library with MMG application after it is properly set up in the python environment to be used.

Currently, MMG supports the following libraries:

- keras
- ONNX

- scikit-learn
- xgboost

As an example, the following section provides information on how to set up and register the scikit-learn library.

Setting up the python library in the python environment:

Open the terminal and install the scikit-learn library using the following command:

```
python3 -m pip install scikit-learn
```

NOTE Proxy might be required to install the packages from pip.

Once the installation is complete, check for the package details using the following command:

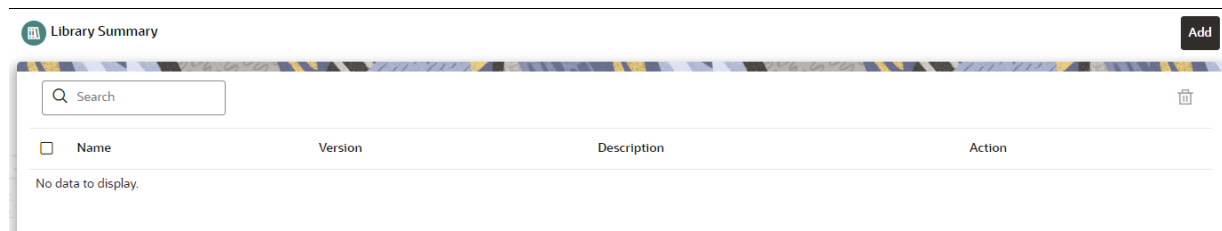
```
pip show scikit-learn
```

Once the installation is complete in python environment, you need to register the library into MMG application.

Registering the python library in MMG

1. In the Mega menu, click **Modeling > Model Libraries**.

The **Library Summary** page is displayed.



2. In the **Library Summary** page, click **Add**.

The **Add Library** page is displayed.

3. Enter the name of the library.
4. Enter the version and description of the library.
5. Enter the signatures such as Import, Load, Train, Save, and Infer. For more details on the signatures, click the respective help icons.

Some of the signatures captured in library stage might not be standard across different algorithm/techniques provided by the library.

6. Click **Create**.

The Model Objective is created and displayed in the Model Objective screen.

NOTE

The MMG User must check the details provided above from the home page of the library being captured.

For example: <https://scikit-learn.org/stable/>.



OR

You can select the **Use Template** option to pre-fill the entries from the seeded list of Libraries. Currently, the following libraries are present in the template.

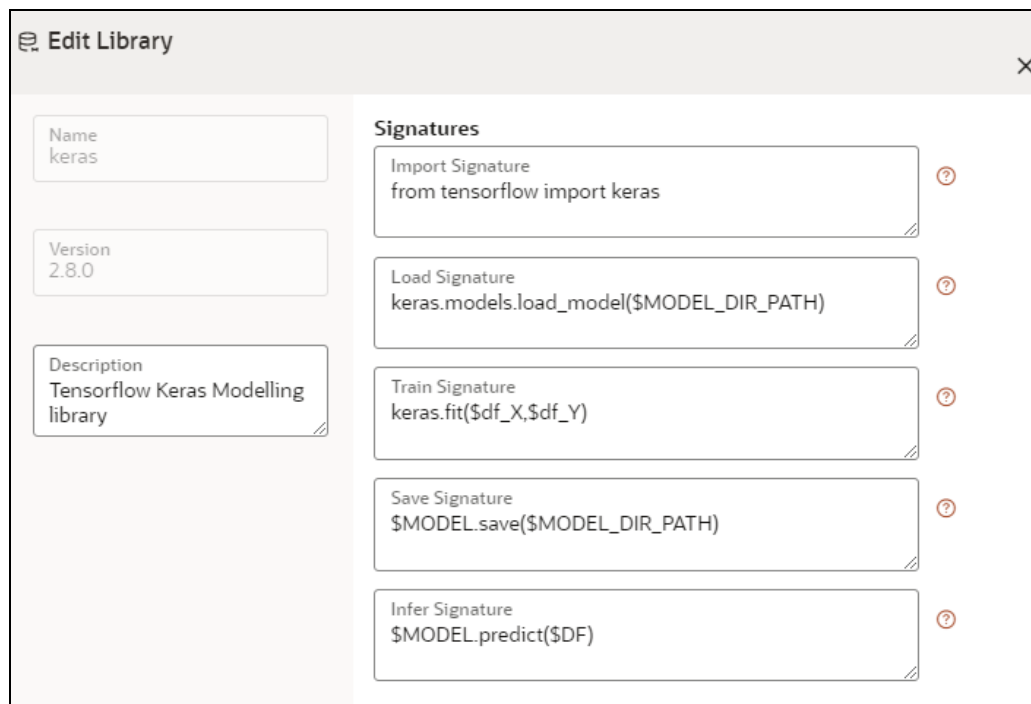
You can also edit the data based on your requirements.

7.2.1 Edit a Model Library

To edit a model library:

1. Navigate to **Library Summary** page.
2. Click  and select Edit .

The **Edit Library** screen is displayed.





3. Make the necessary changes and click **Update**.

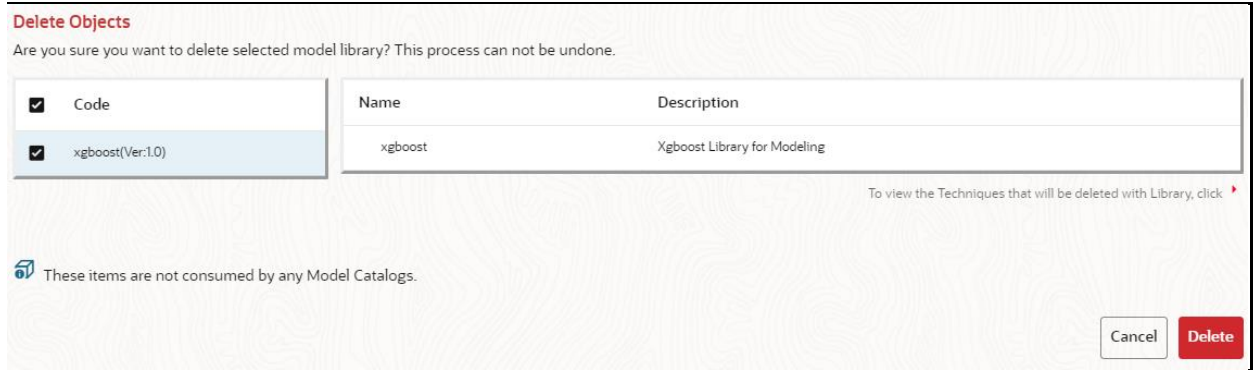
NOTE The Model Library name and version are unique and cannot be modified.

7.2.2 Delete a Model Library

To delete a model library:

1. Navigate to **Library Summary** page.
2. Click  and select Delete .

A confirmation message is displayed.



3. Click **Delete**.

The selected model library and all the associated model techniques are deleted. The libraries that are deleted cannot be consumed by any model catalog.

To delete multiple model libraries select all the model libraries that you want to delete and click the



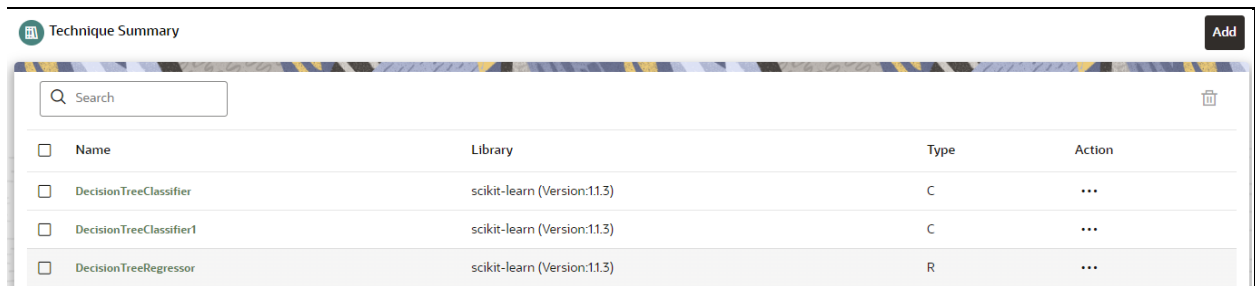
icon on the page header.

7.3 Model Techniques

Model Technique is the algorithm/technique used to create the Python model using the library/package which was created in the Model Library screen. It is the actual information captured in the MMG application that helps in training the model (upload and build).

1. In the Mega menu, click **Modeling > Model Technique**.

The **Technique Summary** page is displayed.



2. In the **Technique Summary** page, click **Add**.

The **Add Technique** page is displayed.

3. Enter the name of the technique.
4. Enter the description of the technique.
5. Select the library from the drop-down. Currently, MMG supports libraries such as keras, ONNX, scikit-learn, and xgboost.
6. Select the type as either **Classification** or **Regression**.

Classification: Classification is a process of finding a function which helps in dividing the dataset into classes based on different parameters. The task of the classification algorithm is to find the mapping function to map the input(x) to the discrete output(y).

Regression: Regression is a process of finding the correlations between dependent and independent variables. The task of the Regression algorithm is to find the mapping function to map the input variable(x) to the continuous output variable(y)

7. Enter the signatures such as Import, Load, Train, Save, and Infer. For more details on the signatures, click the respective help icon.

Some of the signatures captured in library stage might not be standard across different algorithm/techniques provided by the library.

8. Navigate to the **Hyperparameter Details** tab and click **Add** to add the parameters.

You can add parameter types such as String, Integer, Float, and Boolean.

9. Click **Create**.

The Model Technique is created and displayed in the **Technique Summary** screen.

NOTE

The MMG User must check the details provided above from the home page of the library being captured.

For example: <https://scikit-learn.org/stable/>.



OR

You can select the **Use Template** option to pre-fill the entries from the seeded list of libraries.

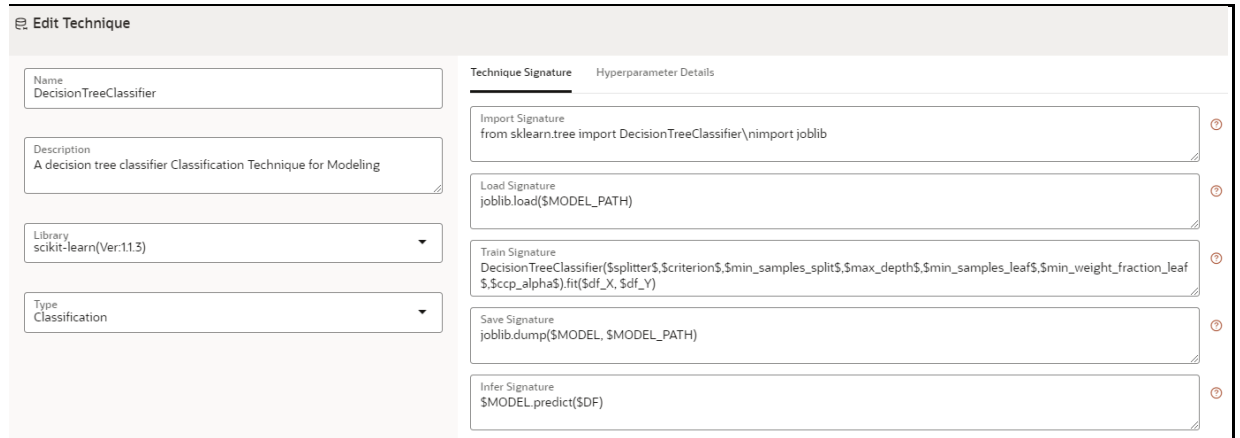
You can also edit the data based on your requirements.

7.3.1 Edit a Model Technique

To edit a model technique:

1. Navigate to **Technique Summary** page.
2. Click  and select Edit .

The **Edit Technique** screen is displayed.





The screenshot shows the 'Edit Technique' interface for a 'DecisionTreeClassifier'. On the left, there are fields for Name, Description, Library, and Type. On the right, there are sections for 'Technique Signature' and 'Hyperparameter Details', each containing a list of code snippets for Import, Load, Train, Save, and Infer signatures.

Edit Technique	
Name DecisionTreeClassifier	Technique Signature Hyperparameter Details
Description A decision tree classifier Classification Technique for Modeling	Import Signature from sklearn.tree import DecisionTreeClassifier\nimport joblib
Library scikit-learn(Ver:11.3)	Load Signature joblib.load(\$MODEL_PATH)
Type Classification	Train Signature DecisionTreeClassifier(\$splitter\$, \$criterion\$, \$min_samples_split\$, \$max_depth\$, \$min_samples_leaf\$, \$min_weight_fraction_leaf\$, \$ccp_alpha\$).fit(\$df_X\$, \$df_Y\$)
	Save Signature joblib.dump(\$MODEL, \$MODEL_PATH)
	Infer Signature \$MODEL.predict(\$DF)

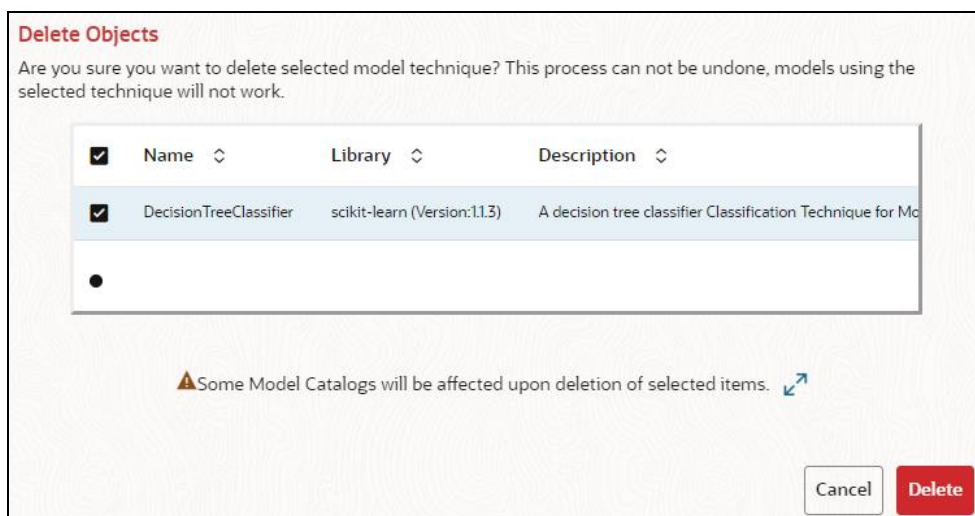
3. Make the necessary changes and click **Update**.
For more details, see the [Model Technique](#) section.

7.3.2 Delete a Model Technique

To delete a model technique:

1. Navigate to **Technique Summary** page.
2. Click  and select Delete .


A confirmation message is displayed.



3. Click **Delete**.

The selected model technique and all the model catalogs associated are deleted.

To delete multiple model techniques, select all the model techniques that you want to delete and

click the  icon on the page header.

7.4 Model Catalog


Use the Model Catalog page to add and manage the Model Technique, Model Library, and Model Objectives. You can either import the models from external sources or create, train, and label it as the champion model.

7.4.1 Model Objective

Model Objective is the top-level metadata where further models are created or trained, which can be consumed in the upcoming steps.

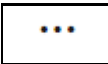
NOTE Ensure Data Studio is up and running. A validation message is displayed when the Data Studio is down during creation of Model Objectives.

To add a Model Objective:

1. Click **Launch Workspace**  corresponding to the workspace you want to launch to display the **MMG Dashboard** window with application configuration and model creation menu.
2. In the Mega menu, click **Model Catalog** to display the **Model Objective Summary** window.

This window displays the model objectives in a tabular format.

The following table provides descriptions for the fields and icons on the **Model Objective Summary** page.

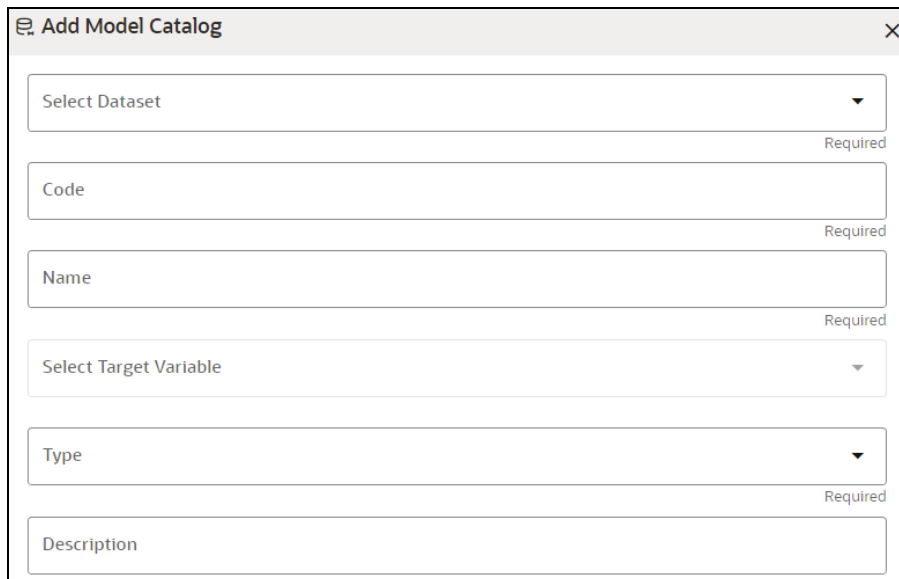
Field or Icon	Description
Search	Search for Model Objectives. Enter your search string, and press Enter on the keyboard.
Code	The unique identifier of the Model Objective.
Name	The name of the Model Objective.
Dataset	The dataset used to create the Model Objective.
Target Variable	Target Variable is the most important parameter after dataset. During dataset selection, the target variable is selected, which constitutes of the number of columns/features.
Type	The type which is selected during model objective creation. It can be either Classification or Regression.
Action 	Click this icon to view or delete the selected model objective.

7.4.1.1 Add a Model Objective

To add a model objective:

1. In the **Model Objective Summary** screen, click **Add**.

The Add Model Objective screen is displayed.



2. Select the required dataset from the drop-down.
For more details on dataset, see the [Dataset](#) section.
3. Enter the code for the Model Objective.
The code must be unique for each model objective.
4. Enter the name for the Model Objective.
5. Select one of the column/features as the target variable for the models that needs to be trained/uploaded.

6. Select the Type from options such as **Classification**, **Regression** or **Others**.

Classification: Classification is a process of finding a function which helps in dividing the dataset into classes based on different parameters. The task of the classification algorithm is to find the mapping function to map the input(x) to the discrete output(y).

Regression: Regression is a process of finding the correlations between dependent and independent variables. The task of the Regression algorithm is to find the mapping function to map the input variable(x) to the continuous output variable(y).

Others: If the Type is not Classification or Regression, select this option.

7. Enter the description for the Model Objective.

8. Click **Create**.



The Model Objective is created and displayed in the **Model Objective Summary** screen.

7.4.1.2 View a Model Objective

To view a Model Objective:

1. Navigate to **Model Objective Summary** page.
2. Click on the Model.

OR

Click  and select View .

The following page is displayed.

Model ID	Code	Version	Type	Status	Action	Champion
1706785088326	SavedFromPipeline	0	Pipeline Model		...	🏆
1698309977652	TESTM	0	Local Model	🟢	...	🏆
1706785153628	UPLOADEDEXAMPLE	0	External Model		...	🏆

Click on Type to view the model, build, and score details.

Model Details ✕

Details | Build Details | Score Details

Model Code
SavedFromPipeline

Description

Library Name
scikit-learn (Version:1.1.3)

Technique Name
DecisionTreeClassifier

Created By
MMGADMIN

Created Date
1 Feb 2024, 16:28:08

7.4.1.2.1 Upload a Model

To upload a model:

1. In the **View Model Objective** page, click **Add** and select **Upload Model**.

The **Upload Model** page is displayed.

2. Select the library from the drop-down.
For more details on the model library, see the [Model Library](#) section.
3. Select the required technique from the drop-down list.
For more details on the model technique, see the [Model Technique](#) section.
4. Enter the model code and description for the Model Objective.
5. Enter the name of the model file with extension to be used while saving or loading.
6. Import the model using the **Import Archive File** option. File format should in be zip format.

OR

Enable **Upload from FTPSHARE** option to import the model. File Path entered is the zip file path present on the MMG Server relative to ftpshare path including file.

Example: <mmg installation path>/temp/models/model.zip

7. Click **Upload Model**.

The model is uploaded successfully.

7.4.1.2.2 Build a Model

To build a model, you must enter the following information:

- [Model Details](#)
- [Pre – Processing Stage](#)
- [Model Training Stage](#)
- [Model Validation Stage](#)
- [Model Summary](#)

Model Details

1. In the **View Model Objective** page, click **Add** and select **Build Model**.

The **Model Details** page is displayed.

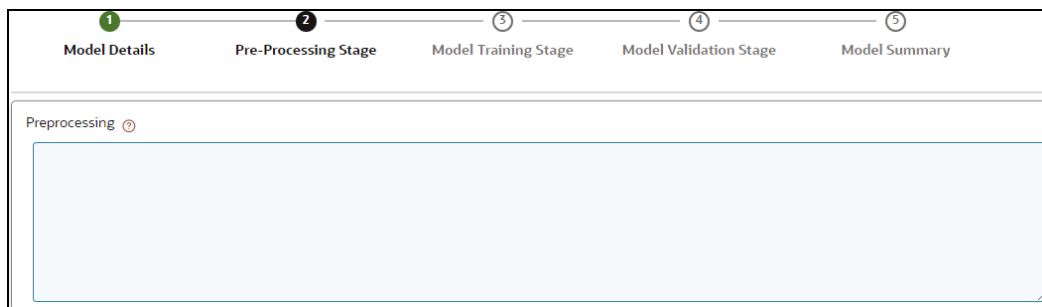
The screenshot shows a multi-step form for building a model. At the top, there are five numbered steps: 1. Model Details, 2. Pre-Processing Stage, 3. Model Training Stage, 4. Model Validation Stage, and 5. Model Summary. The first step, 'Model Details', is active and contains the following fields:

- Select Library:** A dropdown menu with a downward arrow, labeled 'Required'.
- Select Technique:** A dropdown menu with a downward arrow.
- Model Code:** A text input field, labeled 'Required'.
- Description:** A larger text input area.
- Model File Name:** A text input field with a circular icon containing a question mark to its right, labeled 'Required'.

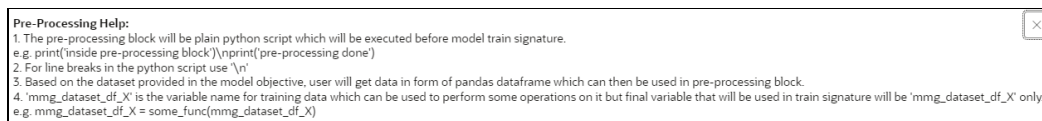
2. Select the library from the drop-down. Currently, keras, ONNX, scikit-learn, and xgboost are supported. For more details, see the [Model Library](#) section.
3. Select the required technique from the drop-down list. For more details, see the [Model Technique](#) section.
4. Enter the model code and description for the model.
5. Enter the name of the model file with the extension to be used during saving or loading.
6. Click Next.

Pre – Processing Stage

After adding the details in the Model Details page, the Pre-Processing Stage screen is displayed.



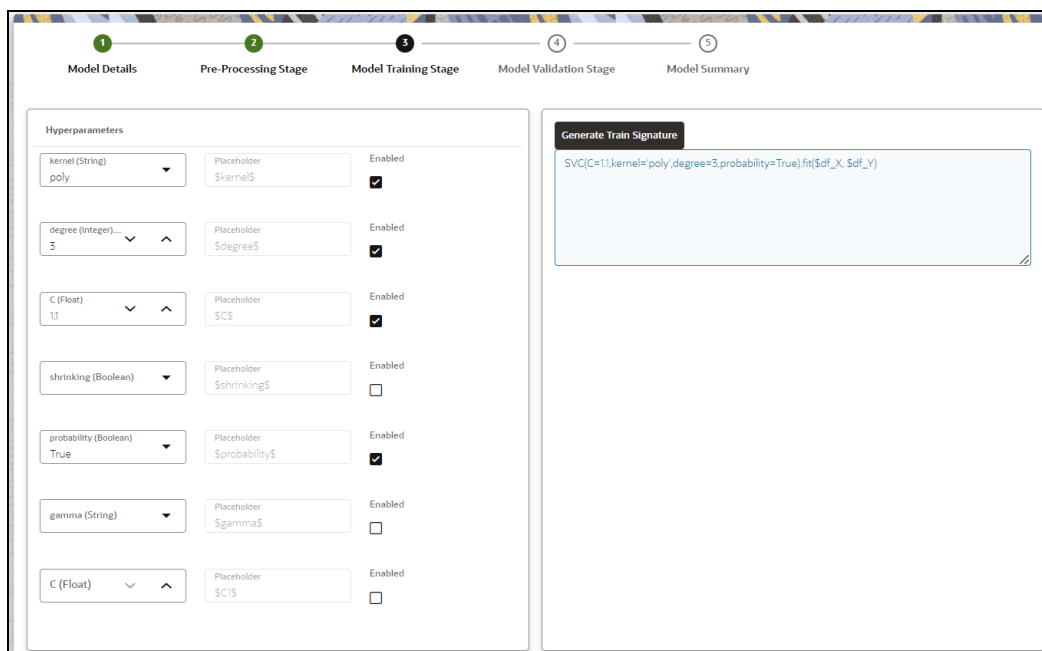
1. Enter the data in the Preprocessing text box. as shown in An example is provided here.



2. Click Next.

Model Training Stage

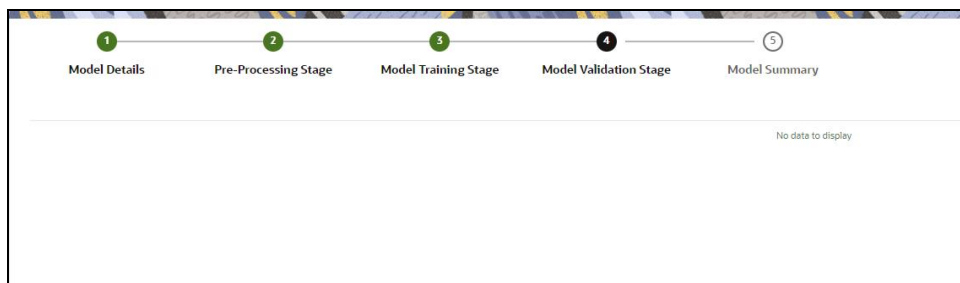
After adding the details in the Pre-Processing Stage page, the Model Training Stage screen is displayed.



1. Select the hyperparameters.
When the parameters are selected, the **Enabled** check box is selected by default.
2. Click **Generate Train Signature**.
The signature is displayed.
3. Click Next.

Model Validation Stage

After adding the details in the Model Training Stage page, the Model Validation Stage screen is displayed.

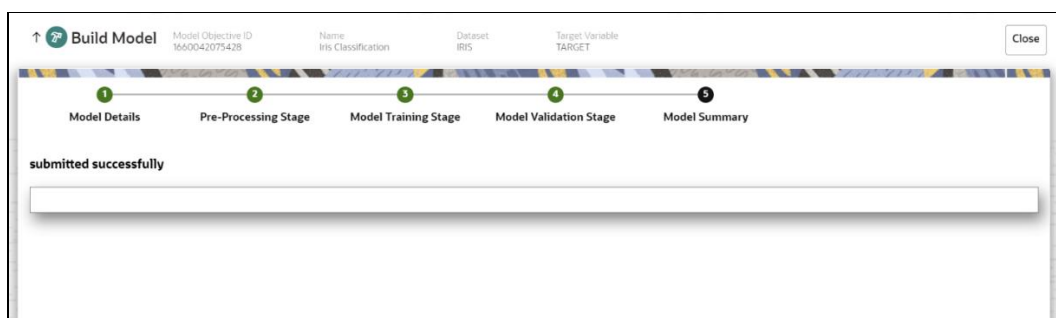


The Validation is work in progress.

1. Click Finish to start training the model.

Model Summary

Once the validation of the model is completed, the Model Summary screen is displayed.



1. Click **Close**.

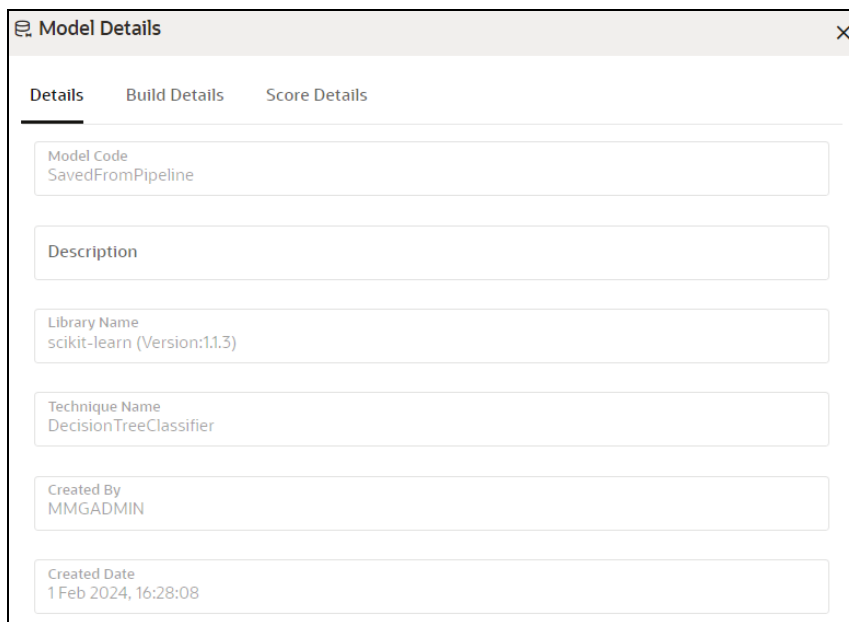
The model is created and displayed in the Model Objective screen.

7.4.1.2.3 View Details of a Model

To view details of a model:

1. In the View Model Objective page, click **Action** and select **View Details**.

The model details are displayed.



2. Click the **Build Details** tab to view the Preprocessing, and Hyperparameters details of the model.
3. Click the **Score Details** tab to view the Latest score, and Scoring details of the model.

7.4.1.2.4 Set the Model as Champion

You can set a trained model as the champion model.

To set a champion model:

1. In the View Model Objective page, hover over the model which you want to set as champion and click the **Set Champion** icon.

Model ID	Code	Version	Type	Status	Action	Champion
<input checked="" type="checkbox"/> 1706785088326	SavedFromPipeline	0	Pipeline Model		...	
<input type="checkbox"/> 1698309977652	TESTM	0	Local Model	✓	...	Set Champion
<input type="checkbox"/> 1706785133628	UPLOADEDEXAMPLE	0	External Model		...	

A confirmation message is displayed.

2. Click **Update**.

The model is set as the champion for the selected model objective.

7.4.1.2.5 Delete a Model

To delete a model:

1. In the View Model Objective page, select the models that you want to delete.
2. Click **Delete** and acknowledge the confirmation message.
3. Click **Delete**.

7.4.1.3 Delete a Model Objective

To delete a Model Objective:

1. Navigate to Model Objective Summary page.
2. Click **Delete** and acknowledge the confirmation message.
3. Click **Delete**. The selected model objective and all its associated models are deleted.

7.5 Pipelines

Model Pipeline enable you to create and publish models based on the workspaces created from datasources. The published models are then deployed in production to be consumed by other services and applications. Modelers create models by using model templates available as part of ML4AML or by developing them independently in Compliance Studio Notebooks. After building and evaluating, multiple models, the best model or champion model can be selected. The champion model can then be deployed for scoring. In this document the champion model can also be referred to as the scoring model.

7.5.1 Prerequisites

The prerequisites for model pipeline are as follows:

- To create a model, your user profile must be mapped to the Modeler Group. For more information, see the [Mapping User Groups](#) section.
- To create a model, a workspace must be deployed. For more information, see the [Create a Workspace](#) section.
- To approve and deploy a model, your user profile must be mapped to the Modeling Administrator Group. For more information, see the [Mapping User Groups](#) section.

7.5.2 Access Model Pipelines

The Model Pipeline window allows you to create and publish models.

To access the Model Pipeline window:

1. Navigate to **Workspace Summary** page.

The page displays workspace records in a table.

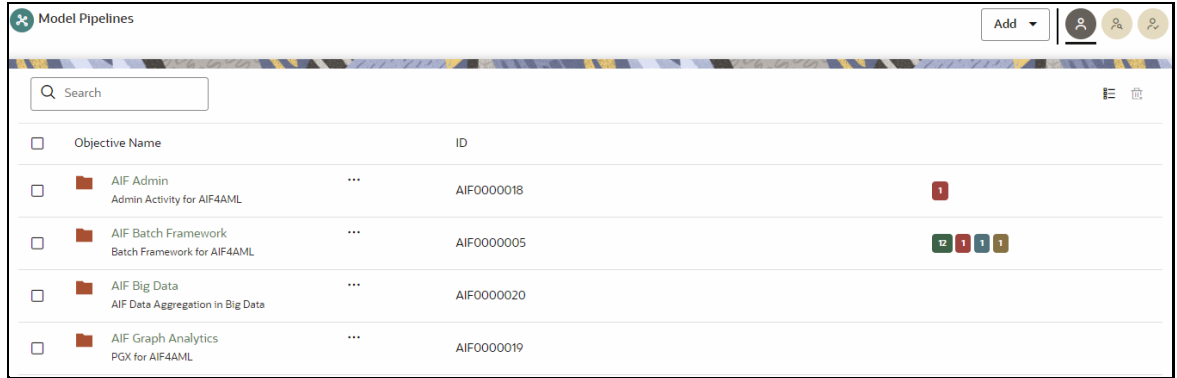
2. Click  next to corresponding Workspace to Launch Workspace.

The MMG **Dashboard** window is displayed with application configuration and model creation menu.

3. In the Mega menu, click **Modeling > Pipelines** to display the **Model Pipelines** page.


The window displays objectives that contain drafts and models. When you hover on the count that are next to the ID column, it displays the count of sub objectives, Drafts, Models, and Champion if available.

Figure 26: Model Pipelines Page




You can switch the Model Summary page view from Flat to Hierarchical and vice-versa. Flat list is the default view in Production workspace while Hierarchical list is the default in Sandboxes.

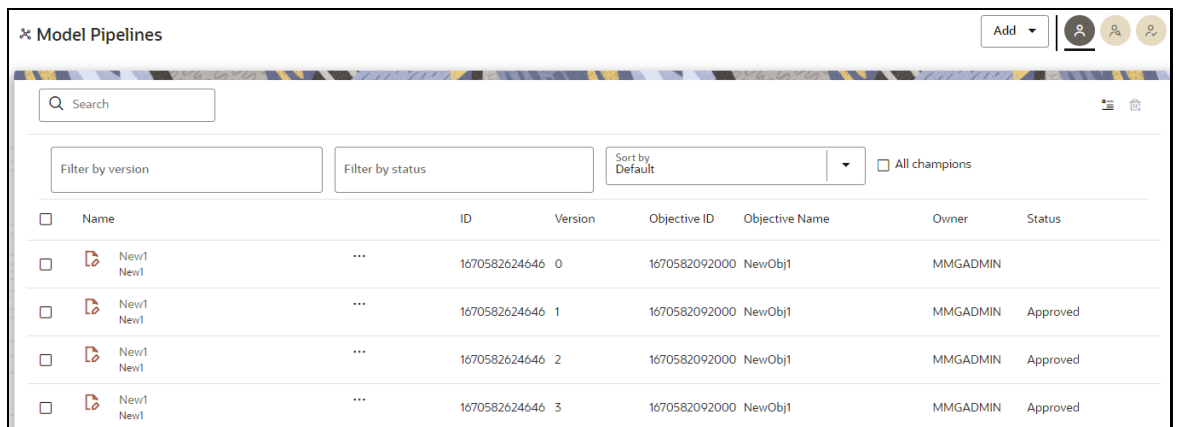
- **Hierarchical option:** The Model Management window shows the hierarchical list of the Objectives

using the Hierarchical  option. In the Hierarchy view, you can see the following details of the Objectives such as Objective Name, and ID.

- **Flat option:** The Model Pipeline window shows the flat list of all the models (published and drafts)








using the Flat  option. Flat list is not objective-specific. It shows the models across all the objectives. You can search the models using the Filter by Version, Filter by Status, and All champions. You can also sort the drafts and models by Default or Latest first options.

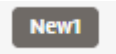


- In the Flat list of models, you can see the following details of the models such as Name, ID, Version, Objective ID, Objective Name, Owner, and Status.



The following table provides descriptions for the fields and icons on the **Model Pipeline** page.




Field or Icon	Description
Model Pipeline Page Header	The header that follows the global header in the application.

Field or Icon	Description
Breadcrumbs	<p>Indicates the position of the current page in the Model Management hierarchy. Use breadcrumbs locator links to navigate back to higher levels in the hierarchy after you have drilled down through levels of functions.</p> <p> Model Pipelines / NewObj1</p> <p>Click Model Pipelines on the breadcrumb to navigate to the Model Summary page.</p> <p>Click  or  to navigate back to Workspace Summary page.</p>
Create Objectives and Models	<p>Select Add to display a list with the following options:</p> <ul style="list-style-type: none"> • Draft • Objective • Seeded Models <p>To create Models, select Draft. To create Objectives, select Objective. See the Create Objective (Folders) and Create Draft Models sections for more information.</p> <p>However, if you want to know about the cycle of model creation, see the Create, Review, Approve, and Deploy a Model Section.</p>
Requester	<p>Displays that the logged-in user has the Requester privileges when the status is green.</p> <p></p> <p>You can create a model. However, to approve and publish, the model must be reviewed by a user with reviewer privileges and approved by a user with approver privileges.</p>
Reviewer	<p>Displays that the logged-in user has the Reviewer privileges when the status is green.</p> <p></p> <p>You can review models. However, to approve and publish, the model must be approved by a user with approver privileges.</p>
Approver	<p>Displays that the logged-in user has the Approver privileges when the status is green.</p> <p></p> <p>You can approve models that are created and reviewed.</p>
Model Pipeline Page Table	The table displays the objective and model records on the page.
Objective Name	<p>Displays the name and description of the Objective</p> <p></p>
ID	Displays the ID of the objective.
Owner	<p>Displays the owner who created the Drafts.</p> <p>This information does not display for an Objective.</p>

Field or Icon	Description
Tags	<p>Displays the tags associated with the Models or Drafts.</p>  <p>This information does not display for an Objective.</p>
Delete Objective	<p>Select  to delete the model from the Confirmation dialog box. Click Delete to process or click Cancel to cancel.</p> <p>This information does not display for an Objective.</p>
Edit Objective	<p>Select  to edit the models in Data Studio. See the Edit Models section for more information.</p> <p>This information does not display for an Objective.</p>

7.5.3 Manage Models

A model has to go through an approval workflow before it can be deployed to production. The following types of users in the system have privileges that restrict the activities, they can do in the model creation and deployment workflow.

Field or Icon	Description
Requester 	<p>You can create a model. However, to approve and publish, the model must be reviewed by a user with reviewer privileges and approved by a user with approver privileges.</p> <p>NOTE: User Groups must be mapped to the MDLDEPLOY role to access Requester functions.</p>
Reviewer 	<p>You can review models. However, to approve and publish, the model must be approved by a user with approver privileges.</p> <p>NOTE: User Groups must be mapped to the MDLREVIEW role to access Reviewer functions.</p>
Approver 	<p>You can approve models that are created and reviewed. You can then promote to production and make the model the champion in the production.</p> <p>NOTE: User Groups must be mapped to the MDLAUTH role to access Approver functions.</p>

The following sections in this topic provide details for the cycle of creation of a model, review, approval, and deployment:

- Create Objective (Folders)
- Create Draft Models
- Publish Models (Scoring)
- View Model Details
- Compare Models
- Understand Model Governance
- Request Model Acceptance
- Review Models and Move to Approve or Reject

- Approve Models and Promote to Production
- Deploy Models in Production and Make it a Global Champion

7.5.3.1 Create Objective (Folders)

Create folders called Objectives within which you can create Models.

To create an Objective:



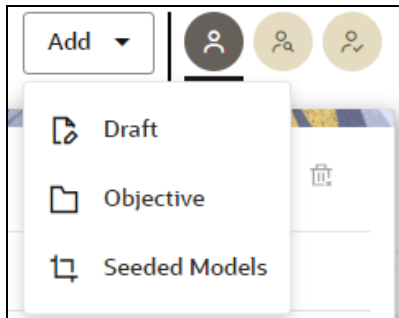
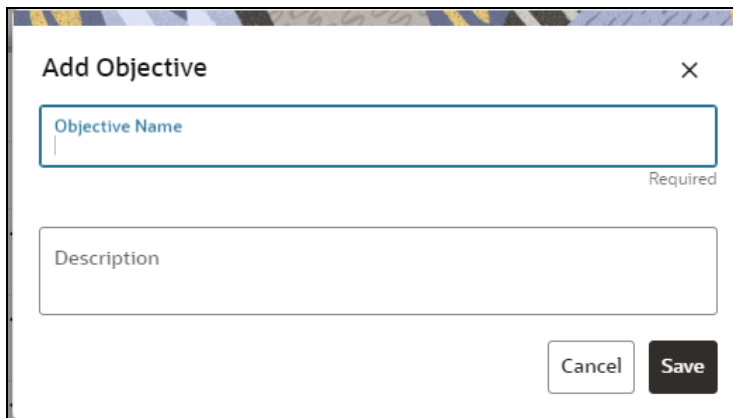
1. Click Launch Workspace  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click **Model Pipelines**  to display the **Model Pipelines** window.
The window displays folders that contain models and model records in a table.
3. Click **Add** and select **Objective** from the list to display the **Objective Details** dialog box.

Figure 27: Select Objective from Add



4. Enter details in Objective **Name** and **Description** fields in the Add **Objective** dialog box.

Figure 28: Objective Details Dialog box



5. Click **Save**.

7.5.3.2 Create Draft Models

Once an objective has been created, a model draft or notebook can be created where model development can start.

To create a draft Model:



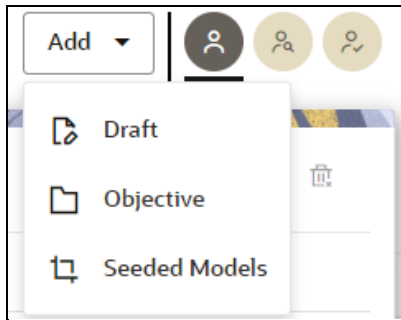
1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click **Model Pipelines**  to display the **Model Pipelines** window.
The window displays folders that contain models and model records in a table.
3. Click **Add** and select **Draft** from the list to display the **Add Draft** dialog box.

Figure 29: Create Model



4. **Create New Model** is the default setting in the **Model Details** dialog box. Use Create New Model to start from a blank Notebook in Compliance Studio. You can also create a draft under Objective (Folder) also. Click an Objective to open it.

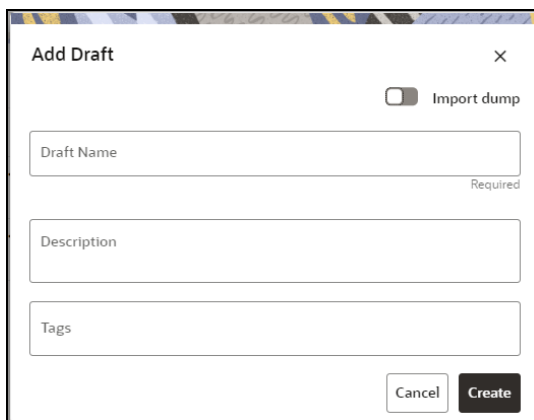
OR

Drag the toggle button to select **Import Dump**. Import Dump lets you drag and drop an existing file with model data and modify it. To import a model data dump from another model, see the [Import a Workspace Model Data into a New Model](#) section.

To create a new model:

- a. Enter details for Draft **Name** and **Description**.

Figure 30: Model Details - Create New Model





- b. Enter a tag in the **Tags** field.
- c. Click Create.

7.5.3.3 Create Seeded Models

You can seed the models from the external sources which can be imported in the MMG application.

To import the models:

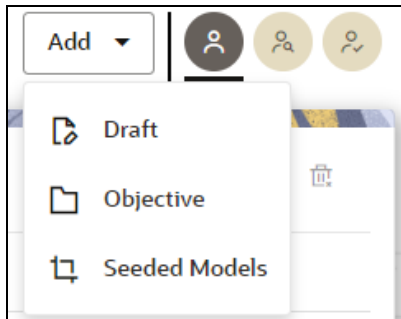
1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.

2. Click **Model Pipelines**  to display the **Model Pipelines** window.

The window displays folders that contain models and model records in a table.

3. Click **Add** and select **Seeded Models** from the list to display the **Add Draft** dialog box.

Figure 31: Add Seeded Models



4. You must add the models in the following installed path location: `<installed path>/ftpshare/mmg/seeded/models`

The added models is displayed in the Seeded Models page.

Figure 32: Seeded Models

Seeded Models					
<input type="checkbox"/>	Objective Path	Model Name	Model Description	Version	Seeded File Name
<input type="checkbox"/>	Test/NewDraft	NewDraft	Supervised learning analysis of loan application frauds	0	CS_1670477976040_0.zip
<input type="checkbox"/>	Test/NewDraft	NewDraft	Supervised learning analysis of loan application frauds	1	CS_1670477976040_1.zip

Import Seeded Models

5. Select the models which you want to import and click **Import Seeded Models**.

The selected models are imported and displayed in the **Model Pipelines** page.

7.5.4 Pipeline Designer

Clicking on the model navigates you to the Pipeline Designer page.

The following sections are available on the Pipeline Designer window:

- Pipeline Canvas
- Dashboard
- Notebook
- Simulations
- Execution History
- Compare

NOTE:

- a. Models in Production workspace have the 'Dashboard' as the default tab.
- b. Drafts or Models in the Sandbox workspace have the 'Pipeline Canvas' as the default tab.

7.5.4.1 Pipeline Canvas

You can perform following functions on Pipeline Canvas:

- Create a Pipeline
- Create Script Template
- View a Pipeline
- Execute a Pipeline
- Publish a Pipeline

7.5.4.1.1 Create Paragraphs using Pipeline Designer

After creating the Models in the Workspace, create Paragraphs using the Pipeline Designer window.

Pipeline Designer enables you to design the paragraph using widgets (graphical representation) instead of using python codes. In addition, if you add new paragraphs in Data Studio, the added paragraphs are displayed in the widget format on Pipeline. Similarly, if you create a Notebook using Pipeline Designer, it can be opened for editing in Data Studio using Studio Notebook option.

NOTE

When you open the notebooks from MMG UI, the attach workspace call will be made from mmg service and proper workspace will get attached.

If the Studio is opened outside of MMG, then the `attach_workspace` command has to be used.

This helps the Financial Institutes and Banks to:

- Visualize data (for example, based on data tasks)

- View dependencies
- Modify the execution flow or execution order
- Ease auditing

You can execute the flow based on requirement. For example, if you have created one flow and want to execute a flow of training paragraphs out of that and other flow as experimental way, then you can modify using the Training and Experimentation link types. One flow can be break into 2-3 flows for execution purpose.

When a draft is edited using the Pipeline Designer/Data Studio, and published, then a new version of published model is displayed in Model Summary page.

NOTE

When you add a new paragraph from studio and opened the same in pipeline designer, it gets linked to multiple paragraphs. For example, you have paragraphs P1, P2 and P3 in the same order in a Notebook. It shows in Pipeline Designer canvas as P1 > P3 > P2.

If you add two new paragraphs P1a and P1b in the Notebook after the P1 and open the canvas, this gets reflected as the following:

1. P1 -> P1a -> P1b -> P2
2. P1 -> P3 -> P2

After opening a Model in the Pipeline Designer, you can:

- Generate Model Report
- Download
- Delete
- Clone Model

After opening a Draft in the Pipeline Designer, you can:

- Generate Model Report
- Download
- Delete
- Publish
- Script Template list

Create a Pipeline

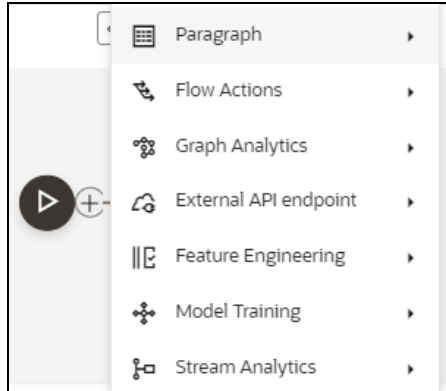
To create a paragraph using pipeline:

1. Navigate to the **Pipeline Designer** page.

The Start widget is displayed by default in the canvas screen.

2. Hover over on Start widget and new nodes can be added using the add button in the Pipeline Canvas.

This will open a menu which contains all the widgets sectioned into different categories. The spectra diagram builder is based on row and column positioning.



NOTE Click on each menu to select the widgets of the required categories.

The following widgets and their categories are supported.

Widget	Supported Types
Paragraph	<ul style="list-style-type: none"> • md • pgql • pgx-algorithm • pgx-java • pgx-python • pyspark • python
Flow Actions	<ul style="list-style-type: none"> • If
Graph Analytics	<ul style="list-style-type: none"> • Load Graph
External API endpoint	<ul style="list-style-type: none"> • Custom API
Feature Engineering	<ul style="list-style-type: none"> • Feature Importance • Feature Selection
Model Training	<ul style="list-style-type: none"> • Model Evaluation • Train Model • Save Model • Load Dataset • Load Model
Stream Analytics	<ul style="list-style-type: none"> • Kafka Producer • Kafka Transform • Kafka Monitor • Kafka Consumer

You cannot edit or delete this widget. Whenever a new draft is created (not by importing dump files), the default paragraph created is converted into a start widget. The visibility of code/result/title in notebook of this node will be kept to invisible.

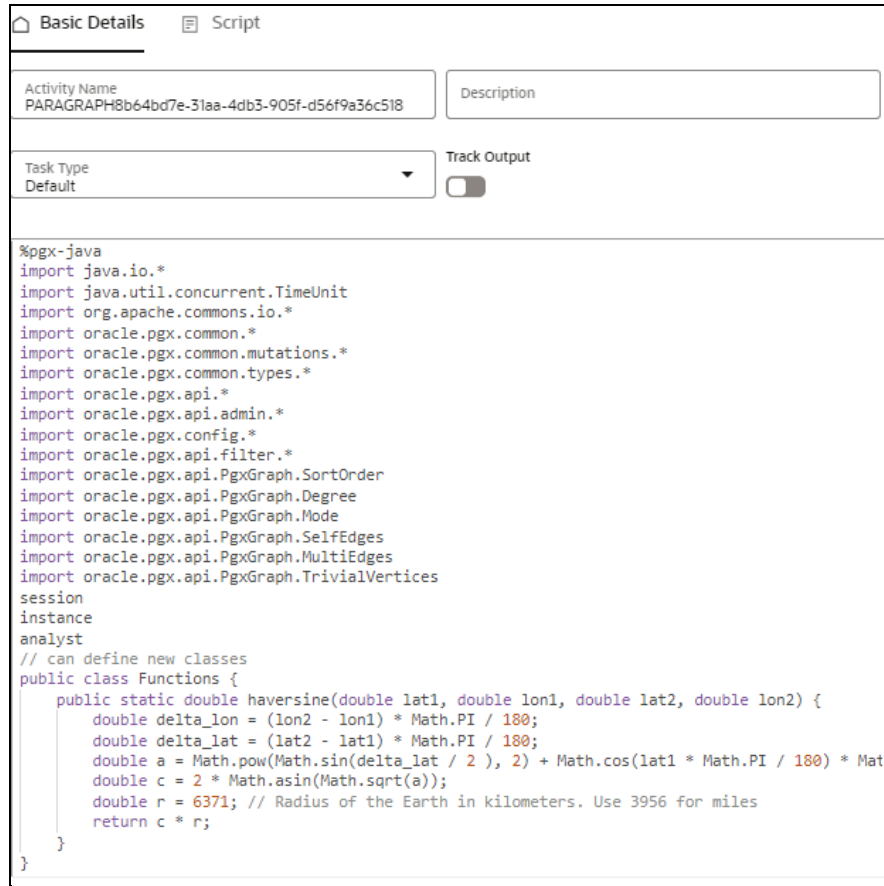
Whenever the notebook is opened, init script execution including workspace attach will happen in this start node.

Title of the node is called 'Start widget'. Publish /download and import /promote to production of model with start widget will keep this widget. Publish from canvas will keep the start widget in the published model. When you publish model from model summary, you can explicitly select the start widget paragraph from the list of paragraphs. After this only, start widget will appear in the published model.

3. Click on the node to add the basic details.

The Basic Details page is displayed.

Figure 33: Basic Details for Paragraph



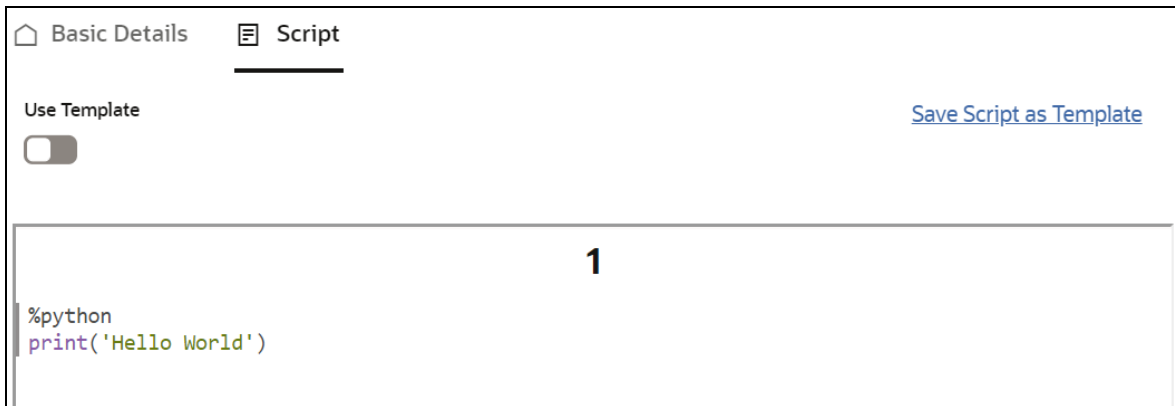
4. Provide details as described in the following table:

Field	Description
Activity Name	Enter the Activity Name
Description	Enter the description of Activity
Task Type	Select the task type. For example, Model Training, Data Analysis and so on. You can also search the task type.

Field	Description
Track Output	If this option is selected for any paragraph, then during the model comparison the output details are displayed. Keep the Track Output to ON in case you want to execute the paragraph and view the result from the Dashboard tab.
Script	Shows the script. You can edit the script in this screen or in the Script tab. This script can be also be saved as the Script Template.

Create Script Template

Navigate to Script tab to manage scripts. These scripts can be called for paragraph. You can also create the Script template by clicking on the More options icon in the Pipeline Designer.



Basic Details **Script**

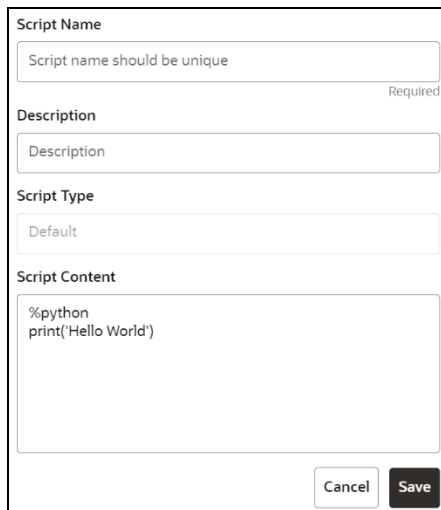
Use Template [Save Script as Template](#)

1

```
%python
print('Hello World')
```

To add a script template:

1. In the Script tab, click the **Save Script as Template** link.



Script Name
Script name should be unique Required

Description
Description

Script Type
Default

Script Content
%python
print('Hello World')

Cancel Save

2. Enter the following details:

Field	Description
Script Name	Enter the Script Name

Field	Description
Description	Enter the description of Script
Task Type	Select the task type. For example, Model Training, Data Analysis and so on. You can also search the task type.
Script Content	Enter Python script

3. Click Save.

A node is created.

You can perform the following functions on Pipeline Designer window:

- **Parameter Sets:** Allows you to view, edit, clone, and delete the Parameter Set. Use the Clone option to duplicate the parameter set with different values and name.
- **Publish:** Allows publishing the pipeline. This option is displayed for the Drafts.
- **Deploy:** Allows you to deploy the model. This option is displayed for the published models.
- **More Actions icon:**
 - **Generate Model Report :** To generate model report
 - **Download :** Use Download to download the current working version in opened in canvas
 - **Script Template list :** Allows you to add, edit, view, and delete the script templates.
 - **Delete :** Allows to delete the current working version. If this is first draft of Model, it will delete all the dependent published version in the Sandbox. If the Model is not first version, then it will delete only the current working version.

The following options are displayed only for the published models.

- **Clone to new draft:** Allows to create a new draft with the same pipeline.
- **Overwrite existing draft:** Allows to overwrite the existing draft with the current published model.

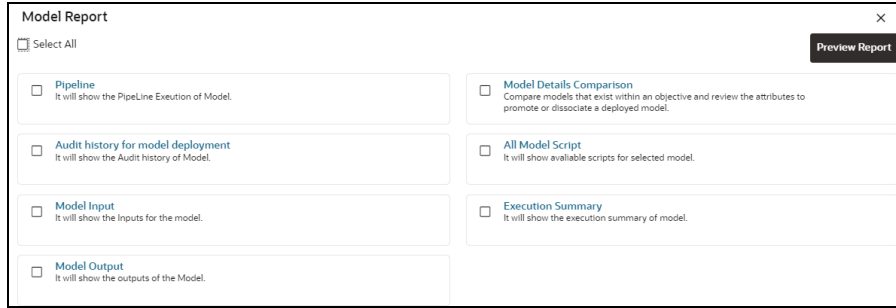
Model Report

This option allows you to view the Model report and download the same in PDF format.

To view and download Report:

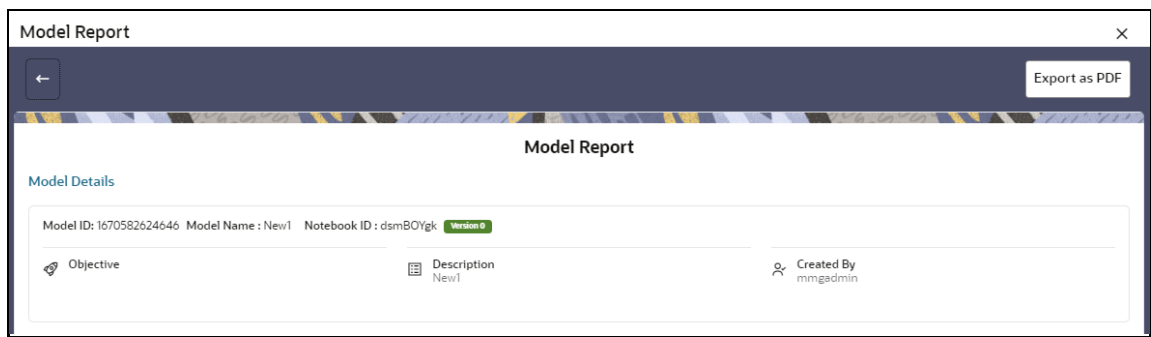
1. Open a Model in Pipeline Designer.
2. Click **Generate Model Report**.

The Model Report window is displayed.



3. Select the Parameters to generate the report.
4. Click **Preview Report**.

The report is displayed based on selected parameters.



5. Click **Export as PDF** to save the report as PDF in local system.

Download a Model

This option allows you to download the Model. To download a model:

1. Open a Model in Pipeline Designer.
2. Click **Download**.

A zip folder is downloaded. This folder contains .cfg and .dsnb files.

Delete

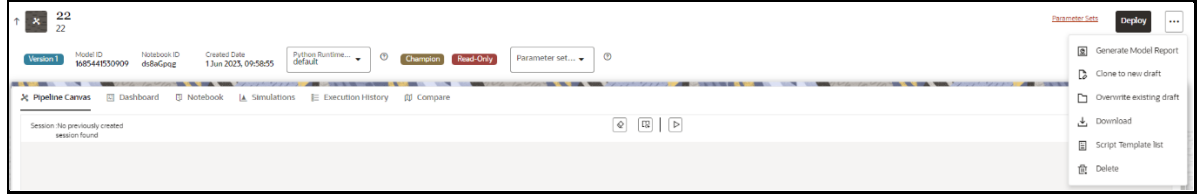
This option is used to delete the Model.

Cloning a Model

You can pick any published model and clone the contents to a new draft in the same objective or clone the content to the current parent draft. The cloned draft can be edited and used further. The Audit Trail window also captures the cloning information.

To clone the model:

1. Open a Published Model in Pipeline Designer.



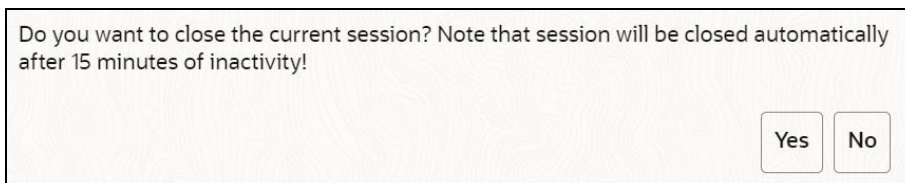
2. Click More Actions icon and select **Clone to new draft** or **Overwrite existing draft** option.

You can perform the following functions on Pipeline Canvas window:

- Clear Execution Results: Clears the execution details.
 - Invalidate session: Deletes the previous session details.
- NOTE:** When you click on Reinitialize or Invalidate session icons, it will kill the existing session and all the session variables will be lost. You must re execute the prior paragraphs in the notebook to reinitialize these session variables.
- Execute : Allows you to execute the pipeline.
 - Save Now: Allows saving the pipeline.
 - Open Notebook in session: Allows you to open the notebook in canvas. This is displayed after the pipeline is executed.
 - Execute Notebook in another session: Allows you to provide different data for the same notebook execution. This option is only displayed when execution is in progress.
 - Stop Execution: Allows you to stop the execution which is in progress. This option is only displayed when execution is in progress.

Whenever user executes a batch, a user session is created. This execution time can be less or more for any execution. Sometime, user doesn't want to wait for execution to complete and navigate away from the Pipeline Canvas page.

For example, if user doesn't want to execute all the paragraphs and want to execute only Paragraph 1 and Paragraph 2. Paragraph 1 takes 15 mins time for execution and Paragraph 2 takes 10 mins for execution. Paragraph 2 execution also wants to use the execution of Paragraph 1. In this case, user can navigate away from the page. A confirmation message is displayed to close the current session. Here, this session time is configurable.

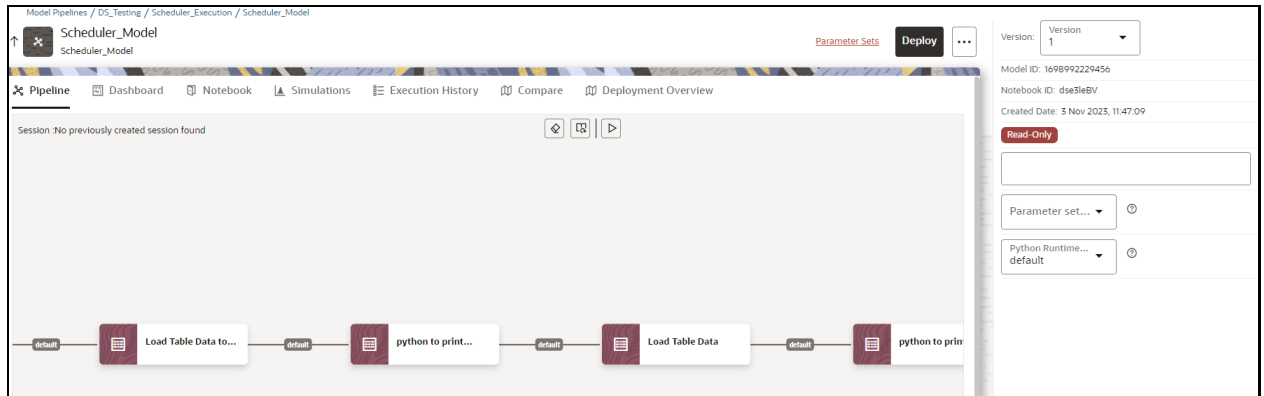


- If user clicks Yes, then execution thread will be closed for this given session time.
- If user clicks No, then execution thread will be valid for this given kill time and run in the background.

You can configure these values in Application.xml file. For more information, see the *MMG Installation Guide*.

Add a Version, Parameter set, and Python Runtime parameters

The Pipeline canvas window allows you to add a Version, Parameter set, and Python Runtime parameters.



- Version: Select the version for the pipeline.
- Parameter set : Select the required parameter set. The selected parameter set will be promoted along with the model pipeline at the time of deployment and you can update this dependency based on your requirements.
- Python Runtime Parameters : Select the required Python Runtime parameter. The selected Python runtime parameter will be used during all the executions and you can update this dependency based on your requirements.

View a Pipeline

The Pipeline canvas window allows you to view the Pipeline using following options:

- Auto-align : Arrange all the widgets in vertical order. After saving, the reverting option will not work.
- Revert-align : Revert all the widgets if they are Auto-aligned.
- Refresh : Refresh the pipeline canvas.

Execute a Notebook

The Execute icon on Pipeline Canvas allows us to execute the notebook.

The following link types are available in the Pipeline Designer:

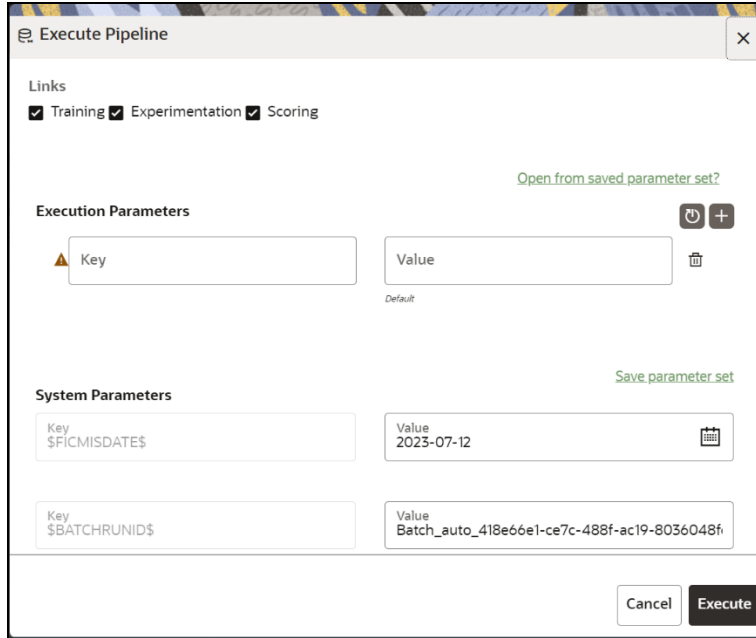
- Default
- Scoring
- Training
- Experimentation

Note: When a model gets published from Model summary page, the Link types configured in Pipeline Designer are set to Default link type.

To execute the notebook:

1. Click the execute icon to view the Execute Pipeline window.

Figure 34: Execute Pipeline



2. Execution parameters are the parameters defined in the notebook required for execution. Select the flow, which you want to execute Scoring, Training, and Experimentation. It displays all the keys defined for all the paragraphs in the notebook with a placeholder for providing the values.
3. Enter the execution Key and Value.

You can also use Runtime parameters for execution. This runtime parameter must be defined in Notebook. If this is defined, you can enter execution value during the process execution.

For more information, see [Create Paragraphs in Model Studio Notebooks](#) section.

The System Parameters window also shows the execution ID, execution Date, and execution Batch. These are required for executing all the paragraphs along with other parameters. It also shows from where the parameter comes from as a subscript.

- **Parameter Sets:** These are the set of parameters with a specific value required for an instance of execution. It consists Key and Value. You can save the parameters set that can be used for one execution instance and reuse it for the next execution. It consists of parameters with a specific value to each parameter. Parameters containing no value will not be taken. Each set is identified with a unique code for each objective. While saving the parameter, you have to provide a code for identifying the name and description which is not mandatory.

You can save Key Value parameter set using the Save Parameter Set option. To Save Parameter Set, enter the Threshold Value and Description in the Parameter Set window.


- **Selecting Parameter Set:** These saved Parameter Set can be selected during the execution. It will replace the values of the parameters from the chosen Parameter Set.


To select the Parameter Set:


- i. Click "Open from saved Parameter Set". The Threshold Code window is displayed.
- ii. Select the Parameter Set from the available list. You can select multiple Parameter Set in the same execution instance. In that case, if there are any common keys, value will be replaced with that from the latest Parameter Set selected.

- You can add new parameters using the **Save parameter set** option.

Note: If the parameter is not defined in the notebook, it will not be used for the execution. In case of multi select, if there are common parameters among the chosen scenarios, it will take the value based on the order of selection. that is first chosen scenario parameter will be taken.

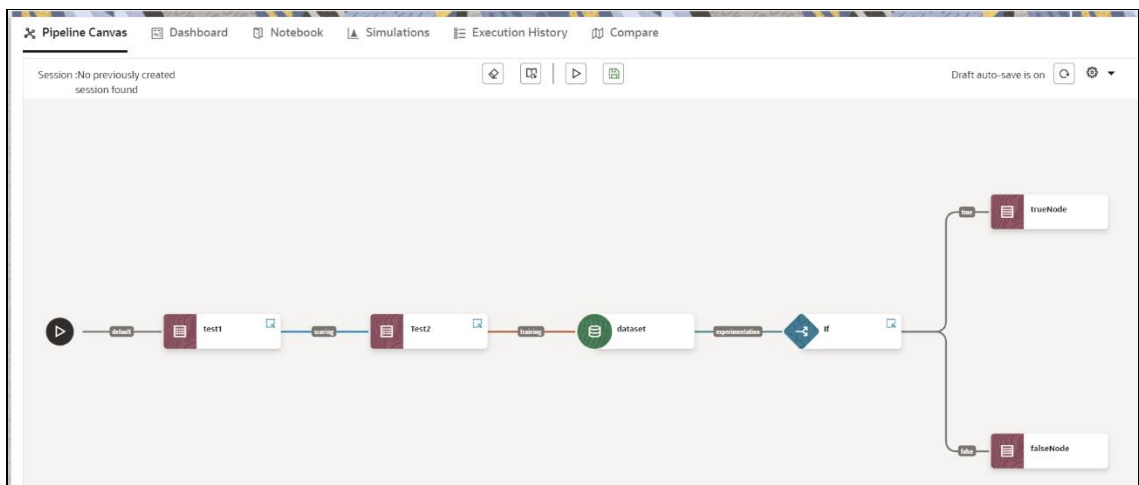
- But if open from saved Parameter Set again (not on single go), then already added will get replaced by the newly added (same as what existed)
- Execution is performed based on selected link types. It filters out all the not required/unused parameters. And all the unused parameters for the current execution are displayed with a warning . To view the only required parameters, click **Show only required** link.

- Click Reset  to reset the entered data.

- Click Delete  to delete the entered Key and Value.

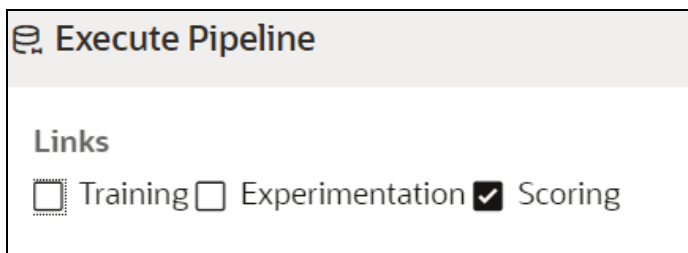
For example, refer to below Figure.

Figure 35: Example of Pipeline Canvas



- Here, if you want to execute this Notebook for scoring purpose, then the flow will be executed till Test2. To perform this, Click Execute Notebook and select Links as Scoring.

Figure 36: Execute Pipeline



- Similarly, if you want to execute this Notebook for training purpose, then the flow will be executed till dataset with default paragraphs. To perform this, Click Execute Notebook and select Links as Training.

Publish a Pipeline

To publish the pipeline:

1. Click Publish to view Publish Pipeline window.

Figure 37: Publish Pipeline

2. Enter the details as shown in the following table.

Field or Icon	Description
Model Name	The field displays the name of the Model. Modify the name if required.
Model Description	The field displays the description for the Model. Enter or modify the description if required.
Technique	Enter the registered technique to use.
Run Version	Select a run version.
Attach Parameter set	<p>If this option is enabled:</p> <ul style="list-style-type: none"> • Selected parameter set will be associated with the published model. • Best performing parameter set or prime reference of the objective is recommended to be associated with the model. • This set is further used for promote to production at the time of deployment. • Users can update this dependency from model details screen.
Associate python runtime	<p>If this option is enabled:</p> <ul style="list-style-type: none"> • Selected python runtime will be associated with the published model. • This python run time will be further used for promoting the model to production at the time of deployment. • Users can update this dependency from model details screen.

3. Click **Publish**.

View Model Details

You can view model information for deployed models, models that require approval, and so on.

To view model details:




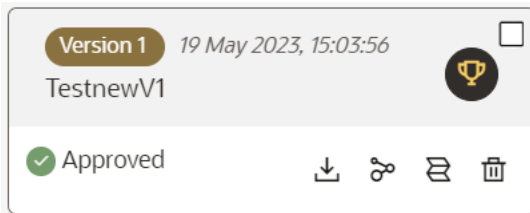




1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click **Model Pipelines**  to display the **Model Pipelines** window.
The window displays folders that contain models and model records in a table.
 - The  icon indicates that Model 1 is the champion
3. Hover over the model records to view the various icons.

Figure 38: Mouse over the Model



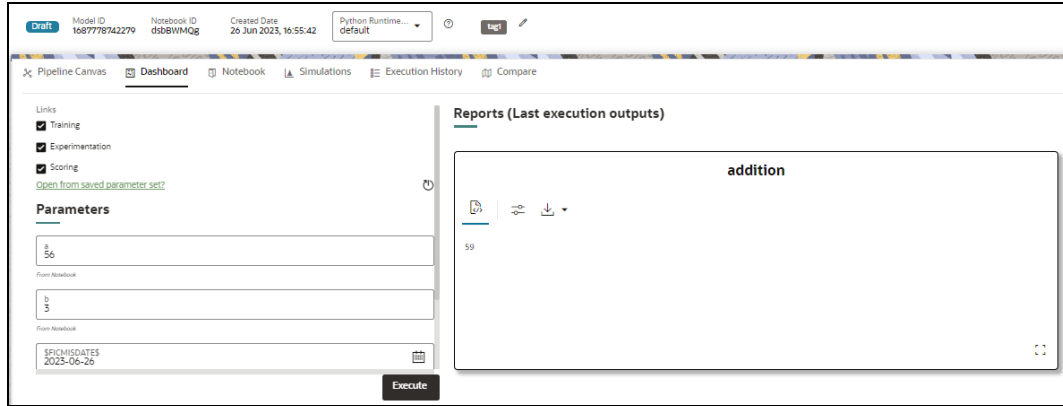
The icon actions are listed in the following:

- a.  Download
- b.  Open in Pipeline Designer. See the [Create Paragraphs using Pipeline Designer](#) section for more details.
- c.  Scope Detail. See the [Scope Detail](#) section for more details.
- d.  Delete Model.

7.5.4.2 Dashboard

This section of Pipeline Designer allows users to execute the Models and also shows the execution output of Model if the widgets are saved with Track output option enabled.

NOTE: For Promoted models, the 'Dashboard' is the default tab.

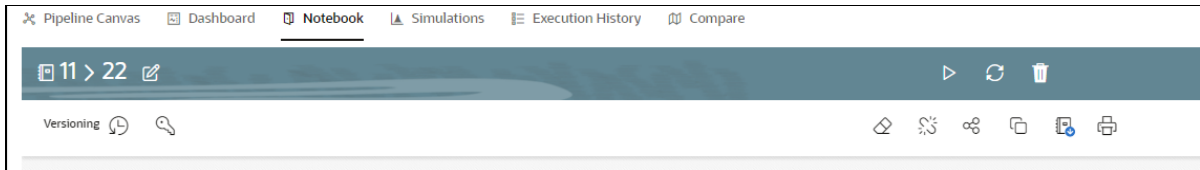


NOTE There is no Cancel button in Settings tab of reports in the Dashboard tab. You can press 'Escape' key to close the Settings.

7.5.4.3 Notebook

NOTE The Username is case sensitive. Ensure you use the correct case for the username when accessing and executing the notebook.

Navigate to the **Notebook** page to view the paragraphs. You can run, invalidate session, edit, add, export the notebook, and so on.



NOTE The following features on Notebook are not supported in the current release.

- Cloning the notebook
- Sharing the notebook
- Versioning the notebook
- Modifying the notebook
- Deleting the notebook
- Attaching credentials to the notebook
- Entering dependency modes to the notebook

7.5.4.3.1 Create Paragraphs in Model Studio Notebooks

After creating the Models in the Workspace, create Paragraphs in the Model Studio window. To create Paragraphs, you must have a working knowledge of scripting and Python.

Navigate to **Notebook** page to view and modify the paragraphs.

Create Paragraphs

The paragraph should be added after the start widget paragraph. Navigate to **Notebook** page to create the paragraphs.

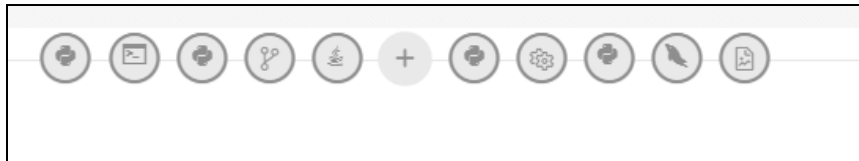
The following types of paragraph creation are supported for model creation:

- Python Paragraph
- Shell in Python Paragraph
- Conda Paragraph
- PGQL Paragraph
- PGX - Java Paragraph
- Paragraph
- PGX - Python Paragraph
- PGX – Algorithm Paragraph
- PGX - PySpark Paragraph
- MySQL Paragraph
- Markdown Paragraph

To create Paragraphs in the Model Studio Notebooks:

1. Open the draft in Pipeline Designer and click **Notebook** tab.
2. Hover your mouse above or below a paragraph to display the interpreter toolbar:

Figure 39: Interpreter toolbar



3. Click an icon in the toolbar to select an interpreter and add a new paragraph that uses that interpreter. When you click some of the icons, the paragraph that's created includes example code that you can run.

NOTE

You should not delete the start widget paragraph or rewrite the contents of this seeded paragraph

Add Python Paragraph

1. Click **Add Python Paragraph** icon in Model Studio to add a python paragraph in the Notebook and add the following scripting instructions.

- a. To fetch connection objects:

```
conn = mmg.getConnection(<workspace name>)
```

This creates a cx_oracle based connection object to the datadom of the workspace being passed:

- b. To fetch current Notebook and Model Objective details, use the following predefined parameters:

- `currentNotebookId` - fetches the current notebook ID
- `objectiveId` - fetches the current objective ID

To fetch the runtime parameters supported in Model Studio runtime or to access optional parameters passed from scheduler services;

- a. To access predefined batch runtime parameters like `taskId`, `batchrunid`, and `ficmisdate` passed during the model execution from scheduler, use the following variables : `$BATCHRUNID$`, `$TASKID$`, `$FICMISDATE$`.

Example:


```
%python
print('BATCHRUNID value is : ${BATCHRUNID$}')
print('TASKID value is : ${TASKID$}')
print('FICMISDATE value is : ${FICMISDATE$}')
```

- b. To access any optional parameters passed during the model execution from scheduler, use the below sample script:

```
%python
print('threshold value is : ${threshold}')
```

NOTE Threshold is the optional parameter passed during the model execution.

NOTE For more details on the predefined functions available in MMG for python scripting, see [Appendix -I](#).

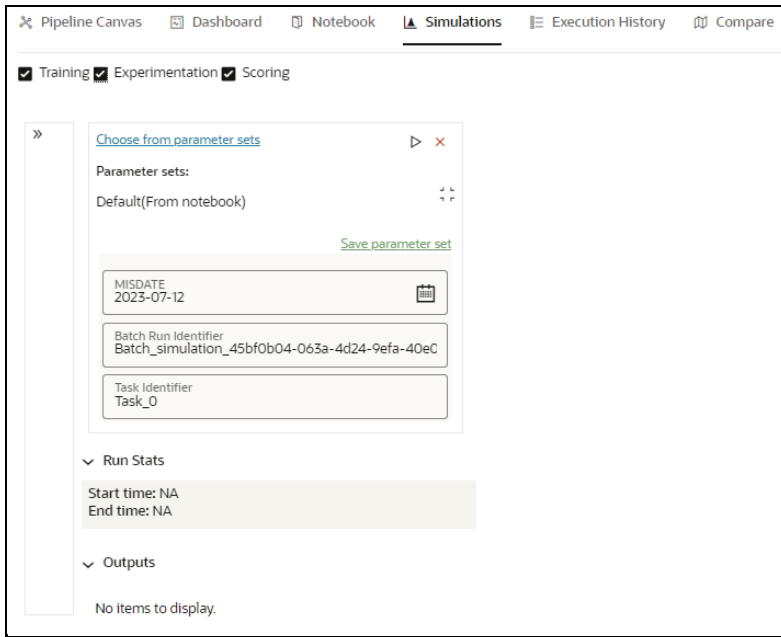
Click  to run the script.

NOTE The execution result from the Pipeline Canvas screen is not displayed in the notebook tab.

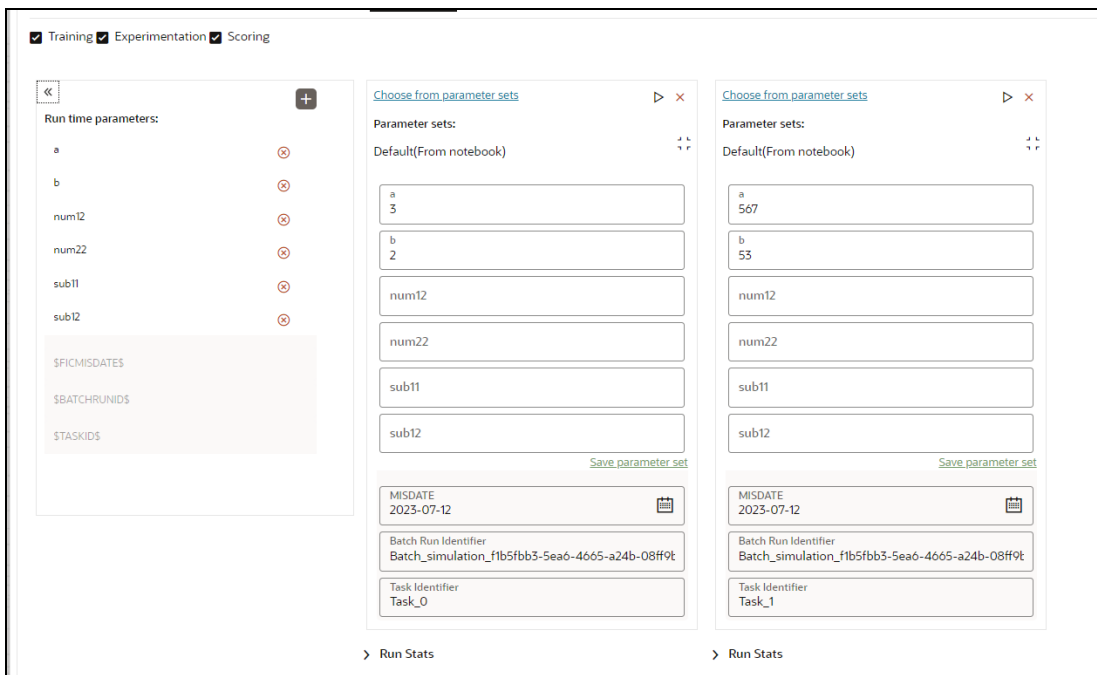
7.5.4.4 Simulations

Simulation run is for executing a single notebook in parallel by giving different values for same parameters. The simulation flow allows for iterative execution along that path with input drivers (variables) that are passed through a parameter set.

You can either create a new parameter set or use the existing parameter set and execute it from this tab. In addition, you can select or deselect the link types which you want to execute.



If you want to add different values for the same parameter, click **Add Run**. You can add any number of Run based on your requirements and then click **Execute all** to execute at one time. The **Batch Run Identifier** will be same for all runs and the Task id will be incremented for newly created run.



The Run Stats displays the execution start and end date. The Outputs of the tracked nodes will be shown under the inputs of each run panel.

7.5.4.5 Execution History

This section of Pipeline Designer shows the history of the executed pipelines including ongoing executions.

Batch Run Identifier	Inputs	Task Identifier	Status	Outputs	Canvas view	MISDATE	Start Time	End Time
Batch_auto_d56c807d-accf-4383-af2d-6264d08ec9b8	Custom	task1	🟡	📄	🖼️	2023-08-07	7 Aug 2023, 18:15:18	7 Aug 2023, 18:15:18
Batch_simulation_771a3711-57a4-491c-8a45-08fa0fcd...	Default(From notebook)	Task_0	🔴	📄	🖼️	2023-07-12	12 Jul 2023, 17:14:42	12 Jul 2023, 17:15:30
Batch_auto_ccceb45-aa70-4bd5-b1bb-d4b5eecd7ed0	Custom	task1	🔴	📄	🖼️	2023-06-26	26 Jun 2023, 16:55:16	26 Jun 2023, 16:56:15
Batch_auto_ccceb45-aa70-4bd5-b1bb-d4b5eecd7ed0	Custom	task1	🔴	📄	🖼️	2023-06-26	26 Jun 2023, 16:55:13	26 Jun 2023, 16:56:17
Batch_auto_ccceb45-aa70-4bd5-b1bb-d4b5eecd7ed0	Custom	task1	🔴	📄	🖼️	2023-06-26	26 Jun 2023, 16:55:10	26 Jun 2023, 16:56:14

You can compare and refresh the executions by clicking on **Compare** and **Refresh** icons.

To view the inputs, output, status, and canvas view, click on the corresponding options in the table.

Clicking **Output** icon displays the Output Details page, where you can view "Executed-only" paragraph outputs. By default, this option is enabled, you can disable this option based on your requirements.

By default, **Tracked** option is selected that displays outputs tracked from the time of the execution. Select **All** option to view all the outputs.

7.5.4.6 Compare

This section allows you to compare the models with Champion model.

To compare:

Navigate to Pipeline Designer window and click **Compare** tab.

This shows the following comparison details:


- Model Properties
- Model Inputs (Last Execution Details)
- Audit Log
- Model Script
- Model Output

Model Properties		feb08 ver 2		feb08 ver 0	
Objective	obj1	obj1		obj1	
Description	test	test		test	
Version	2	0		0	
Language	Default	Default		Default	
Technique					
Model Inputs (Last Execution Details)		feb08 ver 2		feb08 ver 0	
Status of execution		COMPLETED		COMPLETED	
Start time		Feb 8, 2023, 1:08:17 PM		Feb 8, 2023, 1:08:17 PM	
End time		Feb 8, 2023, 1:08:33 PM		Feb 8, 2023, 1:08:33 PM	
a		2		2	
b		2		2	
\$FICMISDATES\$		2023-02-08		2023-02-08	
\$TASKIDS\$		task1		task1	
\$TASKID\$		task1		task1	
\$MISDATE\$		2023-02-08		2023-02-08	
\$BATCHID\$		Batch_auto_dsfc0b01-0b7a-4129-ac11-50f0d8e7d3b6		Batch_auto_dsfc0b01-0b7a-4129-ac11-50f0d8e7d3b6	
\$BATCHRUNIDS\$		Batch_auto_dsfc0b01-0b7a-4129-ac11-50f0d8e7d3b6		Batch_auto_dsfc0b01-0b7a-4129-ac11-50f0d8e7d3b6	
Audit Log		feb08 ver 2		feb08 ver 0	
Created By	MMGADMIN	MMGADMIN		MMGADMIN	
Created Date	Feb 8, 2023, 1:09:24 PM	Feb 8, 2023, 1:02:20 PM		Feb 8, 2023, 1:02:20 PM	
Modified By	MMGADMIN				

7.5.5 Publish Data Studio

After creating the Draft Models, publish the Notebooks, which have the Model script.

To create a Scoring Model:

1. Create a Draft Model. See the [Create Draft Models](#) section for more information.
2. Click  next to corresponding Draft Model and select **Publish Data Studio** option.

The Publish Model window is displayed.

Figure 40: Publish Model

Publish Model ✕

Model Name: Technique:

Description: Run Version:

Script

ID	Title	Script
<input type="checkbox"/> ds5a1kd3	Start widget	## Do not delete this paragraph. Also, ensure that this is the first paragraph in the notebook. You may use 'Move Up/ Move Down' from Setting

Publish

3. Enter the details as shown in the following table.


Field or Icon	Description
Model Name	The field displays the name of the Model. Modify the name if required.

Field or Icon	Description
Model Description	The field displays the description for the Model. Enter or modify the description if required.
Technique	Enter the registered technique to use.
Run Version	Select a run version.
Script	The table displays the Paragraphs created in the Training Model. Select the Paragraphs that you want to use to create the Scoring Model. Track Output - Select this to track the output of the paragraph.

4. Click **Publish**.


7.5.6 Scope Detail

To view the scope details of the model:

1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.

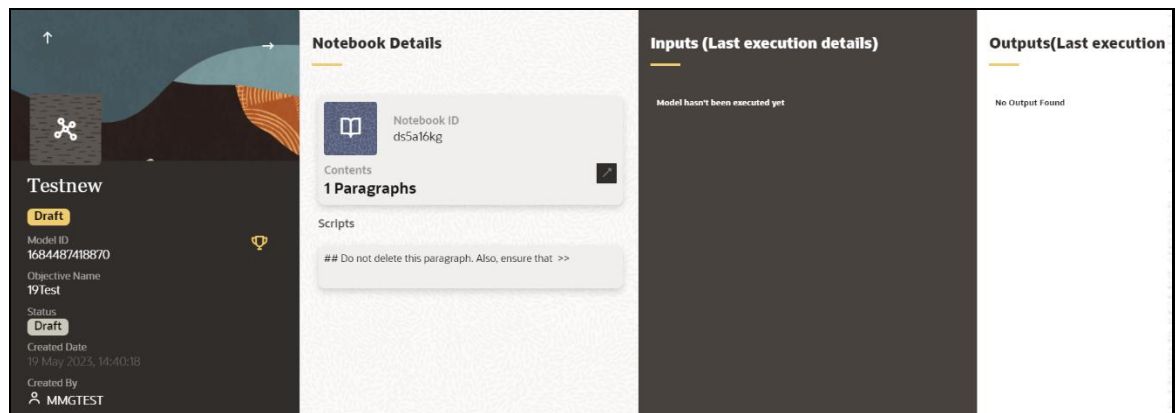
2. Click **Model Pipelines**  to display the **Model Pipelines** window.

The window displays folders that contain models and model records in a table.

3. Click  next to corresponding Model and select **Scope Detail** option. This is available for both Draft and Published models.

The details such as Notebook, Inputs (Last execution details), Deployment Details, and Outputs (Last execution outputs) are displayed.

Figure 41: Scope Details



7.5.7 Model Governance

After comparing models, you must understand the Model Governance system in OFS MMG. The Model Governance has an impact on how the application functions with the various user types and the requests they can place from the Model Details window. You require to understand Model Governance before you request model acceptance, review models, or approve models for production.

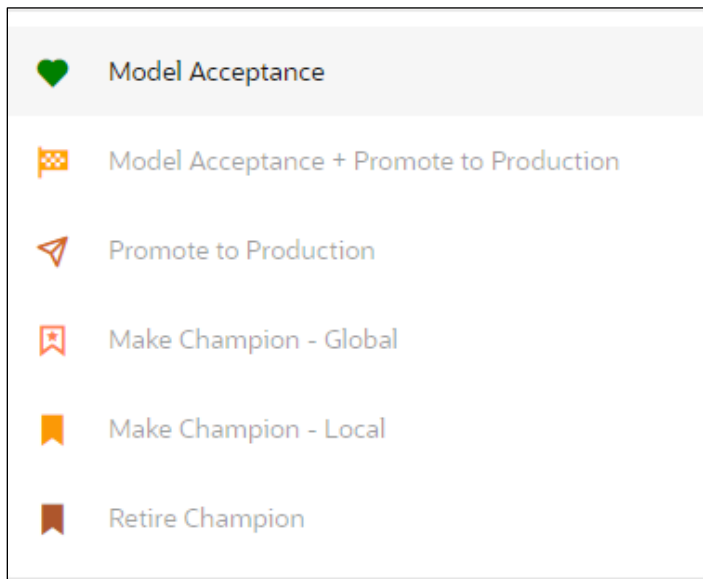
As discussed earlier, the users are of three types:

- Requester
- Reviewer
- Approver

The request consists of the following phases in the Request drop-down list (see the [Request Model Acceptance](#) section for how to access the drop-down list in the Model Deployment window):

- Model Acceptance
- Model Acceptance + Promote to Production
- Promote to Production
- Make - Champion - Global
- Make - Champion - Local
- Retire Champions

Figure 42: The Request Drop-down List



The values in the drop-down list are active based on the type of user (Requester, Reviewer, or Approver) and the phase that the model is in (accepted, promoted to production, global champion, and so on). Let us look at these with a few examples.

Example 1:

Assume that you are a user with Requester privileges, and you create a model. Now you can request for the model to be accepted on the Model Details window from the **Request** drop-down list. The values enabled for selection are **Model Acceptance** and **Model Acceptance + Promote to Production**. Let us proceed and assume that you select Model Acceptance, then a user with Reviewer privileges forwards your model to a user with Approver privileges. At this stage, the Approver can choose to reject or accept your model acceptance request. A rejection would bring the model back to the initial state with comments on the updates required before it can be requested for acceptance again. However, if the Approver accepts your model, then the **Make Champion - Local** selection is enabled when you log in. You can create many

models and send them for acceptance. After acceptance, any model that is accepted can be made the champion on your local workspace at any time replacing the earlier local champion.

Example 2:

Assume that in the previous example, you selected **Model Acceptance + Promote to Production**, then a Reviewer forwards it to the Approver. The Approver, at this stage, chooses to promote the model to production by selecting **Promote to Production**. The model is now available in the production environment and the Approver can choose at any time to select a model from these models in production and select **Make Champion - Global**. If there exists a Champion model in the production environment, then it will be replaced by the new global champion. However, the earlier champion will still be available in the production environment along with other models and the Approver can choose to make it the global champion again at any time or select any of the other models and make one of them the global champion.

7.5.7.1 Request Model Acceptance

After comparing models, move the selected models to acceptance. Only a user with the Requester role can request for model acceptance. The model will be moved to review which will be available to Reviewer and Approver role, and then to acceptance is available to users with the Approver role, who can promote to production. See the [Understand Model Governance](#) section before you start here.

To request a model to promote to production:





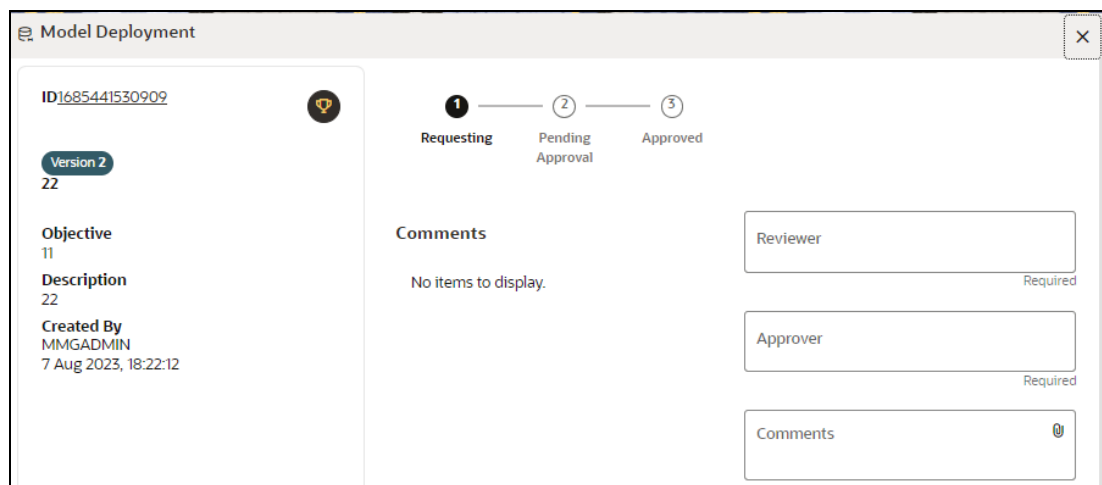
1. Click **Model Pipelines**  to display the **Model Pipelines** window.
The window displays folders that contain models and model records in a table.
2. Click on the Deploy icon on the Model to open it.
3. If a model is a champion, the  icon is displayed on it.
4. To make a model a champion from this window, place the mouse in the selected model columns.
and click  to display the **Model Details** window. If a model is a champion model, the  icon is displayed.

Figure 43: Model Deployment




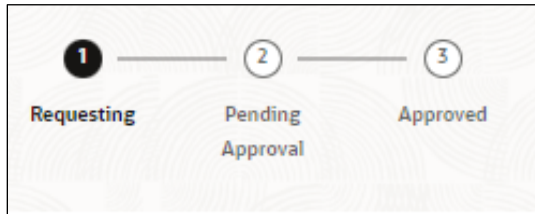
5. Select the Reviewer group from the **Reviewers** drop-down list.
6. Select the Approver group from the **Approvers** drop-down list.
7. Enter comments in **Comments** and click  to attach files supporting the comments.
8. Use the following features on the window to perform additional actions.
 - View the model status change in the progress indicator. The Progress Indicator displays the various states of progress that the model has been through. Accordingly, you must request, review, or approve models.

Figure 44: Model Approval Progress Indicator





- Click the type of **Request** from the drop-down list:
 - Model Acceptance: To review and accept the model creation.
 - Model Acceptance + Promote to Production: To review and promote the model to production.
 - Make Champion - Local: If the model is not the champion model, select to make it the local champion.
 - Promote to Production: To promote a model to production
 - Make Champion - Global: If the model is not the champion model, select to make it the Global champion.
 - Retire Champion: To retire a Champion model
- Comment History: A record of comments entered in the cycle of model creation and approval with the feature to download attachments.

The model sent for acceptance or for promotion to production is now displayed to a Reviewer to review it and then to Approver when signed in, who must either accept the request or reject it.


7.5.7.2 Review Models and Move to Approve or Reject

The Reviewer must provide comments describing the action (approve or reject). If comments are related to rejection and if the Approver rejects, then model goes back to the Requester to make changes or to delete it. If comments are related to approval, then model moves further in the workflow and is displayed to an Approver. See the [Understand Model Governance](#) section before you start here.

To review a model:

1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click **Model Pipelines**  to display the **Model Pipelines** window.

The window displays folders that contain models and model records in a table.

3. Click  to display the Model Details Window.
4. Review the details and send it back to the Requester for modifications or send it to an Approver.

7.5.7.3 Approve Models and Promote to Production




The models reviewed and set to promote to production by either the Requester or Reviewer is displayed to the Approver when signed in. The Approver has to either reject the model and send it back to the requester with supporting comments or approve it for pushing to production. See the [Understand Model Governance](#) section before you start here.

NOTE

When dataset has used the datasource which is of order (N) for example 5 , and the Production workspace does not contain the datasources at order 5, then promotion of models containing dataset from Sandbox to Production workspace fails.

To remedy this issue, ensure that Sandbox and Production workspace contain the same number of Datasources before you perform promotion of models.

To approve or reject models:



1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click **Model Pipelines**  to display the **Model Pipelines** window.
The window displays folders that contain models and model records in a table.
3. Select a model from the records in the objective.
4. Click  to display the Model Details Window.
5. Click **Approve** or **Reject** with appropriate comments.



7.5.7.4 Deploy Models in Production and Make it a Global Champion

After approving the models, deploy it to the production environment. You must have an Approver function role and privileges to do this activity.

Note: Sandbox should have the production workspace attached in order to have this option enabled.

To deploy Models in production:

1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click **Model Pipelines**  to display the **Model Pipelines** window.
The window displays folders that contain models and model records in a table.

3. Select the model to deploy and click  to display the details of the model. If a model is a champion, the  icon is displayed.

7.5.8 Import a Model Data into a New Model

The model data from existing models in OFS MMG in .dmp format and the existing model data in MMG in .dsnb can be imported during the creation of a new model.

Note: The import should happen inside an Objective only.

The import of model data lets you reuse and extend on model creation. This topic is part of the procedure of creating Draft Models and after creating a new model using this method, see the [Create Draft Models](#) section for instructions on how to proceed further.

To import model data:





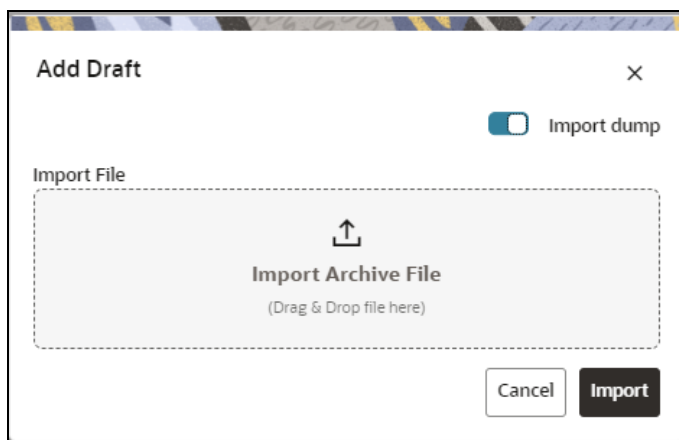
1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click **Model Pipelines**  to display the **Model Pipelines** window.
The window displays folders that contain models and model records in a table.
3. Select an **Objective**.
4. Double click a model to display the model versions in the expanded display.
5. Hover over a model and click  to download the model data dump.
6. Click **Add** and  Drafts to display the **Model Details** dialog box for the creation of a new model.

Figure 45: Model Details - Import Dump



7. Drag the toggle switch to select **Import Dump**.
8. Drag and drop the file into the **Import Dump File** field or click in the box to open the file selector dialog and select a file.

NOTE

If the upload file size is more than 8 MB, you can increase the file size upto 100 MB by modifying the below properties. Restart of services are required once the file size is updated.

mmg-ui/conf/application.properties:

spring.servlet.multipart.max-file-size=8MB

spring.servlet.multipart.max-request-size=8MB

mmg-service/conf/application.properties:

spring.servlet.multipart.max-file-size=8MB

spring.servlet.multipart.max-request-size=8MB

9. Click `Import`.

A new model is created by importing the model data dump of another model.

7.5.9 Execute Models using Scheduler Service

The models that you have created require that they are executed using Scheduler Service before they can be available to the users of OFSAA applications. For more information on this, see the [Scheduler Service](#).

7.5.9.1 Define a Task

MMG supports following three Components during the Task creation:

- Model
- Populate Workspace
- Custom

Enter the following details in Task Details section:

- **Task Name:** Enter the task name.
NOTE: The Task Name must be alphanumeric and should not start with a number. • The Task Name should not exceed 60 characters in length. The Task Name should not contain any special characters except underscore (_).
- **Task Description:** Enter the task description. No special characters are allowed in Task Description. Words like Select From or Delete From (identified as potential SQL injection vulnerable strings) should not be entered in the Description
- **Task Type:** Select the task type from the drop-down list. The options are REST and SCRIPT. You can enter Shell script for Model, Populate Workspace, Custom components. Status key in the curl command should be in uppercase as STATUS.
- **Batch Service URL:** Select the required Batch Service URL from the drop-down list. This can be blank, and you can provide the full URL in the Task Service URL field.
- **Task Service URL:** Enter task service URL if it is different from Batch Service URL.
NOTE: Task Parameters will vary based on the selected Component.

7.5.9.2 When Component is Model

The following window shows the Task Parameters for Model Component.

Figure 46: Task Parameters

Task Parameters			
Parameter	\$BATCHDATES\$	Value	Batch Date
Parameter	\$BATCHRUNID\$	Value	BATCHRUNID
Parameter	Objective	Value*	<input type="text" value="Click to select param va..."/>
Parameter	Model	Value*	<input type="text" value="Click to select param va..."/>
Parameter	Link types	Value	<input type="text" value="Click to select param value"/>
Parameter	Synchronous Execution	Value	<input type="text" value="Click to select param value"/>
Parameter	Optional Parameters	Value	<input type="text"/>

NOTE: Fields marked with * are mandatory fields.

- **Batch Date:** Shows the batch execution date. You can enable or disable this parameter.
- **Batch Run ID:** Shows the batch execution run ID. You can enable or disable this parameter.
- **Objective:** Select the Object which you want to use for execution. For more information, see the Create Objective (Folders) section. The Sub Objective is displayed with path. For example, if Test1 is Objective and Test11 is Sub Objective, and you want to use Test11 Objective for execution, then select this field as Test1/Test11.
- **Model:** Select the Model of selected Objective. It can be any specific model of Objective or All models of Objective.
 - If the ALL_CHAMPION is selected here, then Objectives with no Champion Model is skipped, and the Objectives with Champion Models gets executed.
 - If CHAMPION is selected, and no Champion is present, then Model Execution gets fail.
- **Link Type:** Select the link type for execution. For example: Training, Scoring, or Training+Scoring. For more information, see the Links in the Pipeline Designer section.
- **Synchronous Execution:** You can set this parameter to Yes or No.
 - If Synchronous Execution is set to Yes, then execution will wait for the notebook execution status.
 - If Synchronous Execution is set to No, then execution will not wait for the notebook execution status, it will trigger the notebook and update task status as successful in batch monitor.
- **Optional Parameters:** This is used pass the parameters dynamically.

For example: model_group_name=LOB1,benford_flag=Y,benford_digit=1,from_date=01-Jul-2020,to_date=31-Jul-2021

Model_group is parameter defined in model and value can be passed here.

The Create Task window also shows the following Header Parameters, which are not editable:

- User: logged in user name
- Workspace: shows the launched workspace name
- Locale: shows the locale. For example: en_US

7.5.9.3 When Component is Populate Workspace

If you select Component as Populate Workspace, then to use the data population, enter the following parameters

- Additional Parameters
- Table Filters
- Global Filters

For more information, see the [Populating Workspace](#) section.

7.5.10 Import / Export Models via Utility

You can import and export the models between Sandbox to Production or vice versa using the Utility.

Prerequisite

Before you import, ensure the Model artifacts are available in the <installed path>/ftpshare.

To import the models, perform the following steps:

1. Navigate to <MMG_PACK>OFS_MMG/bin and execute in the following format:

```
./model_export_import_utility.sh IMPORT WORKSPACE LOGIN_USER LOCALE  
FILE_NAME Y/N
```

Example:

```
./model_export_import_utility.sh IMPORT CS SAUSER en_US  
CS_1638105398036_0.zip Y
```

Field	Description
Import	Command to import the Model into Workspace

Field	Description
Workspace	The name of the Workspace to which you are importing the Model
Login_User	The logged in user name.
Locale	The application language preferences For example: en_US
File_name	The file name with the following format: Workspace name_Model ID_Model version.zip For example: CS_1638105398036_0.zip

NOTE If you enter input as **Y**, the utility imports the models in the approved status.
If you enter as **N**, the models are imported but not in the approved status.

To export the models, perform the following steps:

Prerequisite

Before you export, ensure the Models and Drafts are available in the UI / setup.

1. Navigate to <MMG_PACK>OFS_MMG/bin and execute in the following format:

```
./model_export_import_utility.sh EXPORT WORKSPACE LOGIN_USER LOCALE  
MODELID MODEL_VERSION
```

Example:


```
./model_export_import_utility.sh EXPORT CS SAUSER en_US 1638105398036 0
```



Field	Description
Export	Command to export the Model from the Workspace
Workspace	The name of the Workspace from which the model is exported
Login_User	The logged in user name.
Locale	The application language preferences. For example: en_US
Model ID	The Model ID
Model Version	The version of the Model

7.5.11 View Models

The View Models feature launches the OFS MMG Data Studio window. You can view models on this window.

To view models:

1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.

2. Click **Model Pipelines**  to display the **Model Pipelines** window.
The window displays folders that contain models and model records in a table.
3. Click  next to corresponding Model and select Open in Pipeline Designer.
See the [Create Paragraphs in Pipeline Designer](#) sections for details on how to use the OFS MMG Data Studio.






7.5.12 Edit Models

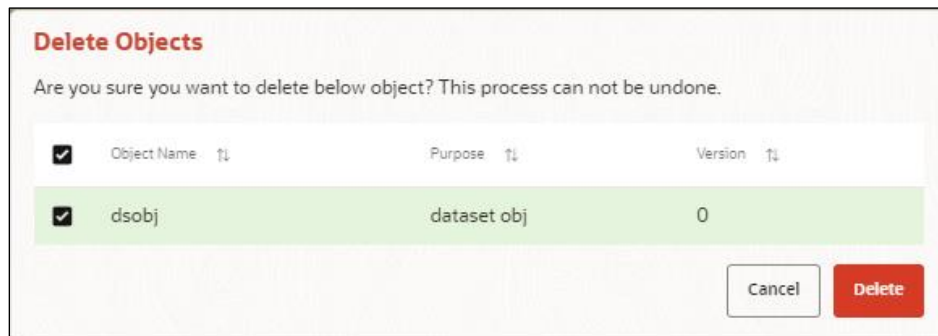
The editing of models created versions that are different from the previously saved model and the cycle of [Model Governance](#) applies to any edited model. You can edit models from the OFS MMG Data Studio window using Python scripting language.

You can edit the script of version 0 only even in Pipeline Designer and Studio. It is not possible in other versions.

7.5.13 Delete Objectives and Draft Models

To delete Objectives and Models that exist in the Objectives:

1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click **Model Pipelines**  to display the **Model Pipelines** window.
The window displays objectives that contain models and model records in a table.
3. Click  next to corresponding record (objective/draft) and select Delete .
4. You can select two or more objectives or models from the records.
5. Click  to display the Delete dialog box.
6. Click **Delete** to delete or click **Cancel** to cancel.



NOTE

If the Model is promoted to Production, you cannot delete the model even if it has been retired.

7.5.14 Programmatic Dynamic Forms and Fixed Dynamic Forms

The Programmatic Dynamic Forms and Fixed Dynamic Forms scripts are supported.

A dynamic form is a user input field that is generated from the code of a paragraph. Dynamic forms allow users to bind free variables in a paragraph.

For Example:

Textbox


The Textbox dynamic form allows users to input any string of characters. Its format is as follows:

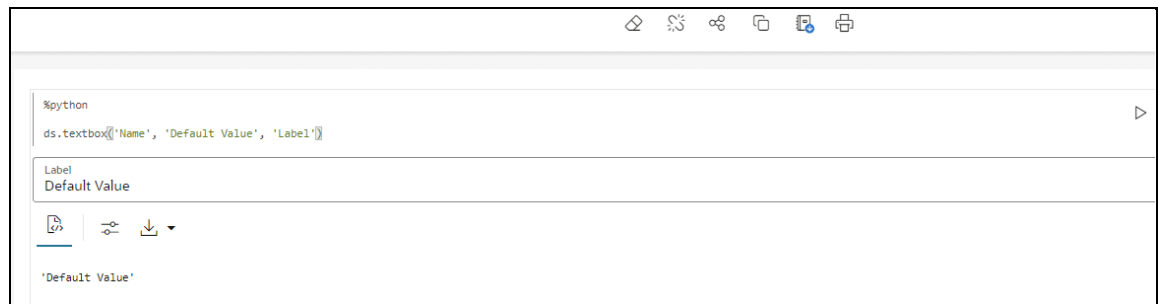
1. Click **Add Python Paragraph** in Model Studio to add a Paragraph in the Notebook and fetch the runtime parameters supported in Model Studio runtime as shown in the following example. This is available for all the interpreters.

For example, enter as follows:

```
%python
```

```
ds.textbox('Name', 'Default Value', 'Label')
```

Click  to run the script and display.



NOTE

In the current release, the MMG Studio supports Textbox, Select, Slider, Checkbox, Date Picker, Time Picker and DateTime Picker dynamic forms.

For more details on the sample dynamic scripts, see

<https://datastudio.oraclecorp.com/docs/user/pages/features/notebooks/dynamic-forms/dynamic-forms.html#dynamic-forms>

7.6 Graphs

The Graph Pipeline feature enables you to transform data in relational tables into a graph.

The latest technology is used to harness the power of Graph Analytics to give Financial Institutions the ability to monitor data effectively. The data is organized as nodes, edges, and properties (property data is stored on nodes or edges). The results of analytics algorithms are stored as properties of nodes and edges in the Graph.

You can harness the power of Graph Analytics using our in-built in-memory Oracle Graph Analytics Engine (PGX).

Use the Graph Pipeline to define graphs easily, attach underlying data, and match pipelines to populate data in the graph.

You can quickly create and configure a graph for use in advanced analytics. You can also manage and schedule the tasks required to run and populate the graph on a periodic basis.

The following user groups are specific to graph related activities.

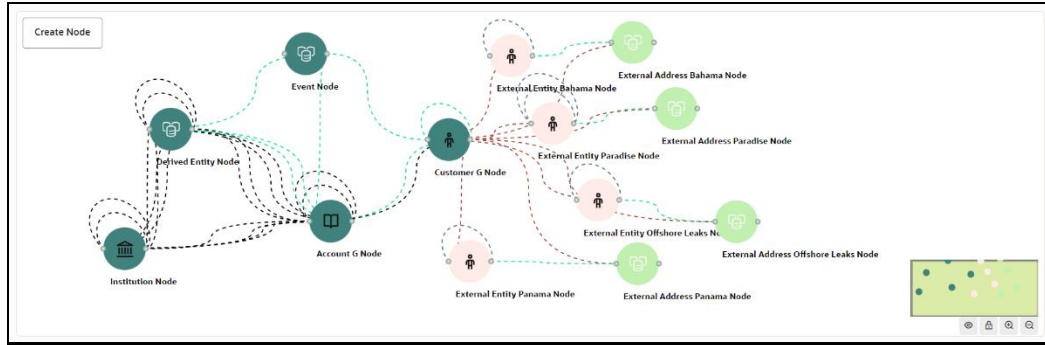
GRPADMIN	The Graph Administrator Group. Users mapped to this group have access to all the menu items in the OFS MMG application related to graph and Pipeline/Refresh graphs related health services.
GRPUSR	The Graph User Group. Users mapped to this group have access to all the menu items in the OFS MMG application related to graph and Pipeline/Refresh graphs related health services.

The Graph Pipeline functionality allows you to:

- Create a Graph Model from its existing relational data model
- Configure the Graph Model via the Pipeline UI
- Create and schedule the data pipeline and match (creation of similarity relationships) it for the Graph Model created
- Add new sources and contextualize the links quickly
- Standardize the data before pushing it to the Graph Model
- Use the following data sources for the Graph Model:
 - Oracle
 - File System (CSV)
- Use BD data source definitions for pre-seeded Workspaces
- Use pre-configured Financial Crime Graph Model pipelines
- Use pre-seeded mappings of Graph Model properties with BD Data source properties
- Schedule Graph creation by running pre-configured batches
- Blend data and get insights from data quickly
- Load data into elastic search indexes so matching and entity resolution can occur in the graph
- Define matching rules for the generating similarity edges in the graph

An example of a preconfigured Financial Crime Graph Model with Nodes and Edges is provided here.

Figure 47: Example of Graph Model



The Graph Model defines the nodes and the relationships between them.

- **Node:** Represents a single entity with its attributes. The entity can be a single table or a combination of tables merged into some common feature; it could be from a file, or any generalized component of multiple substructures merged for a specific reason or objective.

For example, Customer.

A customer could be a single entity.

Customer, Salesperson, Manager, and so on could be individual entities that can be structured together as a “Person” entity with a set of attributes persisted across individual entities.

- **Edge:** A connector between nodes or the same node itself. Each edge can have a set of attributes associated with it. These edges will map to 'join' between two entities, which could be direct or transitive.
- **Modeler Attributes:** Properties of the Node or Edge; these are mandatory inputs.

For example:

A Customer Node will have properties like Customer ID, Name, Age, Gender, etc.


A Transaction edge will have properties like Transaction ID, Date, Amount, From/To account, etc.

See the [Adding a Graph Pipeline](#) section for creating Graphs, Nodes, Edges, and Scheduling.

7.6.1 Access the Graph Summary Page

Use the Graph Summary page to create, view or delete graph pipelines.

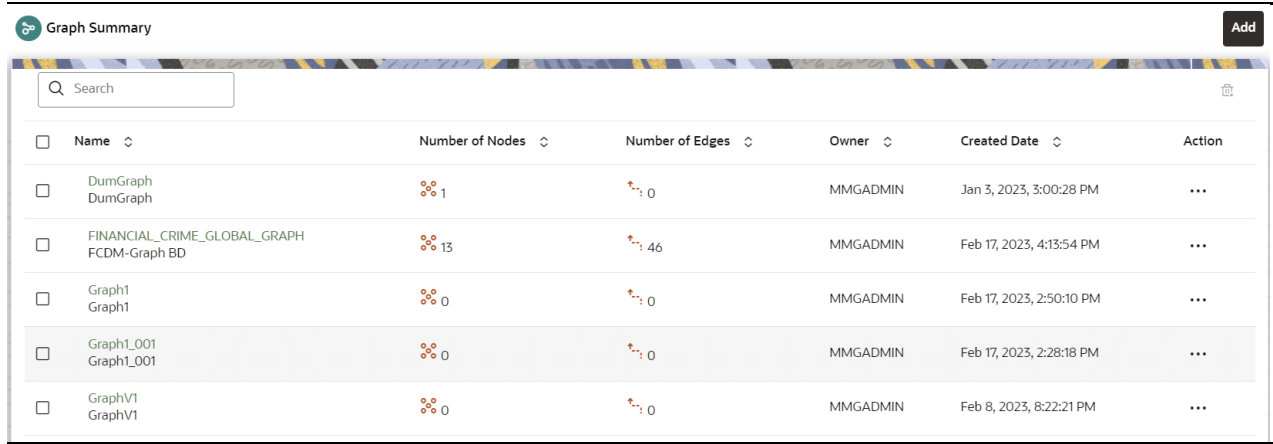
To access the Graph Summary page:

1. Click the **Launch Workspace**  icon corresponding to the workspace you want to launch to display the **MMG Dashboard** window with application configuration and model creation menu.

2. Click the **Graphs**  icon .



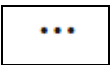
This displays the graph pipeline in a tabular format.

Figure 48: Graph Summary Page



The following table provides descriptions for the fields and icons on the **Graph Summary** page.

Table 6: Graph Summary Details

Field or Icon	Description
Search	Search for a graph pipeline. Enter your search criteria, and press Enter on the keyboard.
Name	The name of the graph pipeline.
Number of Nodes	The number of nodes present in the graph pipeline.
Number of Edges	The number of edges present in the graph pipeline.
Owner	The owner of the graph pipeline.
Created Date	The date on which the graph pipeline was created.
	Click to delete multiple graph pipelines.
	Click to create a new graph pipeline. See the Adding a Graph Pipeline section.
	Click to view, edit, delete or download the selected graph pipeline.

7.6.1.1 Add a Graph Pipeline

To add a graph pipeline:

1. Navigate to the Graph Summary page.
This page displays the graph summary records in a table.
2. Click **Add**.
The **Add Graph** pop-up window is displayed.

Figure: Add Graph Window

3. In the **Graph Name** field, enter a name for the graph.
The name must be unique to a particular workspace.
4. In the **Graph Description** field, enter the description for the graph pipeline and click **Add**.

OR


You can import an existing Graph. Use the toggle button to select **Import Dump**.

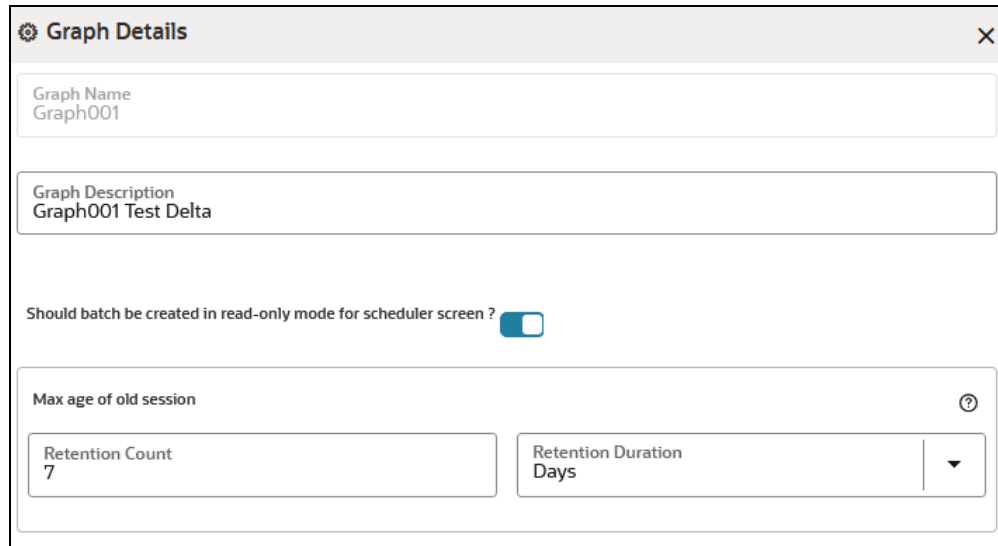
The following page is displayed.

Figure: Import Dump

Browse the file and click **Import**. The Graph Model page is displayed.

The default Maximum Age of Old session for a graph is 7 days. This indicates that the graph will be retained for a period of 7 days. You can modify the description and Max Age of Old session by

clicking the Setting  icon. If you want the batch to be created in read-only mode for scheduler screen, enable that option.



Graph Details [X]

Graph Name
Graph001

Graph Description
Graph001 Test Delta

Should batch be created in read-only mode for scheduler screen ?

Max age of old session ⓘ

Retention Count
7

Retention Duration
Days

5. Click **Save**.

The user session of the Graph Pipeline will be refreshed after the set timeline.

6. You can:

- a. [Create a Node](#)
- b. [Create an Edge](#)
- c. Toggle drawing which will enable or disable the user from dragging components.
- d. [Zoom In and Zoom Out](#)

7.6.1.2 Create a Node

To create a Node:

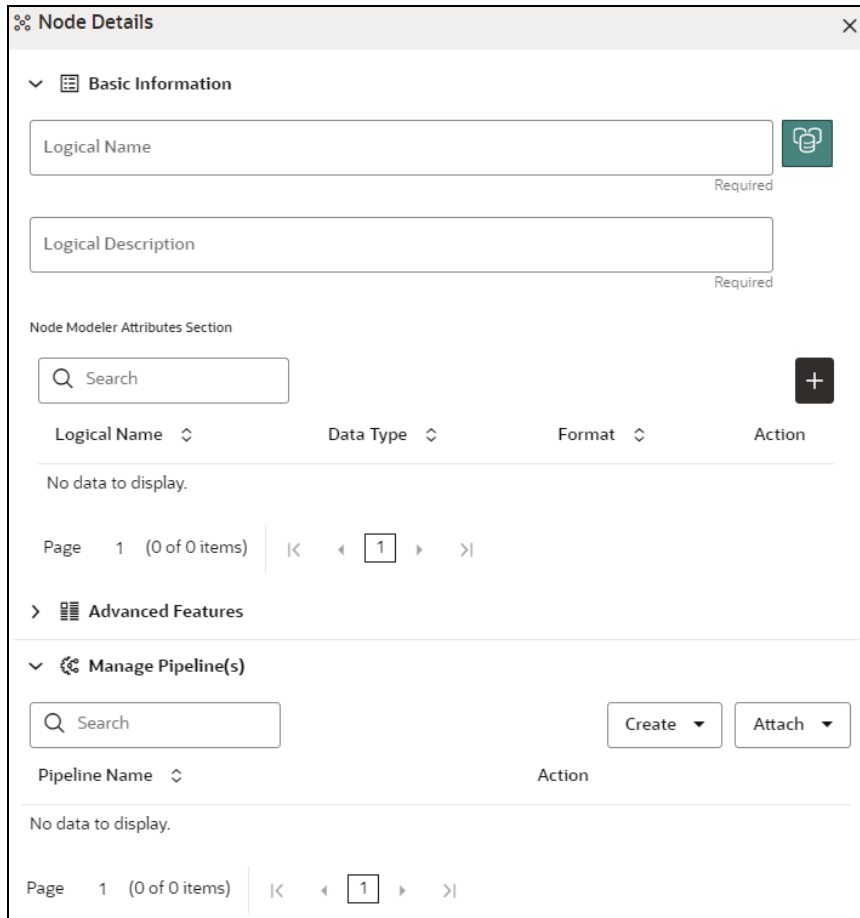
1. In the Graph Model page, click **Create Node**.

OR

Select the graph for which you want to create a Node. Click the **Action** button, and select the **Edit** option. In the Graph Model page, click **Create Node**.

The **Node Details** screen is displayed.

Figure: Node Details




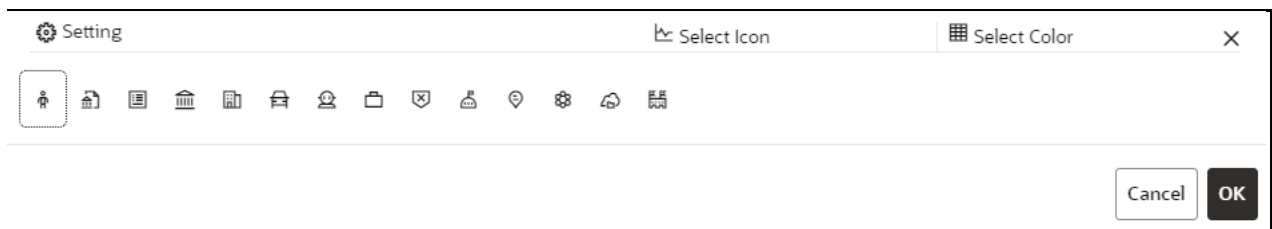
2. In the **Logical Name** field, enter a name for the Node or click **Setting** icon . The **Setting** pop-up window is displayed.

Figure: Setting



3. Select the required representation from the above Node icon.
For example: Person, Institution, Account etc.
Hover over the icon to view the definition of the node.
4. Based on your selection, the related Nodes are displayed. Select the Node, and choose the required color for the Node using the **Select Color** option.
5. The selected Node is displayed on the graph. To add attributes to the Node, click the **Add** icon.
Modeler attributes are the properties of the node or edge and are mandatory inputs.

For Example:

Customer Node has properties such as Customer ID, Name, Age, Gender, etc.

The **Add Node Modeler Attribute(s)** screen is displayed.

6. In the **Logical Name** field, enter the logical name for the modeler attribute.

This field is mandatory.

7. Select the data type based on your requirements in the **Data Type** list.

The available data types are Text, Number, and Date. This field is mandatory.

Based on the data type selection, the following input field is displayed.

For example, the **Maximum Length of Text** field is displayed if the data type is selected as Text.

NOTE

Ensure the Maximum Length attribute is set to at least the field's length from which the data is to be populated.

8. Enter the data and click **OK**.

The Node attributes are displayed on the Node Details page.

Figure: Search

You can add any number of modeler attributes by clicking the Add icon.

9. Under **Advanced Features**, select the modeler attribute from the Column Identifier list. All the created modeler attributes are displayed in this list.

Figure: Advanced Features

Node Details

> **Basic Information**

▼ **Advanced Features**

Column Identifier ▼

Required

> **Manage Pipeline(s)**

Under the **Manage Pipeline(s)** group, you can either create a new data pipeline or attach an existing pipeline.

The application uses data pipelines to prepare filtered data which can be used to create and run scenarios. Data pipelines prepare data by selecting and joining data sources to create virtual data tables, adding derived attributes to data, running derivations on the data to determine the risk associated with the entity, and so on.

NOTE

The newly created data pipeline is not automatically added to the Node. You must attach the pipeline using the **Attach** list.

The selected data pipeline is displayed under Manage Pipeline(s).

Figure: Manage Pipeline(s)

▼ **Manage Pipeline(s)**

Search

Pipeline Name

Action

Create ▼ Attach ▼

🔗 Data Pipeline

No data to display.

- Click the **Create** list and select **Data Pipeline**.

The Create Pipeline window is displayed.

Figure: Create Pipeline

Create Pipeline

Create New Data Pipeline

Select Pipeline

Cancel OK

- Select the **Create New Data Pipeline** option and then click **Ok**.

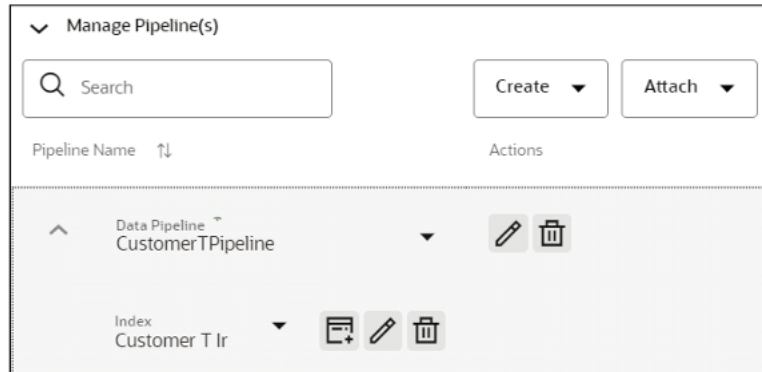
The **Pipeline Designer** page is displayed.

- To create a data pipeline, see the [Managing Data Pipeline](#) section.
- OR
- To clone from an existing data pipeline, see the [Cloning from an Existing Data Pipeline](#) section.

NOTE

Define persist of the Data pipeline of the corresponding node with the prescript. See the [Prescript Condition](#) section for more details.

Figure: Create an Index



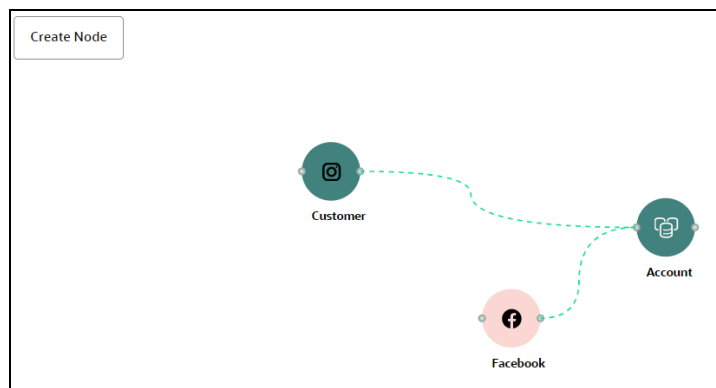
- To define an index for the data pipeline, see the [Defining an Index](#) section.

12. Click the **Attach** list to add any number of data pipelines to the node.

13. Click **OK**.

The node is created with pipeline Facebook and an account attached to it as shown in the below example.

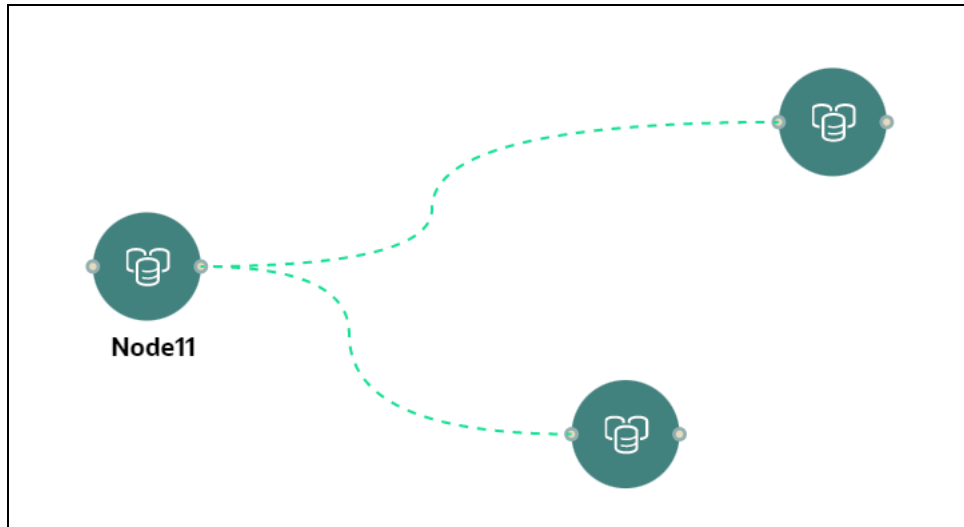
Figure 49: Graph with Node and Edge



7.6.1.3 Create an Edge

Use an Edge to connect two different nodes or connect to itself. Compared to nodes, edges also capture basic information like name, description, attributes to an edge, and possible pipelines that can be attached to an edge.

Figure: Edge



To create an edge:

1. Hover on the node to create a relationship.
The **Edge Details** screen is displayed.

Figure: Edge Details

Edge Details

Basic Information

Logical Name Required

Logical Description Required

Edge Modeler Attributes Section Is Similarity Edge

Search

Logical Name	Data Type	Format	Action
No data to display.			

(0 of 0 items) |< < 1 > >|

Advanced Features

Manage Pipeline(s)

Search

Pipeline Name Action

No data to display.


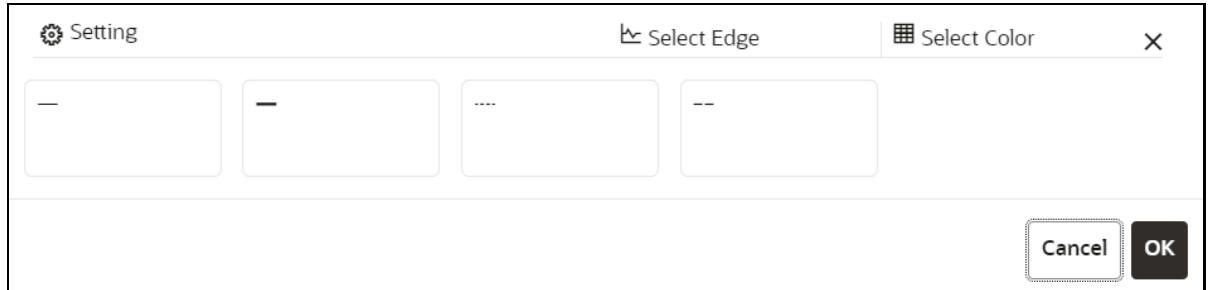
- In the **Logical Name** field, enter the Node's name or click the Setting icon . The **Setting** pop-up window is displayed.

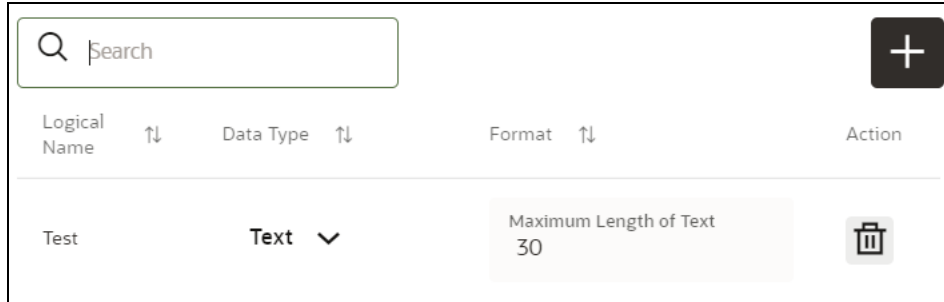
Figure: Setting



- Select the required edge from the options displayed and choose the required color for the edge using the **Select Color** option.
- Click **OK**.
The selected edge is displayed on the graph pipeline
- To add attributes to the edge, click the **Add** icon.
The **Add Edge Modeler Attribute(s)** screen is displayed.

- In the **Logical Name** field, enter the logical name for the edge attribute.
This field is mandatory.
- In the **Data Type** list, select the data type based on your requirements.
The available data types are Text, Number, and Date. This field is mandatory.
Based on the data type selection, the following input field is displayed.
For example, the **Maximum Length of Text** field is displayed if the data type is selected as **Text**.
- Enter the data and click **Ok**.
The edge attribute is displayed on the Edge Details page.

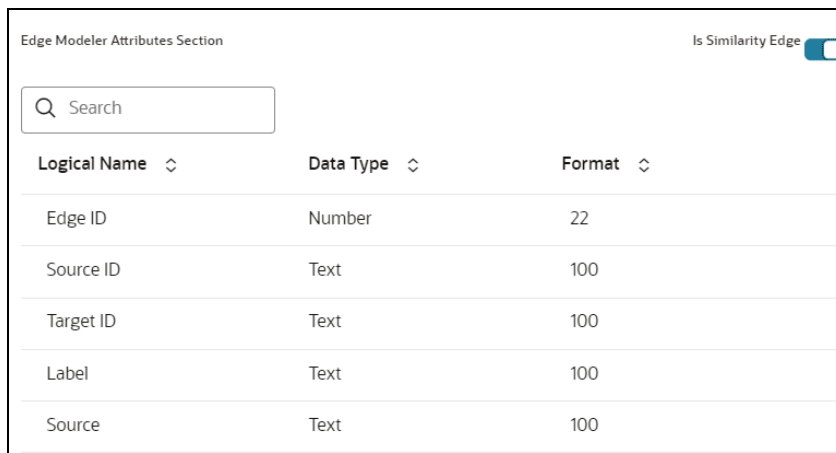
Figure: Search



Click the **Add** icon to add any number of edge attributes.

OR

Figure: Edge Details



Click the **Is Similarity Edge** toggle button the **Edge Modeler Attributes Section** to add the pre-defined set of attributes available in the edge.

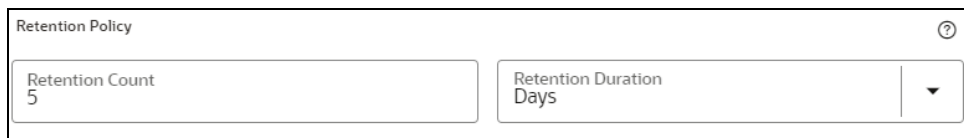
Similarity edges in the graph are created by Match Rules. If the edge is defined using Match Rule (under Manage Pipeline, by selecting Match Rule from the list), enable the toggle button to make it a Similarity Edge.

- Under the **Advanced Features** group, specify the Edge Retention Policy.

For example, An Edge Retention Policy of 7 days specifies that the current edge would be retained in the physicalized Graph for a period of 7 days.

- Enter the retention count and select the retention duration from the list.

The available retention durations are Days, Weeks, and Months.



- Enable the **Pluggable Attribute** to populate the corresponding list with the list of attributes of the Edge.

Pluggable edges are edges whose data can be directly plugged in to the graph. In the Financial Crime and Compliance domain, Transaction is a pluggable edge, which is generally large, and it is

difficult to find out the difference between two subsequent loads. Hence, its data is provided for a range of dates which can be directly plugged in to the PGX memory while refreshing the graph.

Any pluggable edge should have an identifier attribute, which is of the data type “Date”.

Figure: Pluggable Attribute

- Under **Key Attributes**, select the Column, Start, and End identifier from the respective Identifier lists. These attributes are mandatory.

All the created edge attributes are displayed under this list.

- Under **Manage Pipeline(s)**, you can either create a new data pipeline if the edge is coming from source data and Match Rules, to create a similarity edge between nodes, or attach the existing pipeline and Match Rules.

Figure: Manage Pipeline(s) for Edge

- Click Create and then select the Data Pipeline.

The Create Pipeline window is displayed.

Figure: Create Pipeline

- Select the **Create New Data Pipeline** option and then click **OK**.

The Pipeline Designer page is displayed.

- To create a data pipeline, see the *Creating a New Data Pipeline* section.
- OR
- To clone from an existing data pipeline, see the *Cloning from an Existing Data Pipeline* section.

NOTE

Define persist of the Data pipeline of the corresponding edge with the prescript. See the [Prescript Condition](#) section for more details.

- Click **Create** and then select **Match Rules** under Manage Pipeline(s).

The **Create Pipeline** window is displayed.

Figure: Create Pipeline



- Select the **Create New Match Rule** option and then click **Ok**.

The Create Match Ruleset window is displayed.

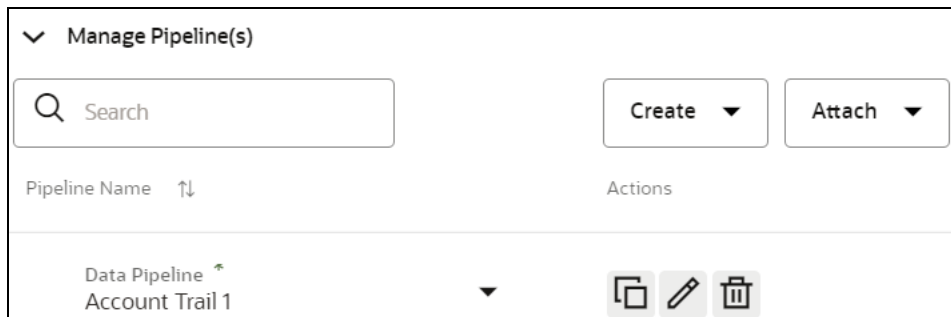
- To create a Match Rule, see the [Creating Match Ruleset](#) section.
- OR
- To clone from an existing match rule, see the [Cloning Ruleset \(Match\)](#) section.

NOTE

The newly created data pipeline and match rule are not automatically added to the edge. You must attach using the Attach option.

The selected data pipeline/match rule is displayed.

Figure: Create Pipeline

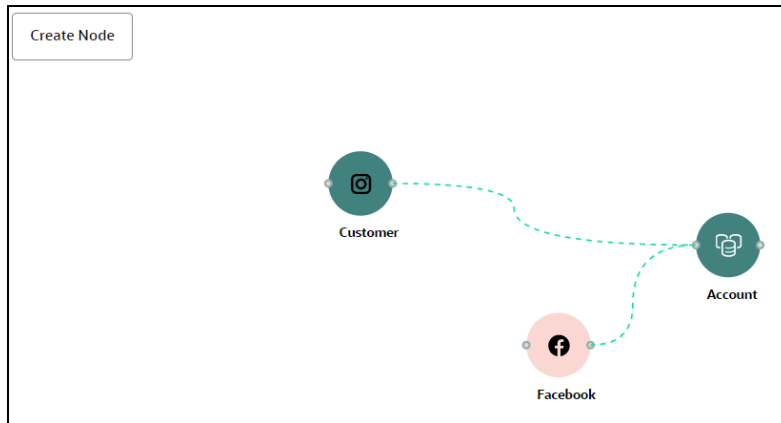


Click the **Attach** list to add any number of data pipelines/match rules to the Node.

- Click **OK**.

An Edge is created between the Customer, Facebook, and Account as shown in the below example.

Figure 50: Graph page



7.6.1.4 Zoom In and Zoom Out

You can zoom in or zoom out of the graph pipeline and view the data pipelines using the diagram present in the bottom right corner of the page.

7.6.1.5 Edit a Graph Pipeline

To edit a graph pipeline:

1. In the **Graph Summary** page, select the graph pipeline you want to edit, click the **Action** icon, and select **Edit**.
2. Edit the **Graph Name**.

The name must be unique to a particular workspace.

3. Click the Setting  icon.
4. Enter the **Graph Description**, and click **Save**.

The following page is displayed.

Figure: Graph page

The Maximum Age of Old session for a graph is 7 days by default. This implies that the graph would be retained for a period of 7 days. You can modify the description and Max Age of Old session by clicking the Setting icon. If you want the batch to be created in read-only mode for scheduler screen, enable the option.

5. Click **Save**.

The user session of the Graph Pipeline will get refreshed after the set timeline.

7.6.1.6 Delete a Graph Pipeline

To delete a graph pipeline:

1. On the **Graph Summary** page, select the graph pipeline you want to delete, click the **Action** icon, and select **Delete**.

To delete multiple graph pipelines, select the graph pipelines which you want to delete and click the



Delete icon in the Header.

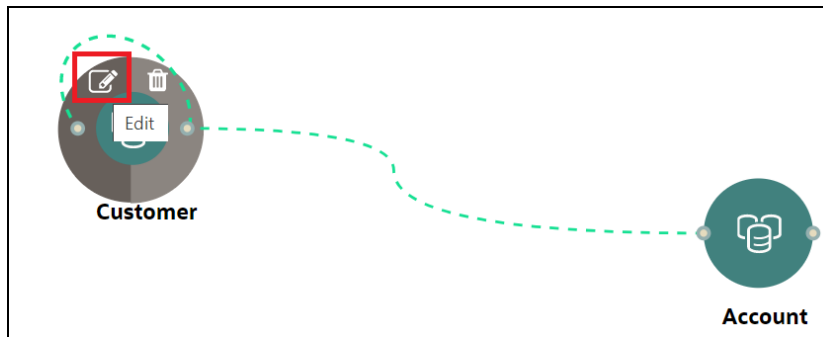
7.6.1.7 Edit a Node

To edit a node:

1. On the **Graph Summary** page, select the graph pipeline you want to edit, click the **Action** icon, and select **Edit**.
2. Hover over the graph pipeline and click the **Edit** icon.

The **Node Details** page is displayed.

Figure: Edit Node



3. Perform the steps 3 to 12 described in the [Creating a Node](#) section.

NOTE

If you delete any attribute in the Node Modeler Attribute section of the Node Details page, you must delete the same attribute in match rule details.

For example:

If the edge has two match rules where one is attached, and the other match is not attached to the edge details, remove attributes in both match rules for this case. To remove the deleted attribute from the Node Details page in the unattached match rule:

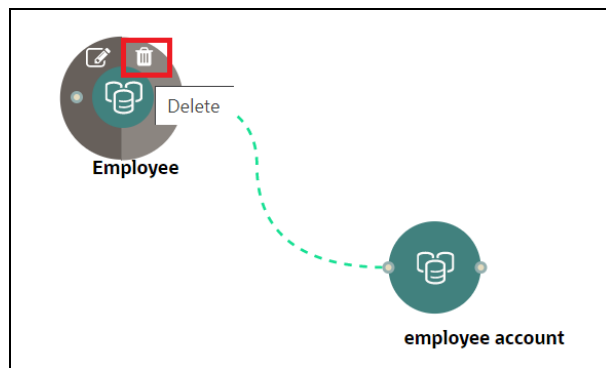
1. Navigate to **Edge Details > Manage Pipeline(s) > Attach**. Attach the new match rule that is not attached to the node details.
2. Click the **Edit** icon and delete the attribute in Ruleset Details, which is removed from the Node Details page.
3. Click **Save**. The attribute is removed.
4. Click **Delete** in Manage Pipeline(s) of the Edge Details page to remove the attached match rule.
5. After saving in the Edge Details page, navigate to the Node Details page and delete the attribute again.
6. Click **OK**. The attribute is removed from the node.

7.6.1.8 Delete a Node

To delete a node:

1. On the **Graph Summary** page, select the graph pipeline you want to edit, click the **Action** icon, and select **Edit**.
2. Hover over the graph pipeline and click the **Delete** icon.

Figure: Delete Node





A confirmation message is displayed.

3. Click **Delete**.
The Node is deleted.

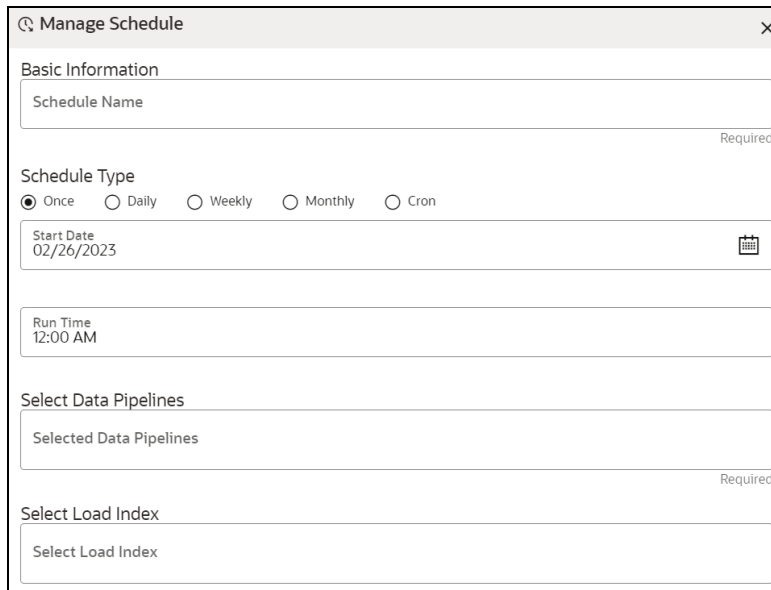
7.6.2 Schedule Details

NOTE Currently, when you execute a Graph pipeline for the first time and navigate to the **Monitor Batch** screen, two run IDs are generated for that batch.

To create a Graph Refresh Schedule:

1. Click **Launch Workspace**  to launch the workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click the **Graphs**  icon .
This displays the graph pipeline in a tabular format.
3. Click the graph for which you want to create a refresh schedule.
The **Graph Model** page is displayed.
4. Navigate to **Schedule Details** page and click **Add Schedule**.

The **Manage Schedule** screen is displayed.

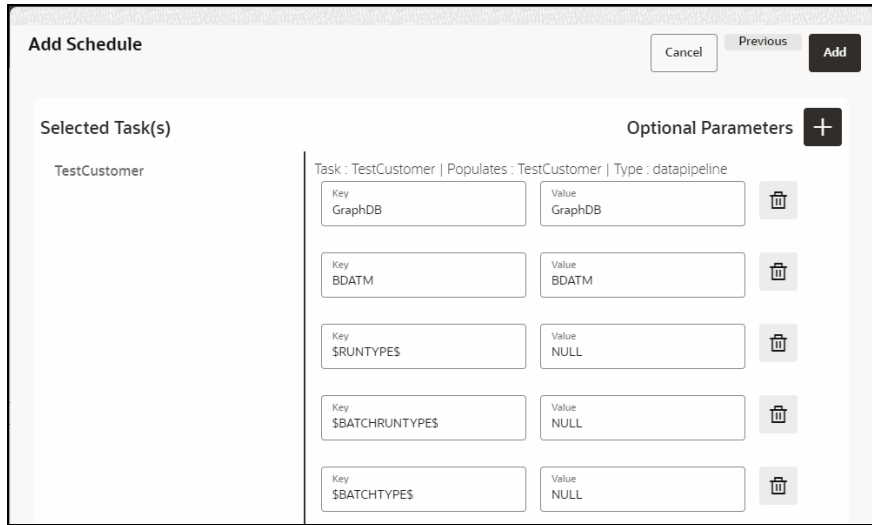


5. In the **Schedule Name**, enter the desired name.
6. Select the **Schedule** Type from the options.

NOTE For more details and expressions of cron schedule type, click the **help** icon.

7. Click inside the **Select Task** field and select one or multiple tasks.
8. Click **Next** and add the values for the selected task, and the values are mandatory fields.

Figure: Add Optional Parameters



9. Click + icon to add optional parameters for the selected task.

For the Pre-configured Data pipeline, the respective Key fields will be displayed. Configure the respective key-value in the Value field as specified in the following table.

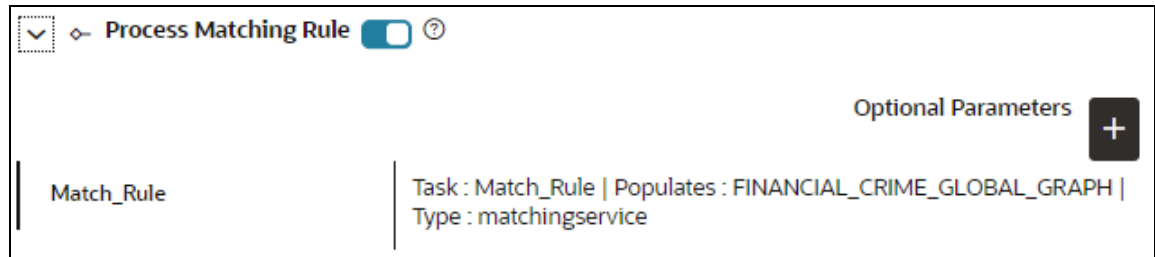
Table: Optional Parameters for Data Pipeline

Name	Description	Default Value
\$GRAPH_SCHEMA	Oracle wallet alias of graph schema. Navigate to <OFS_COMPLIANCE_STUDIO>/wallet/ tnsnames.ora and check the Graph Schema alias name. For example, graph_schema_alias	
\$BD_SCHEMA	Oracle wallet alias of BD schema. Navigate to <OFS_COMPLIANCE_STUDIO>/wallet/ tnsnames.ora and check the BD Schema alias name. For example, bd_schema_alias	
\$RUNTYPE\$	Indicates Run type. It can either be a production batch or a test batch. For a production batch, set it as PROD. For a test batch, as TEST.	PROD
\$batchRunType\$	Indicates Batch Run type. It can either be run or re-run. If it has to execute once, set it as RUN. For re-executing after failure as RE-RUN.	RUN
\$BATCHTYPE\$	Indicates the batch type. It should be DATA for the data pipeline task.	DATA
\$JOBNAME\$	Name of the data pipeline to be executed.	

10. To add Match Rules, enable the Process Matching Rule option, and click + to add optional parameters.

For more information on Match Rules, see the [Creating Match Ruleset](#) section.

Figure: Process Matching Rule



For the Pre-configured Match Rules, respective Key fields are displayed. Configure the respective key-value in the Value field as specified in the following table.

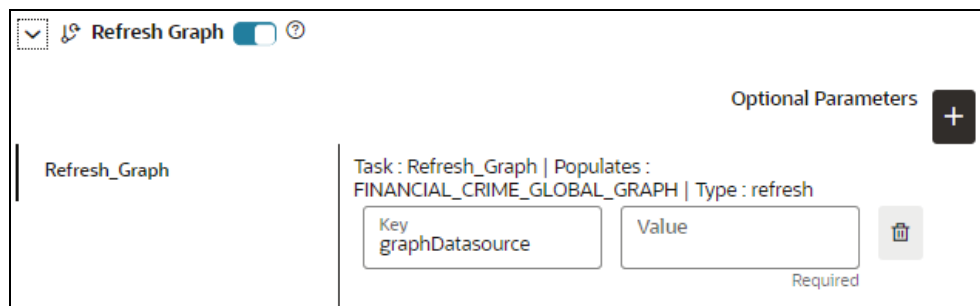
Table: Optional Parameter for Match Rules

Name	Description	Default Value
datasource	Oracle wallet alias of graph schema. Navigate to <OFS_COMPLIANCE_STUDIO>/wallet/ tnsnames.ora and check the Graph Schema alias name. For example, graph_schema_alias	-
loadType	Execution Load Type. Available types are full and delta . In this release, the only supported load type is full .	full
processingGroupName	Logical processing group name for the batch. Set it as MAN.	MAN
basedOnPipelineId	Match rules can be executed based on pipeline IDs or ruleset IDs. The value should be true while running from the Graph.	true
runSkey	A numeric value indicates the runskey of the execution.	100
runType	Indicates matching job that can be executed as part of graph or Entity Resolution. Set it as Graph.	graph

11. Enable the **Refresh Graph** option and click **Add** icon to refresh the Graph to add optional parameters.

NOTE The Key and Value parameters are not required.

Figure: Refresh Graph



NOTE If you do not enable the Refresh Graph option, the pipeline will add nodes and edges to the graph schema but does not load into PGX.

7.6.3 Audit History

You can audit the Graphs from the Audit History page, which displays the events on the Graph. Information such as when the Graph was created, who created the Graph and its status, and so on are available.

The sequence of actions performed on the Graph is listed in the table view and the timeline view (graphical representation).

To view the audit history of the Graph:


1. Click **Launch Workspace**  to launch the workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. In the Mega menu, click **Modeling > Graphs**.
This displays the graph pipeline in a tabular format.
3. Click the graph whose audit history you want to view.
The **Graph Model** page is displayed.
4. Navigate to **Audit History** page to view the details.

Figure 51: Audit History



Status	Type	Name	User	Comments	Time
Created	Graph	FINANCIAL_CRIME_GLOBAL_GRAPH	MMGSAML	Graph FINANCIAL_CRIME_GLOBAL_GRAPH (0) was created by MMGSAML	2 May 2023, 17:40:12


Click **Audit Timeline View** for Timeline View and **Audit Table View** to switch to the regular view. Click **Refresh** to refresh the Audit History.

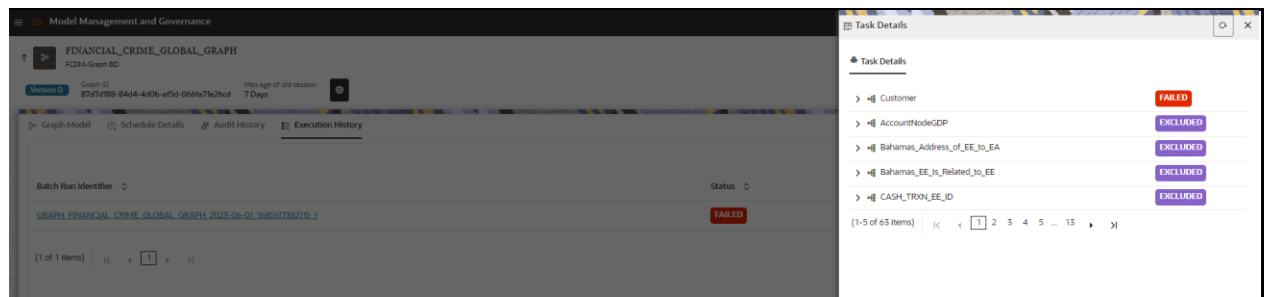
Figure 52: Audit History window Timeline View with Horizontal Time Axis



7.6.4 Execution History

To view the Graph Execution History:


1. Click **Launch Workspace**  to launch the workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. In the Mega menu, click **Modeling > Graphs**.
This displays the graph pipeline in a table.
3. Click on the graph whose execution history you want to view.
The **Graph Model** page is displayed.
4. Navigate to **Execution History** page to view the details.
This window displays details such as Batch Run Identifier, Status, and start and end time of the execution. Click the Batch Run Identifier to view the individual task details.



7.6.5 Analyses

You can analyse and add a notebook from this page.

To analyse the Graph, perform the following steps:

1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. In the Mega menu, click **Modeling > Graphs**.
This displays the graph pipeline in a table.
3. Click on the graph for which you want to view the execution history.
The **Graph Model** page is displayed.
4. Navigate to **Analyses** page to view the details.

8 Orchestration

Orchestration covers the following:

- **Scheduler Dashboard:** Get an overview of the scheduled tasks and processes.
- **Define Batch:** Manage and configure batch definitions.
- **Define Taks:** Create tasks, configure parameters, and set execution dependencies within a batch process.
- **Schedule Batch:** Set execution schedules for your batch processes.
- **Monitor Batch:** Track and monitor batch process executions.

8.1 Scheduler Service

The Scheduler Service automates running of models in Compliance Studio. Its graphical user interface provides a single control point for defining and monitoring background executions.

This service in the infrastructure system automates behind-the-scenes work that is necessary to sustain various enterprise applications and functionalities. This automation helps applications control execution of unattended background jobs programs.

The following terms are used in the context of the Scheduler Service:

- **Batch:** Date and time-based execution of the background tasks based on a defined period during which the resources are available for batch processing.
- **Job:** A batch job is a piece of a program meant to meet specific and business-critical functions. The program is a RESTful API used in a batch.
- **Job Dependency:** When a batch job is submitted, it is moved to the job queue until the system is ready to process it. The system processes the job based on chronological order or based on priority if more jobs are required to be executed in the job queue.
- **Schedule:** Batch jobs are used to automate the tasks that must be performed on a regular basis but don't necessarily need to occur during the day or have an employee interact with the system. Jobs that happen on a regular basis are incorporated into batch schedules. **Monitor:** You can monitor executions using a web-browser to get real-time feedback of the status of the current encoding job and the list of pending jobs in the batch. You can also cancel or restart the service, if required.

8.1.1 Scheduler Dashboard



1. Click **Launch Workspace** to launch the workspace to display the **MMG Dashboard** window.
2. In the Mega menu, click **Orchestration > Scheduler Dashboard**

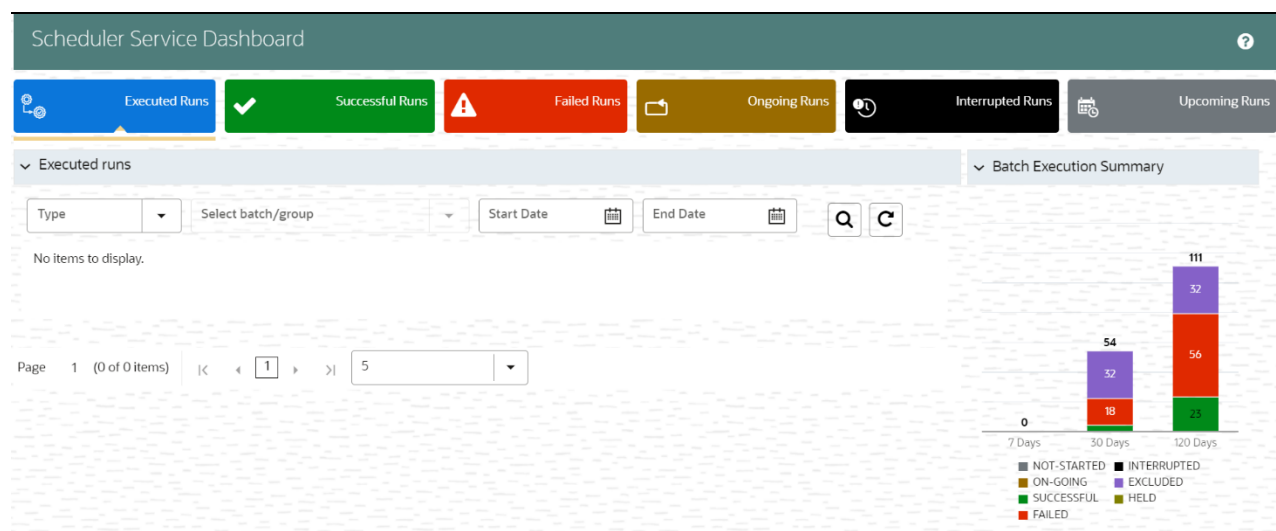
This displays the executed runs.

To view the demonstration of the Dashboard window, see the [Scheduler Service Introduction Video](#).

View the following details in the Scheduler Service window:

- The *Executed Runs*, *Successful Runs*, *Failed Runs*, *Ongoing Runs*, *Interrupted Runs*, and *Upcoming Runs* tabs. You can click the tabs to view the details of the Batches based on their status. For example, click **Ongoing Runs** to view the details of the batches that are currently running.
- The Batches that were executed within the last 7 or 30 days contain details such as Batch Name, Batch Run ID, and Run Time. Click **30 days** to view the batches that were executed within the last 30 days.
- The **Batch execution Summary** pane displays the count of total batches executed that were executed within the last 7 days, 30 days, and 120 days. Additionally, you can see the separate count of successful batches, failed batches, interrupted batches, on-going batches, and the batches which are yet to start, by hovering your mouse the batches.

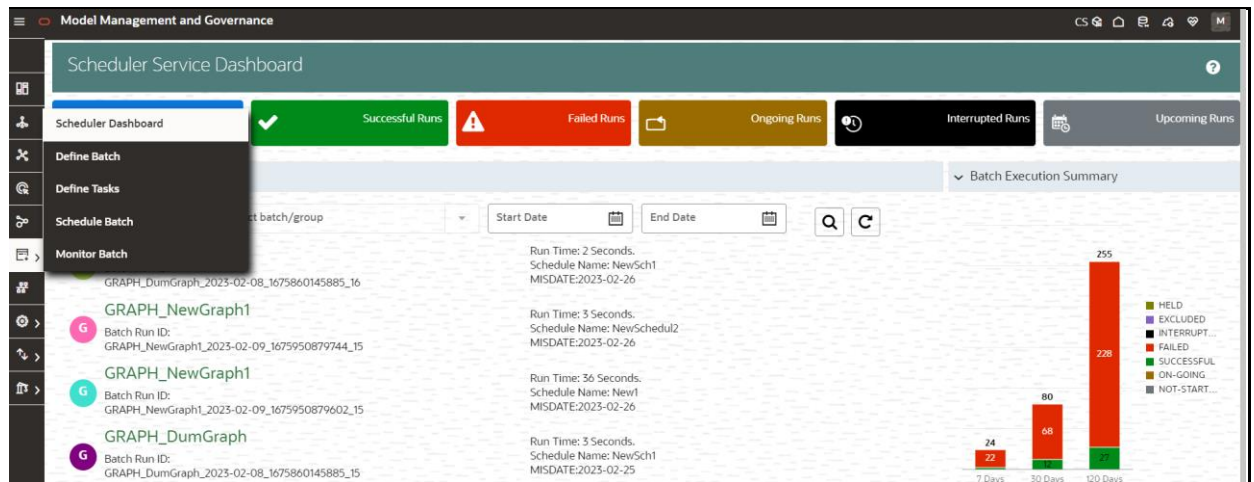
You can filter the executed runs based on Batch type, Batch or group, start and end date by selecting the corresponding options.



On the **Scheduler Service** window, you can see:

- **Menu Navigation:** Shows the menu options available in Scheduler Service.
- **Quick Actions:** Quick actions can be performed by using the buttons in this section.
- **User Details:** View the logged in user's details, help, and set your profile preferences.

Figure 53: Header Details



On the left side of the window, click the **Scheduler Service** icon to see available options in the Scheduler Service.

8.1.2 Configure Batch and Batch Groups

8.1.2.1 Create a Batch

The **Define Batch** window displays the details of all existing batches like Batch ID, Batch Name, Batch Description, Last Modified By and Last Modified Date. You can create a new batch, or edit, copy, or delete batches. You can also create a [Batch Group](#) with a list of batches that you have selected and grouped and execute the Batch Group .

To create a new batch and schedule and monitor the batch that you create:



1. Click **Define Batch** from the Header in the Dashboard window. After selecting the batch, click  corresponding to the batch to proceed to create or edit tasks.
2. In the **Define Batch** window, click . The **Create a New Batch** window is displayed.
3. Specify the details as described in the following table.

Table 1: Fields in the Create a New Batch window and their Description

Field	Description
Batch Details	

Field	Description
Batch Name	<p>The Batch Name is generated based on the values you provide.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • The Batch Name should be unique across the Information Domain. • The Batch Name must be alphanumeric and should not start with a number. • The Batch Name should not exceed 60 characters in length. • The Batch Name should not contain any special characters except “_”.
Batch Description	<p>Enter a description for the batch .</p> <p>NOTE:</p> <p>The Batch description should be alphanumeric. The allowed special characters are_:- and <blank space>. It should not exceed 200 characters.</p>
Service URL Name/ Service URL	<ul style="list-style-type: none"> • Select the Service URL name from the drop-down list, if it is available. The Service URL is displayed in the Service URL field. • To add a new service URL, enter a name to identify it in the Service URL Name field and enter the proper URL in the Service URL field. You can give partial URL here and the remaining URL in the Task Service URL. <p>Choose this option to notify by an e-mail the batch execution status depending on the property selected. E-mail for the email notification is fetched from the IDCS configuration for the logged-in user.</p> <p>NOTE: E-mail is a mandatory field in IDCS.</p> <p>The BATCH_NOTIFY_FUNCT function has to be enabled to access this feature.</p> <p>If it is not available for the logged-in user, this field is grayed out.</p> <ul style="list-style-type: none"> • Every Time: An e-mail is triggered irrespective of the batch status. • Never: No e-mail will be triggered. • On Error only: An e-mail is triggered only when the batch execution has failed/Error. • On Interrupt only: An e-mail is triggered if the batch is successfully interrupted. <p>NOTE: Never is the default option.</p>
Notify on Mail	

4. Click **Save**.

The new Batch is created and displayed in the **Define Batch** window.

8.1.2.2 Manage Batch


You can manage a batch by editing, copying, or delete them as required.

- **Edit:** Use the **Edit Batch** icon to edit the Batch Description, Service URL Name, Service URL. You can also add a new batch parameter. You cannot edit seeded batches.
- **Copy:** Use the **Copy Batch** option to copy a Batch that you want to clone or create instances in the system from the **Define Batch** window.
- **Delete:** Use the **Delete** icon to delete a Batch that is no longer required in the system from the **Define Batch** window. You cannot delete seeded batches.

8.1.2.3 Create a Batch Group

You can create a new batch group in the **Define Batch** window and schedule and monitor the batch group that you create.

To create a new batch group:

1. In the **Define Batch** window, click .
The **Create a New Batch** window is displayed.
2. Select **Batch Group**.
3. Specify the following fields:
 - Name
 - Description
 - Add Batches: This is a multi-select field. You can select the batches that you want to add to the group using this field.
 - Notify on mail

Choose the desired option to notify by an e-mail the batch execution status depending on the property selected. E-mail for the email notification is fetched from the IDCS configuration for the logged in user.

NOTE: E-mail is a mandatory field in IDCS .

The BATCH_NOTIFY_FUNCNT function must be enabled to access this feature.

If it is not available for the logged in user, this field is grayed out.

- Every Time: An e-mail is triggered irrespective of the batch status.
- Never: No e-mail will be triggered.
- On Error only: An e-mail is triggered only when the batch execution has failed/Error.
- On Interrupt only: An e-mail is triggered if the batch is successfully interrupted.

NOTE: Never is the default option.

4. Click **Save**.

The new Batch Group is created and displayed in the **Define Batch** window.

8.1.2.4 Manage Batch Group

You can manage a batch group by editing, copying, or delete them as required.

- **Edit:** Use the edit icon to edit the Batch Group name, Added Batches, and Batch Group Description.
- **Copy:** Use the copy option to copy a batch group that you want to clone or create instances in the system.
- **Delete:** Use the delete icon to delete a batch group that is no longer required in the system.

8.1.3 Configure Tasks

The **Define Tasks** window displays the list of tasks associated with a specific Batch definition. You can create new tasks, edit existing tasks, or delete unwanted tasks. Additionally, you can specify task precedence for each task in the Task Precedence window and schedule the batch.

Use the **Define Tasks** window to perform task operations for your batch and batch group.

8.1.3.1 Add Task to a Batch or Batch Group

You can add new tasks to a selected Batch or Batch Group definition.

To add new task:




1. Click **Define Tasks** from the Header panel.
The **Define Task** window is displayed.
2. Select the Batch or Batch Group for which you want to add a new task from the **Select** drop-down list.
3. Click Add .
The **Create a New Task** window is displayed.
4. Enter the details as given here:

Table 3: Fields in the Create a New Task window and their Description

Field	Description
Task Details	
Task Name	Enter the task name. NOTE: <ul style="list-style-type: none"> • It must be alphanumeric and should not start with a number. • It should not exceed 60 characters. • It should not contain any special characters except underscore (_).
Task Description	<ul style="list-style-type: none"> • Enter the task description. While spaces and alpha-numeric characters are allowed, no special characters are allowed. • Words like Select From or Delete From should not be entered in the description.
Task Type	Select the task type from the drop-down list.
Batch Service URL	Select the required Batch Service URL from the drop-down list. This can be blank; you can provide the full URL in the Task Service URL field.
Task Service URL	Enter task service URL if it is different from Batch or Batch Group Service URL.

5. From the *Task Parameters* pane, click Add  to add a new Task Parameter. By default, all Batch level parameters are added and enabled as task parameters. To disable, deselect the check box corresponding to the task parameter ()
 - a. Enter **Param Name**.

b. Enter the **Param Value**.

You can delete a parameter by clicking  corresponding to the parameter.

6. Click **Save**.

8.1.3.2 Manage Tasks


You can manage tasks by modifying or deleting tasks and also define task precedence.

- **Modify:** Use the edit icon to modify details of existing tasks of a Batch definition such as Task Description, Task Type, Batch Service URL, and Task Service URL. You can also add a new task parameter and enable or disable existing task parameters.
- **Delete:** Use the delete icon to remove a task from a Batch definition which is no longer required in the system from the **Define Task** window.
- **Define Task Precedence:** Task Precedence indicates the execution-flow of a Batch. Task Precedence value facilitates you to determine the order in which the tasks of a Batch are executed.

For example, consider a Batch consisting of 4 tasks. The first 3 tasks do not have a precedence defined and hence will be executed simultaneously during the Batch execution. But, task 4 has a precedence value as task 1 which indicates that, task 4 is executed only after task 1 has been successfully executed.

You can set Task precedence between Tasks or define to run a Task after a set of other tasks. However, multiple tasks can be executed simultaneously; cyclical execution of tasks is not permitted. If the precedence for a task is not set, the task is executed immediately on execution of the Batch.

To define the task precedence in the *Define Task* window, perform the following steps:

1. Click Menu  button corresponding to the task for which you want to add a precedence task. The **Task Precedence Mapping** window is displayed.

NOTE

The Task Precedence option is disabled if a batch has only one task associated.

- a. Select one or multiple tasks you want to execute before the current task, from the **Available Tasks** pane and click >. Press Ctrl key to select multiple items.
2. Click **Save**.
3. Click **Preview** to view the precedence information.


8.1.3.2.1 Define Task Precedence

Task Precedence indicates the execution-flow of a Batch. Task Precedence value facilitates you to determine the order in which the specific Tasks of a Batch are executed.

For example, consider a Batch consisting of 4 Task. The first 3 Task does not have a precedence defined and hence will be executed simultaneously during the Batch execution. But, Task 4 has a precedence value as task 1 which indicates that, Task 4 is executed only after Task 1 has been successfully executed.





You can set Task precedence between Tasks or define to run a Task after a set of other tasks. However, multiple tasks can be executed simultaneously, and cyclical execution of tasks is not permitted. If the precedence for a Task is not set, the Task is executed immediately on Batch execution.

To define the task precedence in the *Define Task* window, perform the following steps:

1. Click Menu  button corresponding to the task for which you want to add precedence task. The **Task Precedence Mapping** window is displayed.

NOTE

The Task Precedence option is disabled if a batch has only one task associated.

- a. Select the batch that you want to execute before the current task, from the **Available Tasks** pane and click . You can press Ctrl key for multiple selections.
 - b. To select all the listed batches, click .
 - c. To remove a batch, select the task from the **Selected Tasks** pane and click .
 - d. To remove all the selected batches, click .
2. Click **Save** to update Task Precedence in the batches.
 3. Click **Preview** to view the Precedence information.

8.1.4 Schedule Batch or Batch Groups

Use the *Schedule Batch* feature to run, schedule, re-start, re-run batches in the Scheduler Service. After you upload the data in the required format into Object Storage, you must load the data into the system using the Scheduler Service. You can schedule them to run in a required pattern and view the run time status of the scheduled services using the Monitor Batch feature.

You can perform operations on batches and batch groups. Information in the following sections is applicable to both batches and batch groups. Where there are unique instructions for batches or batch groups, they are called out clearly.

8.1.4.1 Execute a Batch/Batch Group

Use the Execute batch option to run a batch/batch group instantaneously.

To execute a batch:

1. Click **Schedule Batch** from the Header panel.
The **Schedule** window is displayed.
2. Select the batch name/ batch group name from the **Select Name** list.
For example; AMLDataLoad.

3. Click **Execute**.

After successful execution, a confirmation message is displayed indicating the unique identification reference number for the batch and the date of execution.

4. In the **Execution Status** dialog box, click **Monitor** to monitor the batch.

5. If you want to exclude/include some tasks, click **Exclude Tasks**. For more information, see the [Exclude/Include Tasks](#) section.

6. If you want to hold/release some tasks, click **Hold Tasks**.

For more information, see the [Hold/Release Tasks](#) section.

7. If you want to edit the dynamic parameters of the batch, click **Edit Dynamic Parameters**. For more information, see the [Edit Dynamic Parameters](#) section.

8.1.4.2 Schedule a Batch/Batch Group

You can schedule a Batch/batch Group to run just [Once](#), [Daily](#), [Weekly](#), [Monthly](#), or a [Cron Expression](#) for scheduling the batches. You can also define a schedule and run a batch/batch group.

Schedule Once

To schedule a Batch to run once:

1. Click **Schedule Batch** from the Header panel.

The **Schedule Batch** window is displayed.

2. In the **Schedule Batch** window, click **Once**.

3. Select the batch or batch name you want to schedule once from the **Select** list.

4. Enter a **Schedule Name**.

5. Click the date and time picker icons and select the date and time when you want to run the batch.

6. Click **Schedule**.

Schedule Daily

To schedule a Batch to run daily:

1. In the **Schedule Batch** window, click **Daily**.

2. Select the batch or batch name you want to schedule daily from the **Select** list.

3. Enter a **Schedule Name**.

4. Click the date and time picker icons to select the start date, end date, and time when you want to run the batch.

5. Click **Schedule**.

Schedule Weekly

To schedule a Batch to run weekly:

1. In the **Schedule Batch** window, click **Weekly**.

2. Select the batch or batch name you want to schedule weekly from the **Select** list.

3. Enter a Schedule Name.
4. Click the date and time picker icons to select the start date, end date, and time when you want to run the batch.
5. Select the days of the week when you want to run the batch from the **Select Days of the Week** list.
6. Click **Schedule**.

Schedule Monthly

To schedule a batch to run monthly:

1. In the **Schedule Batch** window, click **Monthly**.
2. Select the batch or batch name you want to schedule monthly from the **Select** list.
3. Enter a Schedule Name.
4. Click the date and time picker icons to select the start date, end date, and time when you want to run the batch.
5. Select the months in the year when you want to run the batch from the **Select Months of the Year** list.
6. Select the day of the month that you want to run the batch from the **Select Day of the Month** list.
7. Click **Schedule**.

Schedule Cron Expression

To run a batch in a custom schedule, use the Cron Expression. A cron expression is a string comprised of 6 or 7 fields separated by white space. Fields can contain any of the allowed values, along with various combinations of the allowed special characters for that field. For more information, click the information icon.

To create a customized schedule for a batch using a Cron Expression:

1. In the **Schedule Batch** window, click **Cron Expression**.
2. Select the batch or batch name you want to schedule from the **Select** list.
3. Enter a **Schedule Name**.
4. Enter the Cron Expression for your schedule. For more information about the Cron Expression, click the information icon.
5. Click **Schedule**.

Pause a Batch

You can pause a batch that has been executed. User can click on pause button and can pause schedule between scheduled dates. Time is not supported for pause activity, if any schedule is paused for current date, it will be paused immediately. If pause start date is passed, user cannot change pause start date, rest fields can be manipulated and will be valid one minute before end of day.

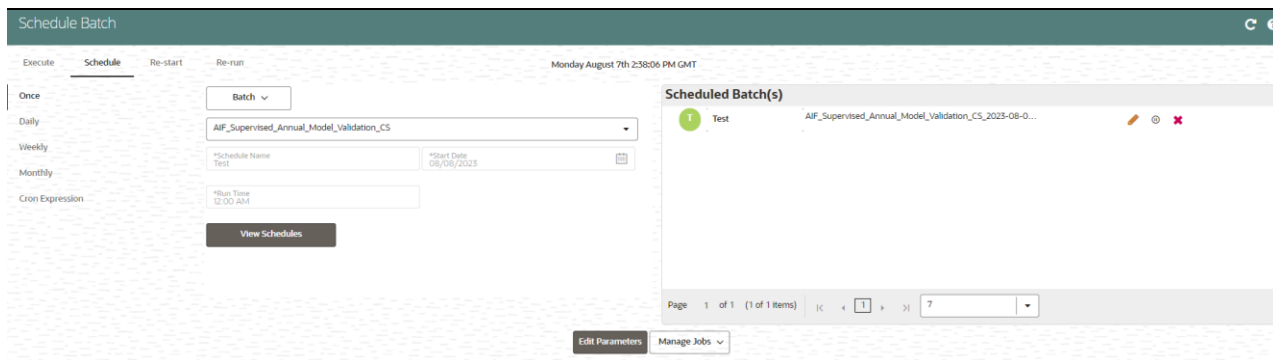
If pause is expired, user cannot edit and delete but will be shown in UI.

To pause a batch:

1. From the Header panel, click **Schedule Batch** and then click the **Schedule** tab.

2. Select the batch you want to pause from the list.
3. For the batch you have selected to pause, select the scheduling type (Once, Daily, Weekly, Monthly, or Cron Expression).
4. Click **View Schedules**.

The scheduled batches are displayed on the right pane.



5. Click the pause icon for the batch you want to pause.
6. In the **Manage Pause** screen, click **Add Pause**.
7. Select the **Pause Start** and **End Date**, add comments if required, and click +.
The Pausing schedule appears in the Pause Summary.
8. Repeat the steps if you want to add multiple pausing schedules for the same batch.

8.1.4.2.1 Re-start a Batch/Batch Group

You can restart a batch/batch group which has not been executed successfully or which has been explicitly interrupted, cancelled, or put on hold during the execution process. By restarting a batch/batch group, you can continue batch/batch group execution directly from the point of interruption or failure and complete executing the remaining tasks.

To re-start a batch/batch group:

1. Click **Schedule Batch** from the header panel.
2. From the **Schedule** window, click the **Re-start** tab.
3. Select the batch/batch group you want to re-start from the **Select Name** list.
4. Select the **Batch Run ID**.
5. Click **Re-start**.

8.1.4.2.2 Re-run a Batch/Batch Group

You can re-run a batch/batch group that has been executed. You can re-run a batch/batch group regardless of the previous execution state. A new Batch Run ID is generated during the rerun and the batch/batch group is executed as a new Batch Run.

To re-run a batch/batch group:

1. Click **Schedule Batch** from the Header panel.

2. In the **Schedule Batch** window, click the **Re-run** tab.
3. Select the batch/batch group you want to re-run from the **Select Name** list.
4. Select the **Batch Run ID**.
5. Click **Re-run**.

8.1.4.2.3 Edit Dynamic Parameters

Dynamic Parameters facilitate modification of dynamic parameters for the batch. You can change the param value and save the changes to the batch. The **Edit Dynamic Parameters** option is available in all tabs in the *Schedule Batch* window.

To edit the dynamic parameters for a batch/batch group:

1. In the **Schedule Batch** window, click **Edit Dynamic Parameters**.
2. In the **Edit Dynamic Params** window, modify the values as required.
3. Click **Save**.

The modified parameters are applied to the batch/batch group.

8.1.4.2.4 Task Definitions of a Batch/ Batch Group

You can modify the task definition state to exclude or hold the defined task in a batch/batch group from execution. The excluded tasks are therefore assumed to have completed execution and get excluded during the Batch/Batch Group Run. While executing or scheduling a batch/batch group, you can:

- Exclude a task or include the excluded task
- Hold a task or release the held task

Exclude or Include Tasks

You can exclude tasks or include the excluded tasks during Batch/Batch Group Execution. The excluded task components are executed in the normal process assuming that the excluded tasks have completed execution.

To exclude/include tasks:

1. In the **Schedule Batch** window, click **Exclude Tasks**.
The **Select Tasks** window is displayed.
2. To exclude tasks:
 - a. Select one or multiple tasks from the **Included Tasks** list and click > or >> respectively. Press the Ctrl key and click to select multiple items.
3. To include the excluded tasks:
 - a. Select one or multiple tasks from the **Excluded Tasks** list and click < or << respectively. Press the Ctrl key and click to select multiple items.
4. Click **Save**.

Hold or Release Tasks

You can hold tasks or release the held tasks during Batch/Batch Group Execution. The tasks which are on hold along with the defined components are skipped during execution. However, at least one task should be available in a batch/batch group without being held/excluded for batch/batch group execution.

To hold/release tasks:

1. In the **Schedule Batch** window, click **Hold Tasks**.
The **Select Tasks** window is displayed.
2. To hold tasks:
 - a. Select one or multiple tasks from the **Released Tasks** list and click > or >> respectively. Press the Ctrl key and click to select multiple items.
3. To release held tasks:
 - a. Select one or multiple tasks from the **Held Tasks** list click < or << respectively. Press the Ctrl key and click to select multiple items.
4. Click **Save**.

8.1.4.3 Batch Group

You can perform the following operations for a batch group:

- [Execute a Batch Group](#)
- [Schedule a Batch Group](#)
- [Re-start a Batch Group](#)
- [Re-run a Batch Group](#)
- [Edit Dynamic Parameters](#)
- [Task Definition of a Batch Group](#)

8.1.4.3.1 Execute a Batch Group

The Execute batch option allows you to run a batch instantaneously. To execute a batch group, perform the following steps:

1. Click **Schedule Batch** from the Header panel.
The **Schedule** window is displayed.
2. Select the Batch Group from the Select Name drop down menu.
For example, AMLDataLoad.
3. Click **Execute**.
The Execution Status Dialog Box is displayed with the Batch executed successfully message.
This indicates the unique identification reference number for the batch and date of the batch execution.
4. In the Execution Status Dialog Box, click Monitor to monitor the batch.
5. If you want to exclude/include some tasks, click **Exclude Tasks**.

For more information, see [Exclude/Include Tasks](#) section.

6. If you want to hold/release some tasks, click **Hold Tasks**.

For more information, see [Hold/Release Tasks](#) section.

7. If you want to edit the dynamic parameters of the batch, click **Edit Dynamic Parameters**.



For more information, see [Edit Dynamic Parameters](#)

8.1.4.3.2 Schedule a Batch Group

You can schedule a Batch group to run just for [Once](#), [Daily](#), [Weekly](#), [Monthly](#), or [Cron Expression](#) for scheduling the batches. You can also have a user defined schedule to schedule and run a batch.




Schedule Once

To schedule a Batch to run once, perform the following steps:

1. Click **Schedule Batch** from the Header panel.
The **Schedule Batch** window is displayed.
2. In the **Schedule Batch** window, click **Once**.
3. Select the Batch Group you want to schedule for once from the Select drop down menu.
4. Enter a Schedule Name.
5. Click  and select the date on which you want to run the Batch.
6. Click  and select the time at which you want to run the Batch.
7. Click **Schedule**.

Schedule Daily




To schedule a Batch to run daily, perform the following steps:

1. In the **Schedule Batch** window, click **Daily**.
2. Select the Batch Group you want to schedule daily from the Select drop down menu.
3. Enter a **Schedule Name**.
4. Click  and select the start date from which you want to run the batch group.
5. Click  and select the end date till which you want to run the batch group.
6. Click  and select the time at which you want to run the batch group daily.
7. Click **Schedule**.

Schedule Weekly




To schedule a Batch to run weekly, perform the following steps:

1. In the **Schedule Batch** window, click **Weekly**.


2. Select the Batch Group you want to schedule weekly from the Select drop down menu.
3. Enter a Schedule Name.
4. Click  and select the start date from which you want to run the batch group.
5. Click  and select the end date till which you want to run the batch group.
6. Click  and select the time at which you want to run the batch group.
7. Select the days in a week you want to run the batch group from the Select Days of the Week multi-select drop down menu.
8. Click **Schedule**.

Schedule Monthly

To schedule a Batch to run monthly, perform the following steps:


1. In the **Schedule Batch** window, click **Monthly**.
2. Select the Batch Group you want to schedule monthly from the Select drop down menu.
3. Enter a Schedule Name.
4. Click  and select the start date from which you want to run the batch group.
5. Click  and select the end date till which you want to run the batch group.
6. Click  and select the time at which you want to run the batch group.
7. Select the months in a year you want to run the batch group from the Select Months of the Year multi-select drop down menu.
8. Select the day of the month that you want to run the batch group from the Select Day of the Month drop down menu.
9. Click **Schedule**.

Schedule Cron Expression

To run a Batch in a user-defined schedule, you can have custom schedule with the help of Cron Expression. A cron expression is a string comprised of 6 or 7 fields separated by white space. Fields can contain any of the allowed values, along with various combinations of the allowed special characters for that field. For more information, click  icon next to the Cron Expression field.

To schedule a Batch based on Cron Expression, perform the following steps

1. In the **Schedule Batch** window, click **Cron Expression**.
2. Select the Batch Group you want to schedule from the Select drop down menu.
3. Enter a **Schedule Name**.
4. Enter the Cron Expression for your schedule.

- For more information about the Cron Expression, click  icon next to the Cron Expression field.
5. Click **Schedule**.


Pre Conditions for a Batch Group

You can schedule the batches and set the pre conditions within a Batch group with frequency as [Weekly](#), [Monthly](#), or based on an [Interval](#) for scheduling the batches. The batch that satisfies the configured pre conditions are executed as part of the schedule.

NOTE Pre Conditions can only be applied when using the Schedule option in the Schedule Batch window.

Weekly

To set the pre conditions to the batches in a batch group weekly, perform the following steps:

1. In the **Schedule Batch** window, you can select either [Once](#), [Daily](#), [Weekly](#), [Monthly](#), or [Cron Expression](#) option based on the schedule that you want to run the batch group.
2. Select the Batch Group you want from the Select drop down menu.
3. Enter a Schedule Name.
4. Specify the other details displayed when you are selecting [Once](#), [Daily](#), [Weekly](#), [Monthly](#), or [Cron Expression](#).
5. Click Pre Conditions.
6. In the Pre Conditions window, specify the Batch from the drop down and from the Frequency drop down and select Weekly.
7. Select the days from the Select Days drop down that you want to schedule the batch run within the selected week.
8. Click  to add the specified entry.

NOTE Pre Conditions can be added only to one batch at a time


9. Click **Save**.

The batch is executed based on the configured pre conditions.

Monthly

To set the pre conditions to the batches in a batch group monthly, perform the following steps:

1. In the **Schedule Batch** window, you can select either [Once](#), [Daily](#), [Weekly](#), [Monthly](#), or [Cron Expression](#) option based on the schedule that you want to run the batch group.
2. Select the Batch Group you want from the Select drop down menu.
3. Enter a Schedule Name.

4. Specify the other details displayed when you are selecting [Once](#), [Daily](#), [Weekly](#), [Monthly](#), or [Cron Expression](#).
5. Click Pre Conditions.
6. In the Pre Conditions window, specify the Batch from the drop down and from the Frequency drop down and select Monthly.
7. Select the days from the Select Days drop down that you want to schedule the batch run within the selected week.
8. Click  to add the specified entry.

NOTE Pre Conditions can be added only to one batch at a time.


9. Click **Save**.
The batch is executed based on the configured pre conditions.

Interval

To set the pre conditions to the batches in a batch group based on an interval, perform the following steps:

1. In the **Schedule Batch** window, you can select either [Once](#), [Daily](#), [Weekly](#), [Monthly](#), or [Cron Expression](#) option based on the schedule that you want to run the batch group.
2. Select the Batch Group you want from the Select drop down menu.
3. Enter a Schedule Name.
4. Specify the other details displayed when you are selecting [Once](#), [Daily](#), [Weekly](#), [Monthly](#), or [Cron Expression](#).
5. Click Pre Conditions.
6. In the Pre Conditions window, specify the Batch from the drop down and from the Frequency drop down and select Interval.
7. Select the interval from the Custom Recurrence (Repeat every) Days drop down that you want to schedule the batch run within the selected week.

NOTE The Custom Recurrence can be set maximum to 60 days.

8. Click  to add the specified entry.

NOTE Pre Conditions can be added only to one batch at a time.

9. Click **Save**.

10. The batch is executed based on the configured pre conditions.

8.1.4.4 Re-start a Batch Group

You can restart a Batch which has not been executed successfully or which has been explicitly interrupted, or cancelled, or put on hold during the execution process. By restarting a Batch, you can continue Batch execution directly from the point of interruption or failure and complete executing the remaining tasks.

To re-start a batch, perform the following steps:

1. Click **Schedule Batch** from the Header panel.
The **Schedule** window is displayed.
2. From the **Schedule** window, select **Re-start** tab.
3. Select the Batch Group you want to re-start from the Select Name drop down menu.
4. Select the Batch Run ID.
5. Click **Re-start**.

8.1.4.5 Re-run a Batch Group

You can re-run a Batch which has previously been executed. Rerun Batch facilitates you to run the Batch irrespective of the previous execution state. A new Batch Run ID is generated during the Rerun process and the Batch is executed as similar to the new Batch Run.

To re-run a batch, perform the following steps:

1. Click **Schedule Batch** from the Header panel.
The **Schedule Batch** window is displayed.
2. In the **Schedule Batch** window, select **Re-run** tab.
3. Select the Batch Group you want to re-run from the Select Name drop down menu.
4. Select the Batch Run ID.
5. Click **Re-run**.

8.1.4.6 Edit Dynamic Parameters

Dynamic Parameters facilitates you to the modify the dynamic parameters for the batch. You can change the param value from the Edit Dynamic Params window and save the changes to the Batch. The Edit Dynamic Parameters option is available in all tabs in the **Schedule Batch** window.

To edit the dynamic parameters for a batch group, perform the following steps:

1. In the **Schedule Batch** window, click **Edit Dynamic Parameters**.
The **Edit Dynamic Params** window is displayed.
2. In the **Edit Dynamic Params** window, modify the values as required.
3. Click **Save**.
The modified parameters are applied to the Batch.

Accessing Scheduler optional parameters inside MMG studio model paragraphs

The Scheduler Service automates the running of models in the MMG application. The Scheduler Service contains a graphical user interface and a single control point for defining and monitoring background executions.

For more details on the Scheduler service, see [Scheduler Service](#) section.

To access the optional parameters passed from the **Scheduler** during execution of any models, run the following script:

To print

```
print('BATCHRUNID value is : ${BATCHRUNID$}')  
print('TASKID value is : ${TASKID$}')  
print('FICMISDATE value is : ${FICMISDATE$}')
```

To access the optional parameters passed during execution of any models, run the following scripts:

```
%python  
print('threshold value is : ${threshold}')
```

NOTE Threshold is the optional parameter passed during the model execution.

8.1.4.7 Task Definitions of a Batch Group

You can modify the task definition state in the Batch Execution window to exclude or hold the defined task in a Batch from execution. The excluded tasks are therefore assumed to have completed execution and get excluded during the Batch Run.

While executing or scheduling a batch group from the *Schedule Batch* window, you can:

- [Exclude a task or include the excluded task](#)
- [Hold a task or release the held task.](#)

8.1.4.7.1 Exclude or Include Tasks

You can exclude tasks or include the excluded tasks during Batch Group Execution. The excluded task components are therefore executed in the normal process assuming that the excluded task have completed execution.




To exclude/include tasks, perform the following steps:

1. In the Schedule Batch window, click **Exclude Tasks**.

The **Select Tasks** window is displayed.

2. To exclude tasks:





- a. Select the required task from the **Included Tasks** list and click . You can press Ctrl key for multiple selections.

- b. To exclude all tasks, click .
3. To include the excluded tasks:
 - a. Select the required task from the **Excluded Tasks** list and click . You can press Ctrl key for multiple selections.
 - b. To include all excluded tasks, click .
4. Click **Save**.

8.1.4.7.2 Hold or Release Tasks

You can hold tasks or release the held tasks during Batch Group Execution. The tasks which are on hold along with the defined components are skipped during execution. However, at least one task should be available in a Batch without being held or excluded for Batch execution.

To hold/release tasks, perform the following steps:

1. In the **Schedule Batch** window, click **Hold Tasks**.
The **Select Tasks** window is displayed.
2. To hold tasks:
 - a. Select the required task from the *Released Tasks* list and click . You can press Ctrl key for multiple selections.
 - b. To hold all tasks, click .
3. To release held tasks:
 - a. Select the required task from the *Held Tasks* list and click . You can press Ctrl key for multiple selections.
 - b. To release all held tasks, click .
4. Click **Save**.

8.1.5 Monitor Batch or Batch Groups

Use the Monitor Batch feature to view the status of executed batch/batch group along with the task's details. You can track the issues if any, on regular intervals and ensure smoother batch/batch group execution. A visual representation as well as tabular view of the status of each task in the batch/batch group is available.

You can monitor operations for batches and batch groups using the **Monitor Batch** feature.

To monitor a batch/batch group:

1. Click **Monitor Batch** from the Header panel.
The **Monitor** window is displayed.
2. Select the batch/batch group from the **Select** drop-down and then select the **Batch Run ID** from the **Run ID** list.
3. Click **Start Monitor**.
The result is displayed in **Visualization** and **List View** tabs.
 - On the Visualization tab are charts and in List View are details in a tabular format with the following details:
 - i. **Batch Status:** Displays the batch status—NOT-STARTED, ON-GOING, SUCCESSFUL, FAILED, INTERRUPTED, EXCLUDED, HELD, and UNDEFINED.
 - ii. **Batch Start Time:** The batch start time.
 - iii. **Batch End Time:** The batch end time.
 - iv. **Task Details:** Mouseover the task to display task status and additional details.
 - v. **More Information:** The message returned by the Rest Service.
4. Select **Stop Monitor** if you wish to stop monitoring. You can also specify the Start and Stop Monitor options along with refresh interval by providing the Refresh every seconds and minutes information.

NOTE

- You can select the refresh interval and the duration of the auto refresh. The default refresh interval is 5 seconds and default duration 5 minutes. That is, data is refreshed every 5 seconds for the next 5 minutes.
- The interval input range must be between 5 to 60 seconds and the duration input range between 5 to 180 minutes.
- You can use the **Stop Monitor** button to stop the auto refresh.

5. To restart, rerun, or interrupt the monitoring, select the Restart, Rerun, or Interrupt buttons respectively.
6. To view log information, click the log icon in the **List View** tab.
The Log Viewer window appears displaying the log details.
7. Click the download icon to download the log, or click the close icon to close the log viewer.

8.1.5.1 Batch Group

Batch Group is a process of grouping the batches that are required to be execute together for execution of the Date and time-based background tasks based on a defined period during which the resources were available for batch processing.

To monitor a batch group, perform the following steps:

1. Click **Monitor Batch** from the Header panel.
The **Monitor** window is displayed.

2. Select the **Batch Group** from the **Select** drop-down and then select the **Batch Run ID** from the Run ID drop-down.
3. Click Start Monitor.

The result is displayed in Visualization and List View tabs. Details of these tabs are as follows:

- The Visualization tab displays the details in the form of a chart represented with the following details:
 - i. Batch Status: Displays the batch status, the different batch status are NOT-STARTED, ON-GOING, SUCCESSFUL, FAILED, INTERRUPTED, EXCLUDED, HELD, and UNDEFINED.
 - ii. Batch Start Time: Displays the batch start time details.
 - iii. Batch End Time: Displays the batch end time details.
 - iv. Batch Details: Mouseover the task to display its status and details.
 - The **List View** tab displays the details in a tabular form with the following details:
 - i. Batch Status: Displays the batch status, the different batch status are NOT-STARTED, ON-GOING, SUCCESSFUL, FAILED, INTERRUPTED, EXCLUDED, HELD, and UNDEFINED.
 - ii. Batch Start Time: Displays the batch start time details.
 - iii. Batch End Time: Displays the batch end time details.
 - iv. Batch Details: Mouseover the task to display its status and details.
 - v. More Information: The message returned by the Rest Service.
4. If you wish to stop the monitoring, select Stop Monitor. You can also specify the Start and Stop Monitor options along with refresh interval in the Refresh every seconds and minutes fields.

NOTE

- You can select the refresh interval and the duration for the auto refresh. The refresh interval is defaulted to 5 seconds and duration is defaulted to 5 minutes. That is the refresh happens every 5 seconds for next 5 minutes.
- Range of interval input must be between 5 to 60 seconds and range of duration.
- Input should be between 5 to 180 minutes.
- You can use the Stop Monitor button to stop the auto refresh.

5. To restart the Batch Group, select Restart .

6. To rerun the Batch Group, select Rerun .

7. To interrupt the Batch Group, select Interrupt .

To view the log information about the batch group, click View Log in the List View tab

8.1.6 External Interface Component Scheduler Service

Use the **EICSchedulerService.sh** utility located in the `<installed path> mmg-home/bin` folder to perform basic scheduler operations.

Prerequisites:

- Ensure public and private keys are present in the `conf` folder and the corresponding path is present in `application.properties` of mmg UI service.
- You should be aware of the `clientId/secret` which will be used for basic authentication. (Currently, these values are stored in `application.properties` as `token.clientid` and `token.secret`).

Table: List of possible flagged arguments to be passed while executing EICSchedulerService.sh

Flag	Description	Comments
-o	Operation Type: The operation the user wants to perform.	A mandatory argument for all type of requests. Possible Values are: 1 – To trigger an object 2 – To get the current status of a run. 3 – To re-start an execution. 4 – To re-run an execution. 5 – To interrupt an execution.
-u	ofs_remote_user	A mandatory argument for all the type of requests
-w	Workspace Id	A mandatory argument for all the type of requests
-c	Client Id for authentication	A mandatory argument for all the type of requests Currently, in <code>mmg-ui</code> <code>application.properties</code> the parameter <code>token.clientid</code> is set to <code>ofsuser</code>
-s	Client Secret for authentication	A mandatory argument for all the type of requests Currently, in <code>mmg-ui</code> <code>application.properties</code> the parameter <code>token.secret</code> is set to <code>secret</code>
-b	Object Name	Batch or Batch Group Name.
-t	Object Type	For Batch, it is set to <code>rest</code> and for Batch Group, it is set to <code>group</code> .
-r	Batch Execution Id	Execution ID of the Batch or Batch Group.
-x	External Unique Id	The unique ID for every execution. Mandatory for execute and rerun operations.
-i	Included Jobs	In case of trigger, included jobs can be provided as comma separated values using this flag.
-e	Excluded Jobs	In case of trigger, excluded jobs can be provided as comma separated values using this flag.
-h	Held Jobs	In case of trigger, held jobs can be provided as comma separated values using this flag.

Table: List of possible exit codes returned by “EICSchedulerService.sh

Exit Code	Description
0	Success
-1	Failure/Failed
-2	Interrupted
1	Not Started
2	Ongoing
4	Excluded
5	Held
-3	Object does not exist.
-4	Invalid arguments passed in request/not enough parameters in Request body.
-6	No executable job present.
-7	Job already interrupted.
-9	Duplicate External Unique ID.
-10	Unable to connect to scheduler.

Sample commands to perform Scheduler Operations

- **Trigger/Execute**

Execute batch “batch1”:

Syntax:

`./EICSchedulerService.sh -o 1 -u < ofs_remote_user > --w < Workspace Id > --c < Client Id for authentication > --s < Client Secret for authentication > --x < External Unique Id > --b < Object Name > --t < Object Type >`

Example:

`./EICSchedulerService.sh -o 1 -u scheduser -w WS1 -c ofsuser -s secret -x batch1_1001 -b batch1 -t rests`

Execute batch “batch1” with “task1” and “task2” included:

Syntax:

`./EICSchedulerService.sh -o 1 -u < ofs_remote_user > --w < Workspace Id > --c < Client Id for authentication > --s < Client Secret for authentication > --x < External Unique Id > --b < Object Name > --t < Object Type > --I < Included Jobs with comma separated values >`

Example:

`./EICSchedulerService.sh -o 1 -u scheduser -w WS1 -c ofsuser -s secret -x batch1_1001 -b batch1 -t rest -i task1,task2`

Execute batch “batch1” with “task1” as excluded and “task2” as held:**Syntax:**

```
./EICSchedulerService.sh -o 1 -u < ofs_remote_user > --w < Workspace Id > --c < Client Id for authentication > --s < Client Secret for authentication > --x < External Unique Id > --b < Object Name > --t < Object Type > --e < Excluded Jobs > --h < Held Jobs >
```

Example:

```
./EICSchedulerService.sh -o 1 -u scheduser -w WS1 -c ofsauser -s secret -x batch1_1001 -b batch1 -t rest -e task1 -h task2
```

- **Status**

Get status of execution having runid = MMG_R1_2022-09-07_1662557327886_1:**Syntax:**

```
./EICSchedulerService.sh -o 2 -u < ofs_remote_user > --w < Workspace Id > --c < Client Id for authentication > --s < Client Secret for authentication > --r < Batch Execution Id >
```

Example:

```
./EICSchedulerService.sh -o 2 -u scheduser -w WS1 -c ofsauser -s secret -r MMG_R1_2022-09-07_1662557327886_1
```

- **Re-Start**

Restart execution for batch “MMG_R1” having runid = MMG_R1_2022-09-07_1662557327886_1:

Syntax:

```
./EICSchedulerService.sh -o 3-u < ofs_remote_user > --w < Workspace Id > --c < Client Id for authentication > --s < Client Secret for authentication > --b < Object Name> --r < Batch Execution Id>
```

Example:

```
./EICSchedulerService.sh -o 3 -u scheduser -w WS1 -c ofsaurer -s secret -b MMG_R1 -r MMG_R1_2022-09-07_1662557327886_1
```

- **Re-Run**

Rerun execution for batch “batch1” having runid = batch1 -r batch1_2022-09-01_1662011065557_1:

Syntax:

```
./EICSchedulerService.sh -o 4-u < ofs_remote_user > --w < Workspace Id > --c < Client Id for authentication > --s < Client Secret for authentication > --x < External Unique Id > --b < Object Name> --r < Batch Execution Id>
```

Example:

```
./EICSchedulerService.sh -o 4 -u scheduser -w WS1 -c ofsaurer -s secret -x batch1_1002 -b batch1 -r batch1_2022-09-01_1662011065557_1
```

- **Interrupt**

Interrupt execution for batch “batch1” having runid = batch1_2022-09-07_1662530601924_1:

Syntax:

```
./EICSchedulerService.sh -o 5-u < ofs_remote_user > --w < Workspace Id > --c < Client Id for authentication > --s < Client Secret for authentication > --b < Object Name> --r < Batch Execution Id>
```

Example:

```
./EICSchedulerService.sh -o 5 -u scheduser -w WS1 -c ofsaurer -s secret -b batch1 -r batch1_2022-09-07_1662530601924_1
```

NOTE

- On successful request for execute/rerun, the batchrunid corresponding to external unique id will be stored in the AAICL_SS_EXT_BATCH_RUN_ID_MAPPING table.
- External Unique ID is required only in case of execute/rerun request.

9 More

More feature covers the following:

- **Export Objects:** Utilize Object Migration feature to efficiently export and save objects.
- **Import Objects:** Import previously exported objects into the system.
- **Model Actions:** Review and approve model deployments in bulk.
- **Audit Trail:** Monitor all system activities and changes.
- **Data Pipelines:** Create and manage data pipelines for efficient data flow and processing.

9.1 Object Migration

Object Migration is the process of migrating or moving objects between environments.

You may want to migrate objects for reasons such as managing global deployments on multiple environments or creating multiple environments so that you can separate the development, testing, and production processes.


Prerequisites to Migrating Objects

In order to migrate objects, users must be mapped to the **Object Migration Admin Group**.

NOTE

Identity Administrator Group users cannot migrate objects if they are not mapped to the **Object Migration Admin Group**.

Migration Object Types



You can migrate (import/export) the following object types by clicking the Object Migration  icon on the left menu.

- **Schedule:** Provides the instruction to schedule the execution of defined processes. When a schedule is migrated, the associated batch is also migrated.
- **Batch:** A group of jobs that are scheduled to automatically execute at a preset interval of time without any user intervention. When a batch is migrated, the batch and the associated pipeline information are also migrated
- **Batch Group:** A set of individual batches are consolidated to form a single Batch Group. When you migrate a batch group all the batches, tasks, and pipeline information associated with that batch group are also migrated
- **Pipeline:** A pipeline is an embedded data processing engine that filters, transforms, and migrates data on-the-fly. Pipelines consist of a set of data processing elements called widgets connected in series, where the output of one widget is the input to the next element.
- **Threshold:** The threshold limit associated with values of set variables for scenarios in FCCM Cloud Service. These threshold values are set when scenarios are created or installed and can be changed, if required.













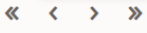
- **Job:** Jobs provide a set of instructions to execute Workflow Pipelines, based on the set threshold values.
- **PMF Process:** PMF Processes are defined to sequence the Workflow Pipelines, the applications, and to design the artifacts that participate in the pipelines, to implement the pipelines. When exporting a PMF Process, dependent metadata such as data fields, transition rules associated with the PMF process are taken care of.
- **Roles:** Roles are used to map functions to a defined set of groups to ensure user access system security.
- **Groups:** Groups are used to map Roles. Specific User Groups can perform only a set of functions associated with that group.

9.1.1 Export Objects

To access the Object Export Summary page:

1. Click **Launch Workspace**  to launch the workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click the Object Migration  icon and select **Export Objects**.

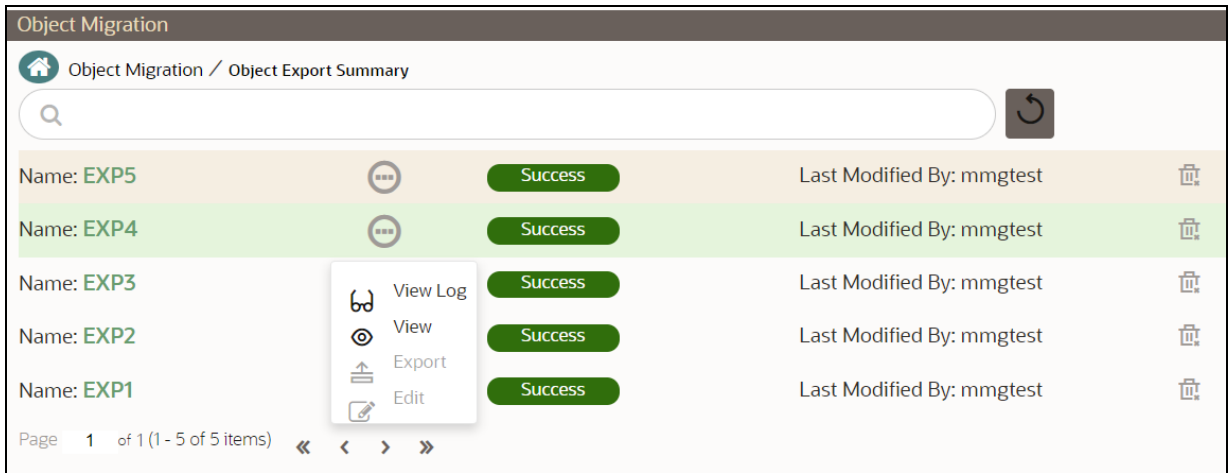
The Object Export Summary page containing the records is displayed with the following details.

Object Migration				
Object Migration / Object Export Summary				
<input type="text"/>				
Name: EXP5		Success	Last Modified By: mmgtest	
Name: EXP4		Success	Last Modified By: mmgtest	
Name: EXP3	 View Log  View  Export  Edit	Success	Last Modified By: mmgtest	
Name: EXP2		Success	Last Modified By: mmgtest	
Name: EXP1		Success	Last Modified By: mmgtest	
Page 1 of 1 (1 - 5 of 5 items) 				

- **Name:** The unique migration name assigned to the collection when the migration definition was created.
- **Object Migration Status:** The migration status of the record corresponding to the specified Definition Name. The three migration status values are:
 - **Success** - Set when the object export is completed successfully.
 - **Saved** - Set when the migration definition is ready for export and needs to import.
 - **Failed** - Set when the migration definition is not exported successfully.
- **Last Modified By:** The ID of the user who last modified the record.

9.1.1.1 Search Objects to Export

To search for a specific migration definition, type the first few letters of the user name that you want to search in the **Search** box and click the search icon.



Use the controls at the bottom of the page, to set the number of entries displayed per page and to navigate between pages.

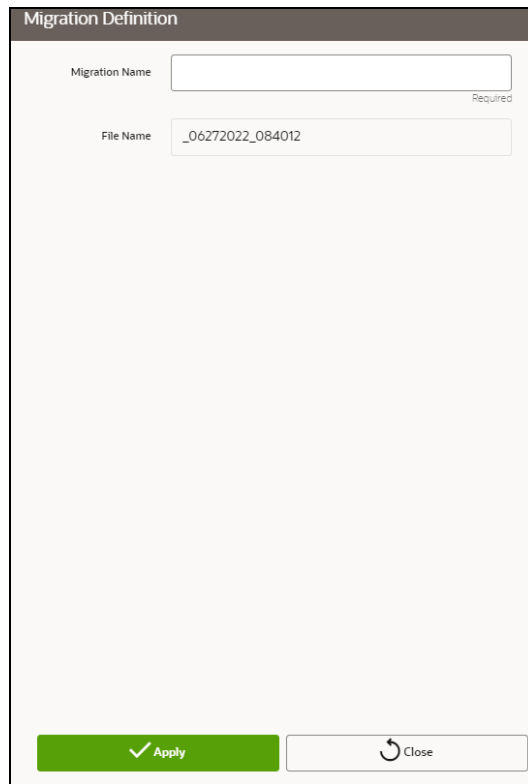
9.1.1.2 Create Migration Export Object Definitions

You can create Migration Export object definitions for the following object types.

- Batch Group
- Threshold
- PMF Process
- Batch
- Pipeline
- Schedule
- Job

To create a definition for export of objects to be migrated:

1. Click **Add**  in the **Object Export Summary** page to display the **Migration Definition Window**.



The screenshot shows a 'Migration Definition' dialog box. It has a title bar at the top. Below the title bar, there are two input fields. The first is labeled 'Migration Name' and has a 'Required' label to its right. The second is labeled 'File Name' and contains the text '_06272022_084012'. At the bottom of the dialog, there are two buttons: a green 'Apply' button with a checkmark icon and a 'Close' button with a circular arrow icon.


2. Enter the following details:
 - **Migration Name:** Enter the code of the export of objects to be migrated definition.
This is a unique identifier.
 - **File Name:** The system auto-creates the file name of the objects that can be used to export the definition in the following format:
 - **For Business Objects:** Migration Name_BO_Time Stamp (MMDDYYYY HHMMSS)
 - **For Identity Objects:** Migration Name_IDM_Time Stamp (MMDDYYYY HHMMYY)
3. Click **Apply** to save the details.
The Object Selection page is displayed.
4. Select the required **Object Type**.
The object types listed are: Schedule, Batch group, Batch, Pipeline, Threshold, Job and PMF process. For more information about the object types, refer [Migration Object Types](#)
Use the search field to locate items quickly.
The list of objects is displayed.
5. Select the objects to be added to the Migration Definition.
The selected objects are added to the respective object type branch.
6. Click **Save** to create the Migration Definition.
A confirmation message is displayed.

The new migration definition is listed in the Object Export Summary page and the status is set to Saved.

NOTE If the migration definition object is not created successfully and the status is set to Failed, contact [My Oracle Support](#).

9.1.1.3 View Migration Objects to be Exported

You can view and edit migration objects from the **Object Export Summary** Page.

To view the list of migration export objects associated with a migration definition, highlight the migration definition and click  .


You can:

Field	Description
View Log	View the migration log details of the selected migration definition. For more information, refer to View Log of Migration Export Objects .
View	View object details of a migration definition. Click an object to view more details. For more information, refer to Viewing Export Migration Object Details .
Export	Click Export to initiate Object Migration (Export) for a specific migration definition. When the migration is completed, the status will change from Saved to Success. For more information, refer to Exporting Migration Objects .
Edit	Click Edit to view and edit the objects linked to a migration definition. For more information, refer to Editing Migration Export Definitions .

9.1.1.3.1 View Log of Migration Objects Exported

Logs provide information of the definition for export of objects to be migrated along with their status.

To view the log details of object whose migration status is Success or Failed:

1. Highlight the migration definition and click  and select **View Log**.
The View Log page is displayed.

The status of the export migration is displayed with the following details.

Field	Description
Object Migration ID	The migration ID associated with the export object.
Object Type	The object type of the export object.
Object Code	The object code associated with the export object.
Creation Date	The date of creation of the export object.
Created By	The User ID of the user who created the export object.


Field	Description
Status	<p>The migration status of the export object.</p> <ul style="list-style-type: none"> • Success - Indicates that the export migration was completed successfully. • Failed - Indicates that the export migration did not complete.

NOTE The View Log page for a migration object in the Saved status will be empty.

2. Click **OK** to close the window.


9.1.1.3.2 View Details of Exported Migration Objects

To view the list of objects added to a specific Migration Definition:

1. Highlight the migration definition and click  and select **View**.
The list of migration objects added to the definition is displayed.
2. Double-click an object to view the object attribute details.

9.1.1.4 Export Migration Objects

To export the list of objects added to a specific Migration Definition:


1. Highlight the migration definition and click  and select **Export**.
The status is indicated as either Success or Failed.

NOTE Use Object Migration (export) to export a set of objects within the same setup or across different setups.

9.1.1.5 Edit Exported Migration Definitions

You can edit the migration export objects that are not exported and whose status is either Saved or Failed. If the object is already exported and the status is set to Success, you cannot edit the object details.

To edit a record of the definition of export of objects to be migrated, follow these steps. You can add more objects to export or remove existing objects.

1. Highlight the migration definition and click the **Menu** button  and select **Edit**.
The **Object Selection** window is displayed.
2. Update the required details.
3. In the **Object Selection** window, select the required object type from the **Object Types** list.
The object types listed for the System Configuration tab are, Batch_Group, PMF_Process, Batch and Schedule. For more information about the object types, refer [Migration Object Types](#).

You can also enter the first few letters in the Search field to add a particular object from a selected Object type.

The list of objects is displayed.

4. Select the objects to be added or deleted from the Migration Definition.

The selected objects are added/deleted from the respective object type branch.

5. Click **Save**.

A confirmation message is displayed, when the definition is saved successfully.

The edited migration definition is listed in the Object Export Summary page and the status is set to Saved.

6. Click **Save** to update the changes.



9.1.1.6 Delete Exported Migration Definitions

You can only delete records in the Saved or Failed state; records in Success state cannot be deleted.

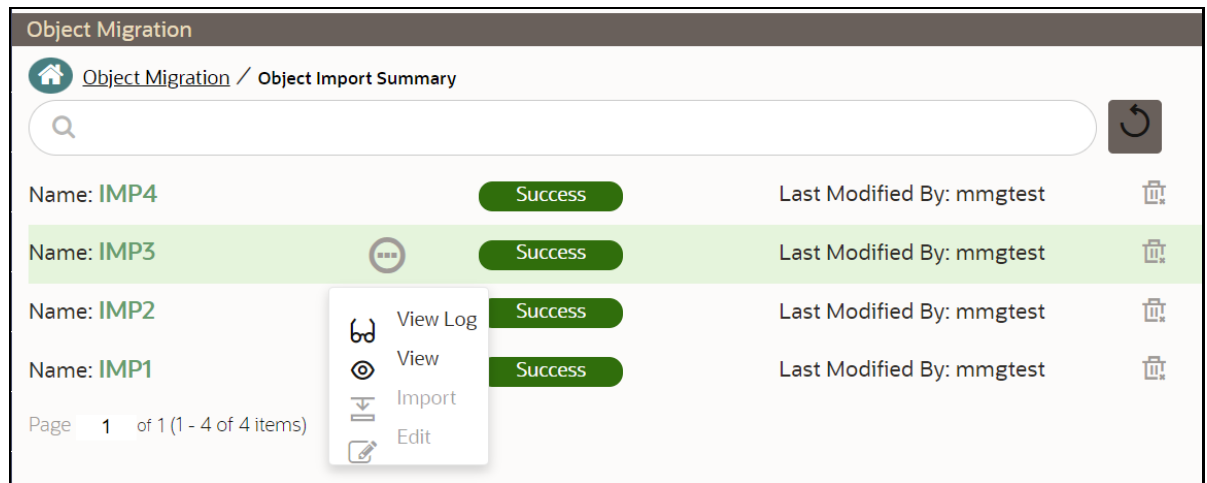
To delete a migrate export object definition, highlight the record to be deleted and click the delete button. Click **Yes** to confirm and proceed with the deletion.

9.1.2 Import Objects

To access the Object Import Summary page:

1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click the Object Migration  icon and select **Import Objects**.

The Object Import Summary page containing the records is displayed with the following details.

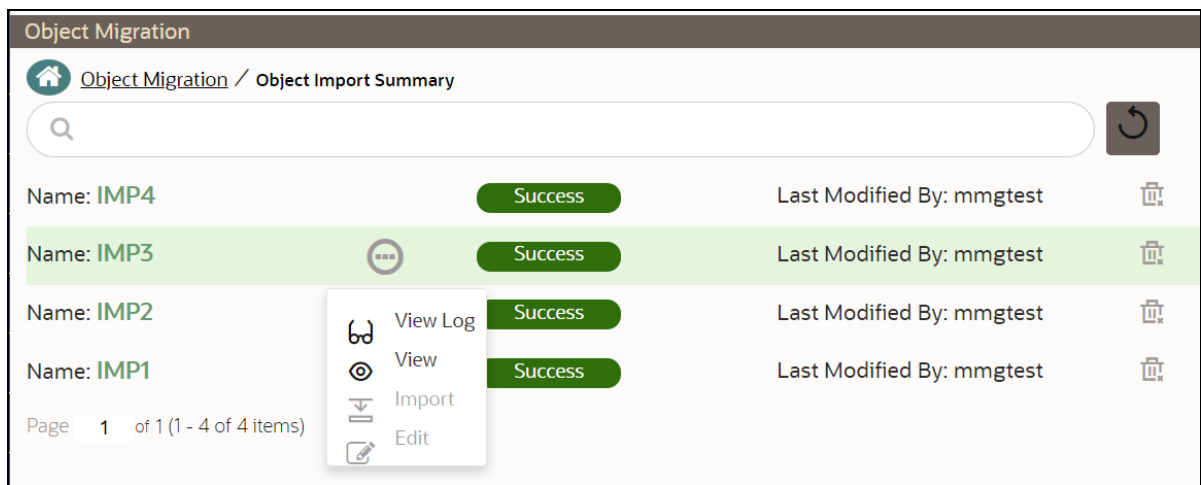


- **Name:** The unique migration name assigned to the collection when the migration definition was created.

- **Object Migration Status:** The migration status of the record corresponding to the specified Definition Name. The three migration status values are as follows:
 - **Success** - Set to Success, when the object import is completed successfully.
 - **Saved** - Set to Saved, when the migration definition is ready for import and needs to import.
 - **Failed** - Set to failed, when the migration definition is not imported successfully.
- **Last Modified By:** The ID of the Last Modified by user who has modified the record.

9.1.2.1 Search Objects to Import

To search for a specific migration definition, type the first few letters of the user name that you want to search in the **Search** box and click the search icon. The search results display the names that consist of your search string.



At the bottom of the page, you have controls to navigate the search entries and also specify the number of entries available on a single page.

9.1.2.2 Create Migration Import Object Definitions

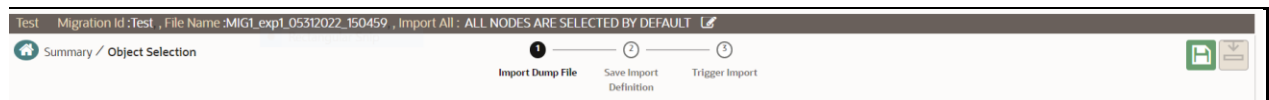
You can create Migration Import object definitions for the following object types.

- Batch Group
- Threshold
- PMF Process
- Batch
- Pipeline
- Schedule
- Job

To create a definition for import of objects to be migrated:

1. Click **Add**  in the **Object Import Summary** page to display the **Migration Definition Window**.

2. In the **Migration Definition** window, enter the following details:
 - **ID:** Enter a valid name for the new migration import definition. This is a unique identifier.
 - **Dump File:** Select the dump file to be utilized for creating the migration import definition.
3. **Import All:** Select an option to import the nodes that are associated with the selected object type. You can edit this option if required, in the **Object Selection** page.




- **Yes** - Imports all the nodes that are included in the dump file.
 - **No** - Imports only those nodes that you can select in the **Object Selection** page.
4. **Fail on Error:** Select an option to proceed with the definition creation in case of an error. You can edit this option if required, in the **Object Selection** page.
 - **Yes** - Stops the creation process, if error is generated
 - **No** - Creates the import definition even when error is generated. The node with the error is not included in the object creation.
 5. **Overwrite:** Select an option to overwrite the existing definition file. You can edit this option if required, in the **Object Selection** page.

- **Yes** - Replaces the existing import definition.
 - **No** - Creates a new import definition.
6. Click **Apply** to save the details.
The **Object Selection** page is displayed.
 7. In the **Object Selection** page, click **Add Members**, to add objects associated with specific object types.
 8. In the **Object Selection** page, select the required **Object Type** from the **Object Types** list.
The object types listed are Schedule, Batch group, Batch, Pipeline, Threshold, Job and PMF process. For more information about the object types, refer [Migration Object Types](#).
You can also enter the first few letters in **Search** to add a particular object from a selected Object type.
The list of objects is displayed.
 9. Select the objects to be added to the Migration Definition.
You can select the objects only if you select **No** for **Import All**.
The selected objects are added to the respective object type branch.
 10. Click **Save**.
A confirmation message is displayed, when the definition is saved successfully.
The new migration definition is listed in the Object Import Summary page and the status is set to **Saved**.

NOTE If the migration definition object is not created successfully and the status is set to Failed. Contact [My Oracle Support](#) of more information.

9.1.2.3 View Migration Objects to be Imported

You can view and edit the migration objects from the **Object Import Summary** page.

To view the list of migration export objects associated with a migration definition, highlight the migration definition and click **Menu** button  .


The following options are displayed.

Field	Description
View Log	View the migration log details of the selected Migration Definition. For more information, refer to View Log of Migration Import Objects .
View	View the Object Details for a specific Migration Definition. Click an object to view more details. For more information, refer to Viewing Import Migration Object Details .

Field	Description
Import	Click Import to initiate Object Migration (Import) for a specific Migration Definition. When the migration is completed, the status will change from Saved to Success . For more information, refer to Importing Migration Objects .
Edit	Click Edit to view and edit the objects linked to a Migration Definition. For more information, refer to Editing Migration Import Definitions .

9.1.2.3.1 View Log of Migration Objects Imported

To view the log information of a record of the definition for import of objects to be migrated, follow these steps. The view log facilitates you to view the log information of the definition for import of objects to be migrated with its status.

1. Highlight the migration definition and click **Menu** button  and select **View Log**.

The View Log Page is displayed.

The export migration status with the following details is displayed.

Field	Description
Object Migration ID	The migration ID associated with the export object.
Object Type	The object type of the export object.
Object Code	The object code associated with the export object.
Creation Date	The date of creation of the export object.
Created By	The User Id of the User who created the export object.
Status	The migration status of the export object. <ul style="list-style-type: none"> • Success - Indicates that the export migration was completed successfully. • Failed - Indicates that the export migration did not complete


NOTE

The View Log Page for a migration object with status Saved will be empty

2. Click **OK** to close the window.

9.1.2.3.2 View Details of Imported Migration Objects

To view the list of objects added to a specific Migration Definition:


1. Highlight the migration definition and click **Menu** button  and select **View**.

The list of migration objects added to the definition is displayed.

2. Double-click an object to view the object attribute details.

9.1.2.4 Import Migration Objects

To import the list of objects added to a specific Migration Definition:

1. Highlight the migration definition and click **Menu** button  and select **Import**.

After you export, the following types of status are displayed:

- **Success** - When the object is migrated successfully
- **Failed** - When the object migration didn't complete.

NOTE

Object Migration (import) facilitates you to import a set of objects within the same setup or across different setups

9.1.2.5 Edit Imported Migration Definitions

You can edit the migration objects that are not imported and whose status is Saved or Failed. However, you cannot edit object details of objects already imported and whose status is set to Success.

To edit the imported migration definitions, follow these steps. You can add more objects to import or remove existing objects.

1. Highlight the migration definition and click **Menu** button  and select **Edit**.

The Object Selection window is displayed.

2. Update the required details.

3. In the Object Selection window, select the required object type from the **Object Types** list.

The object types listed for the System Configuration tab are, Batch_Group, PMF_Process, Batch and Schedule. For more information about the object types, refer [Migration Object Types](#).

You can also enter the first few letters in the Search field to add a particular object from a selected Object type.

The list of objects is displayed.

4. Select the objects to be added or deleted from the Migration Definition.

The selected objects are added/deleted to the respective object type branch.

5. Click **Save**.

A confirmation message is displayed, when the definition is saved successfully.


The edited migration definition is listed in the Object Export Summary Page and the status is set to Saved.

6. Click **Save**.

9.1.2.6 Delete Imported Migration Object Definitions

You can only delete records in the Saved or Failed state; records in Success state cannot be deleted.



To delete an imported migration object definition:

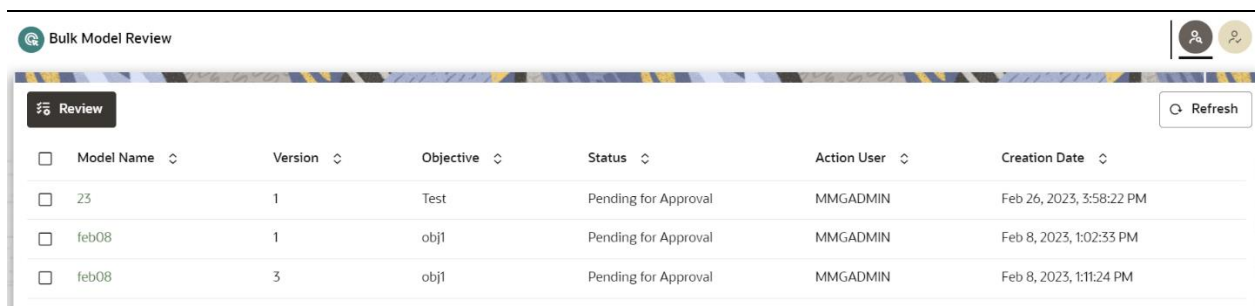
1. Highlight the record to be deleted and click the **Delete**  button.
2. Click **Yes** to confirm and proceed with the deletion.

9.2 Model Actions

Use the Model Actions feature to view the list of models which requires review or approval across the workspace.

For example, when model users send models for review or approval, the Model Actions window displays the list of models to be reviewed or approved. You can review them before deployment or take actions on multiple models simultaneously, such as making multiple models champion locally or globally, and so on.

1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.
2. Click **Model Actions**  to view the list models pending an action such as approval.



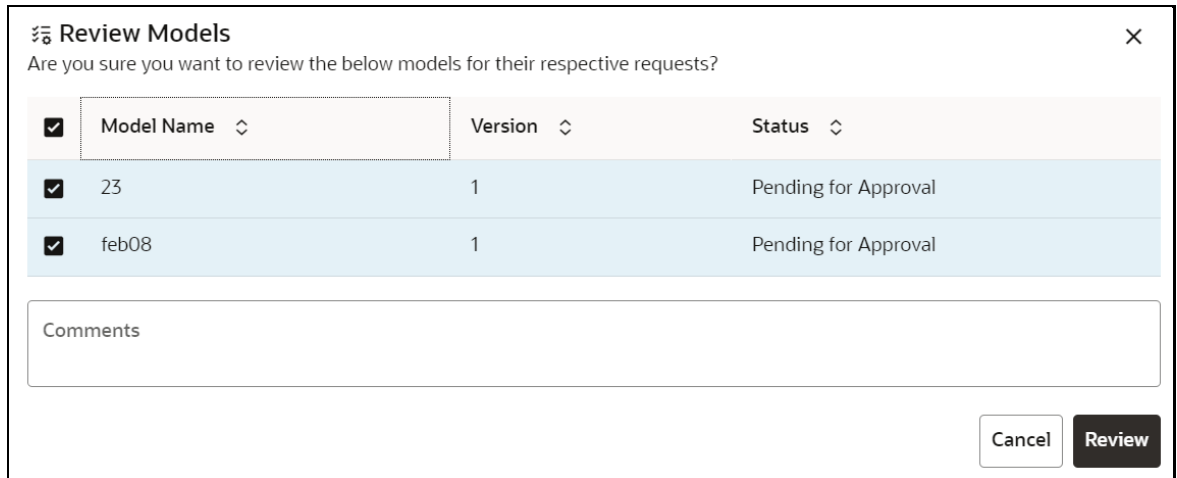
The screenshot shows the 'Bulk Model Review' window. At the top left, there is a 'Review' button with a filter icon. At the top right, there is a 'Refresh' button. The main content is a table with the following columns: Model Name, Version, Objective, Status, Action User, and Creation Date. There are three rows of data, each with a checkbox in the first column.

<input type="checkbox"/>	Model Name	Version	Objective	Status	Action User	Creation Date
<input type="checkbox"/>	23	1	Test	Pending for Approval	MMGADMIN	Feb 26, 2023, 3:58:22 PM
<input type="checkbox"/>	feb08	1	obj1	Pending for Approval	MMGADMIN	Feb 8, 2023, 1:02:33 PM
<input type="checkbox"/>	feb08	3	obj1	Pending for Approval	MMGADMIN	Feb 8, 2023, 1:11:24 PM

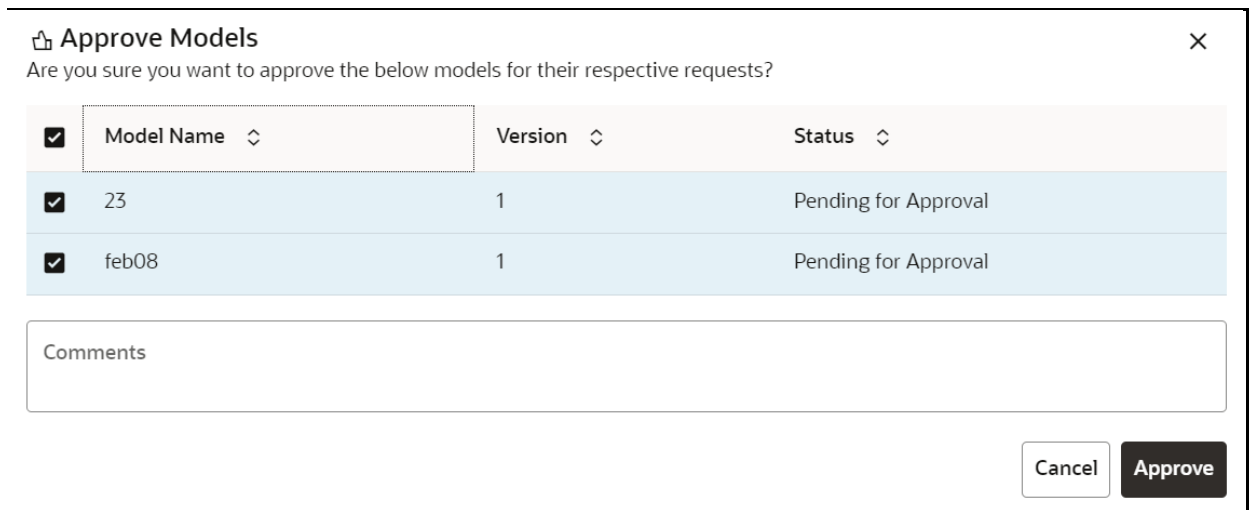
If you are a reviewer, the Review Models screen is displayed while if you are an approver, the Approve Models screen is displayed. You can toggle the views using the Reviewer and Approver icons in the screen header.

3. To review the model:
 - a. Select the Model using the corresponding check box and click **Review**.
 - b. Enter **Comments**, if any, and click **Review**.

Figure 54: Review Models window



4. To approve or reject models:
 - a. To approve or reject a model: Select the model you want to approve or reject. Click **Approve** or **Reject**, respectively.
 - b. Enter Comments, if any, and click **Approve** or **Reject**.




9.3 Audit Trail

At any time, you can audit the models from the Audit Trail window. The Audit Trail window provides the complete details of model. This shows the information such as, when Model was created, who created the Model, workflow of Model, for example when this Model became champion or deployed, and so on.

The sequence of actions performed in the model lifecycle is listed in the table view and the timeline view (graphical representation).

To audit models:

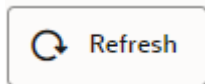
1. Click **Launch Workspace**  next to corresponding Workspace to Launch Workspace to display the **MMG Dashboard** window with application configuration and model creation menu.

- In the Mega menu, click **More > Audit Trail** to view the time of the various actions performed on the model in the **Audit Trail** window.

Figure 55: Audit Trail Window

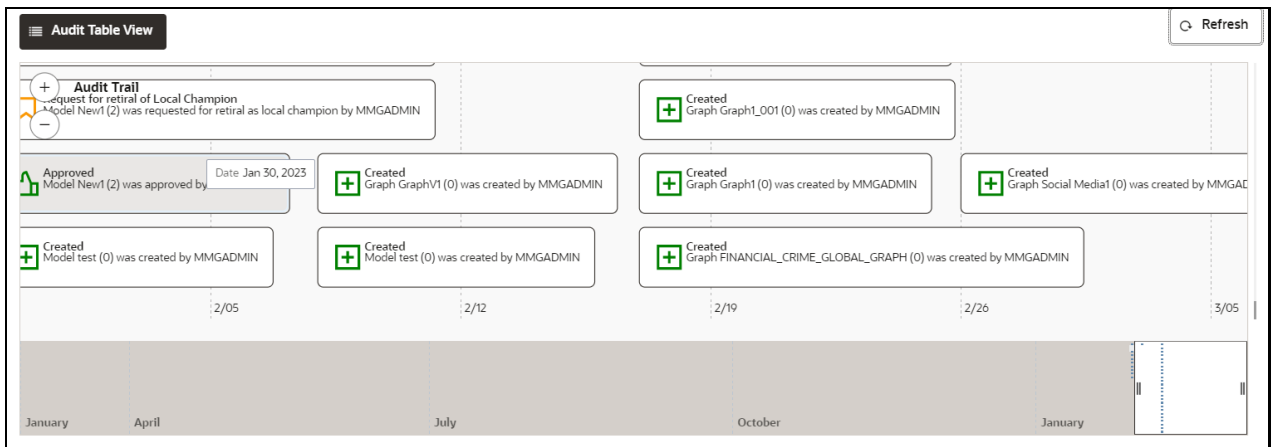
Status	Type	Name	User	Comments	Time
Created	Graph	Social Media1	MMGADMIN	Graph Social Media1 (0) was cr... Graph Social Media1 (0) was created by MMGADMIN	Feb 27, 2023, 12:04:22 AM
Created	Model	NewDraft	MMGADMIN	Model NewDraft (2) was created... Model NewDraft (2) was created by MMGADMIN	Feb 26, 2023, 9:04:17 PM
Created	Model	NewDraft	MMGADMIN	Model NewDraft (1) was created... Model NewDraft (1) was created by MMGADMIN	Feb 26, 2023, 9:03:56 PM
Created	Model	NewDraft	MMGADMIN	Model NewDraft (0) was created... Model NewDraft (0) was created by MMGADMIN	Feb 26, 2023, 9:03:55 PM
Approved	Model	testFeb20	MMGADMIN	Model testFeb20 (2) was approv... Model testFeb20 (2) was approved by MMGADMIN	Feb 26, 2023, 8:46:37 PM

- Click **Audit Timeline View** for Timeline View. Click **Audit Table View** to switch to the regular view.



Click  to refresh the Audit Trail window.

Figure 56: Audit Trail Window Timeline View with Horizontal Time Axis



10 Appendix -I

All the listed APIs/Functions can be utilized by users in Model Pipelines.

Table: Python paragraph scripting

API Type	Functionality	Prerequisite	Notebook Execution Script	Notebook Script Input	Minimum Supported Version
Set User	Set the user for a session		<pre>%python from mmg.constants import * user = "SAUSER" set_user(user)</pre>	user - username to be set	8.1.1
Get User	Get the user that has been set	Set User	<pre>%python from mmg.constants import * get_user()</pre>		8.1.1
Attach Workspace	Attach the workspace for a session		<pre>%python from mmg.workspace import attach_workspace workspace = "CS" attach_workspace(workspace)</pre>	workspace-workspace to be attached	8.1.1
Get Workspace	Get the workspace that has been attached	Attach Workspace	<pre>%python from mmg.workspace import get_workspace get_workspace()</pre>		8.1.1
List Workspaces	Lists all workspaces available to a user	Set User	<pre>%python from mmg.workspace import list_workspaces list_workspaces()</pre>		8.1.1
Check AIF	Check if AIF is set or not	Set User	<pre>%python from mmg.workspace import check_aif check_aif()</pre>		8.1.1
List All Data Sources	List all data sources available in a workspace for a set user. The default workspace chosen is the one that is attached.	Set User, Attach Workspace	<pre>%python from mmg.workspace import list_datasources list_datasources(order=None)</pre>	order - None ensures that all the data sources will be listed for the attached workspace	8.1.1

API Type	Functionality	Prerequisite	Notebook Execution Script	Notebook Script Input	Minimum Supported Version
List All Data Sources of Workspace	List all Data Sources of a specific Workspace that is not the attached workspace for a set user.	Set User	<pre>%python from mmg.workspace import list_datasources workspace="HELLO NEW" list_datasources(workspace,order=None)</pre>	workspace - Name of workspace for which data sources should be listed order - None ensures that ALL data sources will be listed for that workspace	8.1.1
Fetch First Order Data Source	This method will fetch the data source related to attached workspace with default order 1.	Set User, Attach Workspace	<pre>%python from mmg.workspace import list_datasources list_datasources()</pre>	order - 1 by default, if not specified	8.1.1
Fetch First Order Data Source of Workspace	This method will fetch the data source with default order 1 related to specified workspace.	Set User	<pre>%python from mmg.workspace import list_datasources workspace="CS" list_datasources(workspace)</pre>	workspace - Name of workspace for which data source should be listed order - 1 by default if not specified	8.1.1
Fetch Nth Order Data Source	This method will fetch the data source related to attached workspace with given order	Set User, Attach Workspace	<pre>%python from mmg.workspace import list_datasources list_datasources(order=2)</pre>	order - Order of data source to be fetched	8.1.1

API Type	Functionality	Prerequisite	Notebook Execution Script	Notebook Script Input	Minimum Supported Version
Fetch Nth Order Data Source of Workspace	This method will fetch the data source with given order related to specified workspace.	Set User	<pre>%python from mmg.workspace import list_datasources workspace="CS" list_datasources(workspace,order=2)</pre>	workspace - Name of workspace for which data source should be listed order = Order of data source to be fetched	8.1.1
Get Connection Object	Returns Oracle/SQL Alchemy Connection Object to Data Source of order 1 in attached workspace.	Set User, Attach Workspace	<pre>%python import cx_Oracle from mmg.workspace import get_connection conn=get_connection() if not isinstance(conn,cx_Oracle.connect): print("Not Connection Object") print(conn)</pre>		8.1.2.0
Get Connection Object To Specific Data Source	Returns Oracle/SQL Alchemy Connection Object to specified Data Source	Set User	<pre>%python import cx_Oracle from mmg.workspace import get_connection datasource="DS001" conn=get_connection(datasource) if not isinstance(conn,cx_Oracle.connect): print("Not Conn Object") print(conn)</pre>	datasource - Name of datasource for which the connection object has to be returned	8.1.2.0
Get Connection Object To Data Source Using Order	Returns Oracle/SQL Alchemy Connection Object to Data Source of specified order in attached workspace.	Set User, Attach Workspace	<pre>%python import cx_Oracle from mmg.workspace import get_connection datasource=2 conn=get_connection(datasource) if not isinstance(conn,cx_Oracle.connect): print("Not Conn Object") print(conn)</pre>	datasource - Order number of datasource in attached workspace for which the connection object has to be returned	8.1.2.0

API Type	Functionality	Prerequisite	Notebook Execution Script	Notebook Script Input	Minimum Supported Version
Test Connection Object	This script can be used to test the connection object to data source	Get Connection Object OR Get Connection Object To Specific Data Source OR Get Connection Object To Data Source Using Order	<pre> python query="SELECT table_name FROM user_tables" cur = conn.cursor() cur.execute(query) print(cur.fetchall()) if cur: cur.close() </pre>		8.12.0

PYTHON LINEPARSER APIs (for MMG version 8.1.0)

API Type	Functionality	Notebook Execution Script	Note
Attach Workspace	Attach the workspace for a session	<pre>%python mmg.attachWorkspace(workspace) #eg- mmg.attachWorkspace("CS")</pre>	workspace - workspace to be attached (String) Sets 'mmg' python variable which contains the information about the attached workspace. Output- Print a boolean in one line on the status of workspace attachment and another line of boolean on status of AIF enabled and attached.
List Workspaces	Lists all workspaces available to a user	<pre>%python mmg.listWorkspaces()</pre>	Sets 'ofs_wsList' python variable which is the list of all available workspaces. Output- Print the list of workspaces.
Check AIF	Check if AIF is set or not	<pre>%python print(aif__isAttached)</pre>	Output- Boolean on the status of AIF.
Get Connection Object	Returns cx_Oracle Connection Object	<pre>%python mmg.getConnection(schema_name) #eg- mmg.getConnection("OFSAA")</pre>	schema_name = name of the schema for which connection is required (String). Sets 'conn' python variable which is the cx_Oracle connection object to be used for firing queries.
Publish	Fetch and sets the Notebook JSON dump	<pre>%python mmg.publish()</pre>	Sets 'emf_para' python variable which is the JSON dump for the notebook component. Output- Print the set 'emf_para' value.
Register	Register the Notebook	<pre>%python mmg.register(register) #eg- mmg.register({"modelname":"model1", "\ # "modeldescription":"Model description"}) #eg- mmg.register(emf_para) {After doing mmg.publish() }</pre>	register - JSON Stringify object for RegisterNotebookBean Object. Sets 'publishedNotebookId' python variable which is the studio notebook id for the published version. Output- Prints the published notebook id.
Load Flat File		<pre>%python mmg.loadFlatFile() #eg- mmg.loadFlatFile() Incomplete</pre>	
Profile Data		<pre>%python mmg.profileData(code,title) #eg- mmg.profileData(ABC,XYZ)</pre>	

11 Appendix - II

Public APIs for Scheduler Operations

The following APIs are exposed for the Scheduler Operations.

NOTES

1. All the below APIs are POST requests.
2. All the APIs accept below values in request header:
 - ofs_tenant_id - Optional
 - ofs_service_id - Optional
 - ofs_workspace_id - Respective workspace id where the batch has to be created
 - ofs_remote_user – MMG login user

The ofs_workspace_id and ofs_remote_user are mandatory fields.

Table: APIs for Scheduler Operations

Base URL: `http(s)://<MMG_Service_HostName>:<MMG-Service_Port>/<CONETXTNAME>/`

Functionality	API	Sample Request JSON	Sample Response JSON	Comments
Execute Immediate	rest-api/v1/external/trigger	<pre>{ "batchName": "batch1", "batchType": "rest", "includedTasks": "task1,task2", "excludedTasks": "task1,task2", "heldTasks": "tas k1,task2" }</pre>	<pre>{ "severity": "info", "summary": "Object triggered successfully with Run Id: batch1_2022-08- 17_1660721567845_1", "batchRunId": "batch1_2022-08- 17_1660721567845_1", "details": "Object triggered successfully.", "status": "success", "statusCode": "0" }</pre>	<ul style="list-style-type: none"> • The includedTasks/ excludedTasks/ heldTasks are options keys. • The batchType will be “group” for batch group execution.

Functionality	API	Sample Request JSON	Sample Response JSON	Comments
Execution Status	rest-api/v1/external/status	<pre>{ "batchRunId": "batch1_2022-08-17_1660721567845_1", "tasks":["task1","task2"] }</pre>	<pre>{ "severity": "info", "batchRunId": "batch1_2022-08-17_1660721567845_1", "taskStatusList": [{ "taskCode": "task1", "taskStatus": "SUCCESSFUL", "statusCode": "0" }, { "taskCode": "task2", "taskStatus": "EXCLUDED", "statusCode": "4" }], "batchStatusCode": "0", "batchList": [], "batchStatus": "SUCCESSFUL", "status": "success", "statusCode": "0" }</pre>	<ul style="list-style-type: none"> “tasks” is options key. If not passed, then response will contain status all the tasks inside a batch.

Functionality	API	Sample Request JSON	Sample Response JSON	Comments
Rerun	rest-api/v1/external/rerun	<pre>{ "batchName": "batchgroup1", "batchRunId": "batchgroup1_202 2-08- 17_1660720814942 _1" }</pre>	<pre>{ "severity": "info", "summary": "Object triggered successfully for rerun with Run Id: batchgroup1_2022- 08- 17_1660730049819_1 ", "batchRunId": "batchgroup1_2022- 08- 17_1660730049819_1 ", "details": "Object triggered successfully.", "status": "success", "statusCode": "0" }</pre>	

Functionality	API	Sample Request JSON	Sample Response JSON	Comments
Restart	rest-api/v1/external/restart	<pre>{ "batchName": "MMG_R1", "batchRunId": "MMG_R1_2022-07- 15_1657867378160 _1" }</pre>	<pre>{ "severity": "info", "summary": "Object triggered successfully for restart with Run Id: MMG_R1_2022-07- 15_1657867378160_1 ", "batchRunId": "MMG_R1_2022-07- 15_1657867378160_1 ", "details": "Object triggered successfully.", "status": "success", "statusCode": "0" }</pre>	

Functionality	API	Sample Request JSON	Sample Response JSON	Comments
Interrupt	rest-api/v1/external/interrupt	<pre>{ "batchName": "B2001", "batchRunId": "B2001_2022-05- 22_1653222717896 _1" }</pre>	<pre>{ "summary": "Execution interrupted successfully for Run Id: B2001_2022-05- 30_1653233511394_1 ", "severity": "info", "batchRunId": "B2001_2022-05- 30_1653233511394_1 ", "details": "Execution interrupted successfully.", "statusCode": "0", "status": "success" }</pre>	

Failed Response Body

Failed Sample Response JSON	Description
Batch Status Failed	<pre>{ "severity": "info", "batchRunId": "BT-BI-EXCHG_RATES_EOD_2022-05-27_1653662703599_1", "batchStatusCode": "-1", "batchList": [], "batchStatus": "FAILED", "statusCode": "0", "status": "success" }</pre>
Object Not found	<pre>{ "severity": "error", "summary": "Object does not exist.", "details": "Object does not exist.", "error": { "errorCode": "OBJECT_NOT_EXIST", "errorMsg": "Object does not exist." }, "statusCode": "-3", "status": "failed" }</pre>

Status Codes in the Response Body

Status Code	Description
0	Success
1	Not Started
2	Ongoing
4	Excluded
5	Held
-1	Failure
-2	Interrupted
-3	Object does not exist
-4	Invalid arguments passed in request/not enough parameters in the Request body
-5	Invalid request headers/request headers missing

Status Code	Description
-6	No executable job is present
-7	Job is already interrupted

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