

Oracle® Communications

Unified Inventory and Topology Deployment Guide



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Preface

This guide describes how to deploy and administer Oracle Communications Unified Inventory and Topology in a cloud native environment.

Audience

This document is for system administrators, database administrators, and developers who install and configure Unified Inventory and Topology.

Documentation Accessibility

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1

About Unified Inventory and Topology



Note:

Active Topology Automator (ATA), Unified Topology for Inventory and Automation (UTIA), and Unified Topology are used interchangeably in this document. These refer to the same application.

Unified Inventory and Topology includes the following services:

- Unified Inventory Management (UIM)
- Active Topology Automator (ATA)
- Authentication
- Authorization
- OpenSearch
- SmartSearch
- Unified Operations Message Bus

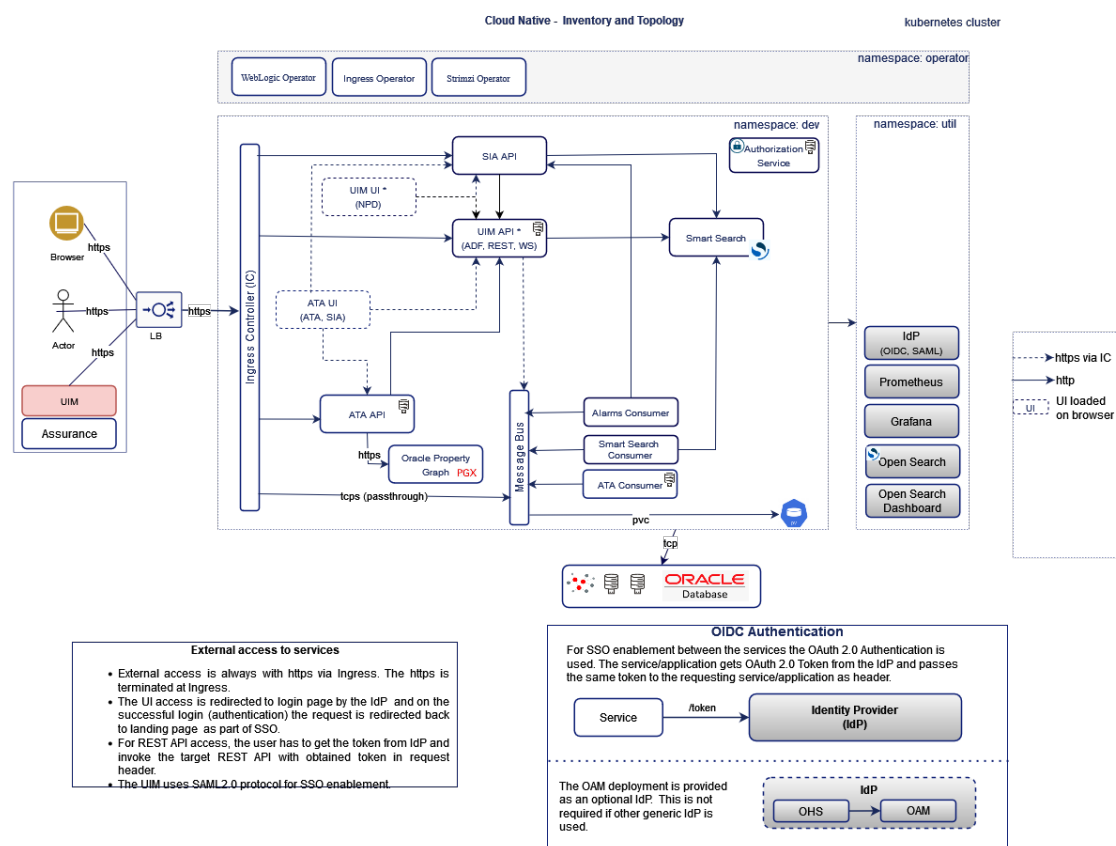
ATA, Unified Operations Message Bus, Authentication, Authorization, and SmartSearch are cloud native containerized applications that are supported in a Kubernetes environment. UIM can be a traditional application or a cloud native instance.

- The embedded topology from UIM is now available as a micro-service (ATA) based on Helidon MP.
- The communication between UIM and the ATA service is asynchronous and this is achieved by using Message Bus service.
- OAM is an optional Identity Provider that supports SAML 2.0 and OIDC protocol, used for single sign-on (SSO).

Unified Inventory and Topology Architecture

The following figure shows a high-level architecture of Unified Inventory and Topology and how the services communicate.

Figure 1-1 High-level Architecture of Unified Inventory and Topology



See the corresponding architecture diagrams of the services for more information.

About UIM

UIM is a standards-based telecommunications inventory management application that enables you to model and manage customers, services, and resources. UIM supports complex business relationships and provides full life-cycle management of services and resources. UIM provides you with a real-time, unified view of customers, services, and resource inventory, enabling you to develop and introduce new services quickly and cost-effectively. UIM supports two deployment models: traditional (on-premise) deployment and cloud native deployment in a Kubernetes cluster.

About ATA

Active Topology Automator (ATA) enables you to view the service, network, and resource topologies in the form of topology graphs. ATA uses Oracle Property Graph DB to manage the topology hierarchy.

ATA has the following sub components.

- ATA API
- ATA PGX
- ATA Consumer

- ATA UI
- Alarm Consumer
- SmartSearch Consumer
- Impact Analysis API

See *ATA User's Guide* for more information.

About Authentication

Authentication leverages SAML 2.0 (Security Assertion Markup Language) and Open ID Connect (OIDC) authentication protocol of Identity Provider (IdP) to implement the Single Sign-On (SSO) authentication solution with the services (UIM, ATA, Authorization, Message Bus, SmartSearch, OpenSearch). This enables you to seamlessly access multiple applications without being prompted to authenticate for each application separately. The main advantage of SSO is that you are authenticated only once, which is when you log in to the first application and you do not need to authenticate again when you subsequently access different applications within the same web browser session.

IdP also supports the single logout (SLO) feature. If you access multiple applications using SSO within the same web browser session, and then if you log out of any one of the applications, you are logged out of all of the applications.

Examples for authentication services are: IDCS, Keycloak, OAM, and so on.

For more information about IDCS, see <https://www.oracle.com/technical-resources/articles/middleware/oracle-identity-cloud-service.html>

For more information about OAM, see [Administering Oracle Access Management](#)

About Authorization

Authorization service defines a simplified and centralized approach for managing the authorization configurations for Unified Inventory and Topology services by defining the authorization policies. Authorization is the process of granting or denying access to specific resources based on the verified identity of a user whereas authentication is about verifying the identity of the user.

Authorization service is designed to provide permissions to access resources of an application for the authenticated user(s) with allowed role(s) or group(s).



Note:

Authorization service is not responsible to define users or assign role(s) or group(s) to the users.

Authorization service provides the capability to define various roles or groups in an application and define the permissions to resources under each role. For more information on Authorization, see "[Deploying Authorization Service](#)".

About OpenSearch

OpenSearch is a NoSQL database. It is an open-source search and analytics suite that makes it easy to ingest, search, visualize, and analyze data.

About SmartSearch

SmartSearch is a micronaut application, when integrated with OpenSearch, offers a powerful, flexible, and feature-rich search experience that can be tailored to specific business and user needs. Using OpenSearch as the underlying engine, SmartSearch can handle large volumes of data, perform real-time indexing, and support complex querying to enhance search relevancy. Features such as autocomplete, fuzzy matching, synonym recognition, and intelligent ranking make it easier for users to locate precise information, even if search terms are partially matched or misspelled.

About Unified Operations Message Bus

Message Bus is a distributed event store and stream-processing service. Message Bus service sends and receives events and messages asynchronously to a specific destination (called as **Topic**) between the services. The Message Bus service uses Apache Kafka, which is a distributed event store and stream-processing platform, as the messaging platform. For packaging or deploying, Strimzi is used. Strimzi simplifies the process of running Apache Kafka in a Kubernetes cluster. Strimzi also provides container images and operators for running Kafka on Kubernetes.

Planning UIM Installation

The following workflow helps you with information required for UIM installation.

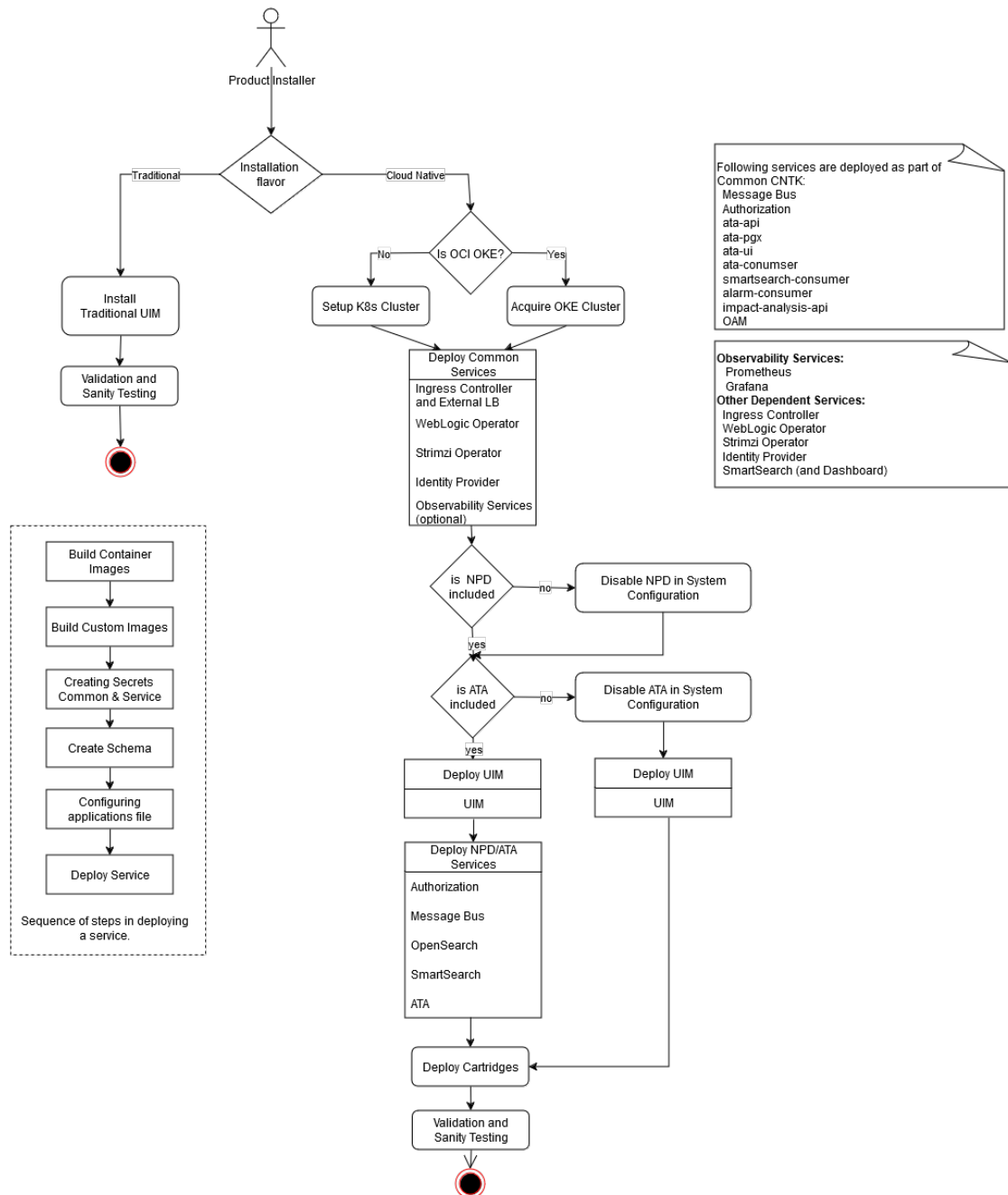


Table 1-1 Planning UIM Installation Workflow

Workflow Action	Reference	Description
Install Traditional UIM	Unified Inventory Management Installation Overview	Provides information on installing traditional UIM using an on-premise installer.

Table 1-1 (Cont.) Planning UIM Installation Workflow

Workflow Action	Reference	Description
Setup K8s Cluster	Planning and Validating Your Cloud Environment Installing Oracle Property Graph Plugin in Database https://strimzi.io/docs/operators/latest/deploying#considerations-for-data-storage-str https://kubernetes.io/docs/concepts/storage/storage-classes/	To deploy cloud native services, you must set up and validate a list of prerequisite software. Before starting the service deployments: • Install property graph plugins on the PDB that are used for ATA • Configure the Storage Class in Kubernetes to provision Persistent Volumes dynamically to be used for the Message Bus service and OpenSearch service.
Deploy Common Services	About the Unified Inventory and Topology Toolkit About the UIM Cloud Native Toolkit	Download the required software and set the environment variables.
Ingress Controller and External Load Balancer	About Load Balancing and Ingress Controller Installing the Ingress Controller SSL Certificates	You can use any Ingress Controller that conforms to the standard Kubernetes ingress API and that supports annotations required for UIM. Samples for Nginx are included in the toolkit. For a secure access of services, you must set up an Ingress Controller with TLS termination. TLS Termination setup for services is provided in deployment of each service..
WebLogic Operator	Installing the WebLogic Kubernetes Operator Container Image	The WebLogic Kubernetes Operator (operator) supports running your WebLogic Server and Fusion Middleware Infrastructure domains on Kubernetes,
Strimzi Operator	Strimzi Operator	Required only if ATA or NPD should to be enabled. The Strimzi Operator supports deployment of Apache Kafka cluster on Kubernetes or OpenShift.
Identity Provider	Configuring Authentication for Services	You can use any Identity Provider (IdP) that supports SAML 2.0 (Security Assertion Markup Language) and OIDC (Open ID Connect) authentication protocols for implementing SSO (Single Sign-On) authentication solution among services.
Observability Services	Setting Up Prometheus and Grafana Deploying OpenSearch and OpenSearch Dashboard	Optionally, deploy services such as Grafana, Prometheus and OpenSearch for Metrics and Log Monitoring.

Table 1-1 (Cont.) Planning UIM Installation Workflow

Workflow Action	Reference	Description
Disable NPD in System Configuration	Not applicable.	Modify <code>\$UIM_CNTK/charts/uim/config/system-config/custom-config.properties</code> to disable NPD: #If true, render new canvas in network visualization tab. uim.ui.createNetworkGuidedFlow.canvas.enabled=false openSearchEnabled=false
Disable ATA in System Configuration	Not applicable.	Modify <code>\$UIM_CNTK/charts/uim/config/system-config/custom-config.properties</code> to disable ATA: # Topology MicroService disableTopology=true microServiceEnabled=false
Deploy UIM		Not applicable.
Build Container Images	Creating UIM Cloud Native Images	Not applicable.
Build Custom Images	Customizing Images	This is optional. Required while extending the base image.
Create Secrets	Creating Secrets	Not applicable.
Create DB Schema	Installing the UIM and RCU Schemas	Not applicable.
Update Application Configurations	Setting System Properties	Not applicable.
Deploy Service	Creating a Basic UIM Instance	Not applicable.
Deploy NPD/ATA Services		Not applicable.
Authorization	Deploying Authorization Service	Not applicable.
Message Bus	Deploying Unified Operations Message Bus	Not applicable.
OpenSearch	Deploying OpenSearch and OpenSearch Dashboard	Oracle OCI OpenSearch has to be used in OKE Cluster environment.
SmartSearch	Deploying SmartSearch	Not applicable.
ATA	Deploying the Active Topology Automator Service	Not applicable.
Validation and Sanity Testing	Validation and Sanity Testing	Not applicable.

Validation and Sanity Testing

To perform validation and sanity testing:

1. Log in to UIM using `https://<instance>.<project>.<hostSuffix>:<LB Port>/Inventory`.
2. If NPD is enabled, select **Create Network**. The **Verify Guided Flow** appears
 - a. Enter **Network Name**.
 - b. Select **Create and Save New Location**.

- c. Associate **New Location** to **Network** and click **Continue**.
 - d. Add **New Resource - Logical Device** to **Location**.
 - e. Select **Continue** and then click **Finish**. The **Verify Network** page appears.
- 3. If ATA is enabled, open ATA using `https://<instance>.<project>.topology.<hostSuffix>:<LB Port>/apps/ata-ui`
 - a. Select **Create New - Device**.
 - b. Enter new device name (from above) and click **Search**.
 - c. Verify the device that appears.

Planning UIM Upgrade

This section provides information about planning your UIM upgrade for traditional and cloud native environments.

Planning Traditional UIM Upgrade

The following workflow helps you with information required for UIM upgrade.

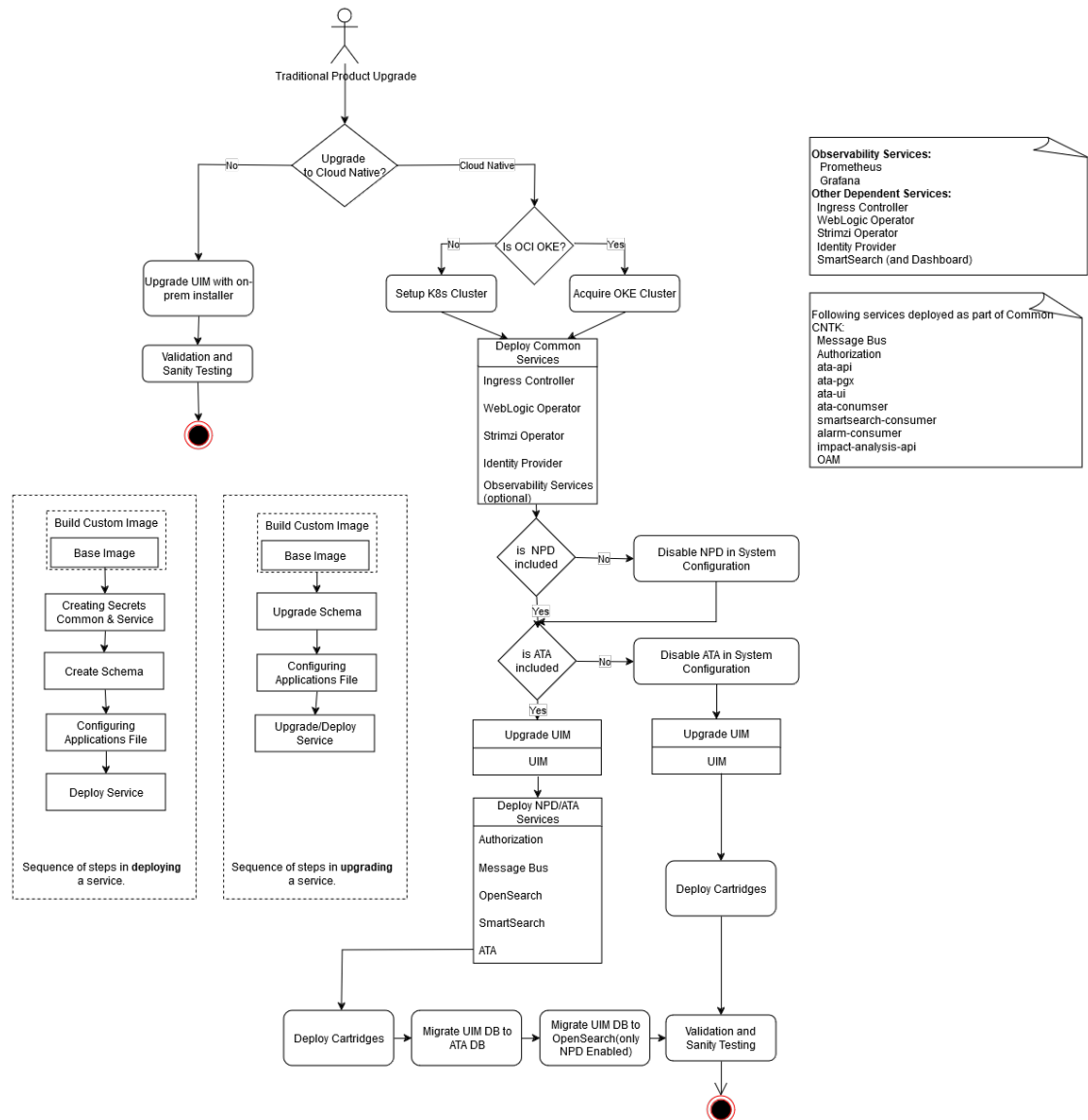


Table 1-2 Planning Traditional UIM Upgrade Workflow

Workflow Action	Reference	Description
Upgrade Traditional UIM	Upgrading Unified Inventory Management	Provides information on installing traditional UIM using an on-premise installer.

Table 1-2 (Cont.) Planning Traditional UIM Upgrade Workflow

Workflow Action	Reference	Description
Setup K8s Cluster	Planning and Validating Your Cloud Environment Installing Oracle Property Graph Plugin in Database https://strimzi.io/docs/operators/latest/deploying#considerations-for-data-storage-str	To deploy cloud native services, you must set up and validate a list of prerequisite software. Before starting the service deployments: • Install property graph plugins on the PDB that are used for ATA • Configure the Storage Class in Kubernetes to provision Persistent Volumes dynamically to be used for the Message Bus service and OpenSearch service.
Deploy Common Services	About the Unified Inventory and Topology Toolkit About the UIM Cloud Native Toolkit	Download the required software and set the environment variables.
Ingress Controller and External Load Balancer	About Load Balancing and Ingress Controller Installing the Ingress Controller SSL Certificates	You can use any Ingress Controller that conforms to the standard Kubernetes ingress API and that supports annotations required for UIM. Samples for Nginx are included in the toolkit. For a secure access of services, you must set up an Ingress Controller with TLS termination. TLS Termination setup for services is provided in deployment of each service..
WebLogic Operator	Installing the WebLogic Kubernetes Operator Container Image	The WebLogic Kubernetes Operator (operator) supports running your WebLogic Server and Fusion Middleware Infrastructure domains on Kubernetes,
Strimzi Operator	Strimzi Operator	Required only if ATA or NPD should to be enabled. The Strimzi Operator supports deployment of Apache Kafka cluster on Kubernetes or OpenShift.
Identity Provider	Configuring Authentication for Services	
Observability Services	Setting Up Prometheus and Grafana Deploying OpenSearch and OpenSearch Dashboard	Optionally, deploy services such as Grafana, Prometheus and OpenSearch for Metrics and Log Monitoring.
Disable NPD in System Configuration	Not applicable.	Modify \$UIM_CNTK/charts/uim/config/system-config/custom-config.properties to disable NPD: <pre>#If true, render new canvas in network visualization tab. uim.ui.createNetworkGuidedFlow.canvas.enabled=false openSearchEnabled=false</pre>

Table 1-2 (Cont.) Planning Traditional UIM Upgrade Workflow

Workflow Action	Reference	Description
Disable ATA in System Configuration	Not applicable.	Modify <code>\$UIM_CNTK/charts/uim/config/system-config/custom-config.properties</code> to disable ATA: # Topology MicroService disableTopology=true microServiceEnabled=false
Upgrade UIM	Moving to UIM Cloud Native from a Traditional Deployment Creating the UIM Cloud Native Images Creating a Basic UIM Cloud Native Instance Upgrading ATA	Not applicable.
Deploy UIM		Not applicable.
Build Container Images	Creating UIM Cloud Native Images	Not applicable.
Build Custom Images	Customizing Images	This is optional. Required while extending the base image.
Create Secrets	Creating Secrets	Not applicable.
Create DB Schema	Installing the UIM and RCU Schemas	Not applicable.
Update Application Configurations	Setting System Properties	Not applicable.
Deploy Service	Creating a Basic UIM Instance	Not applicable.
Deploy NPD/ATA Services		Not applicable.
Authorization	Deploying Authorization Service	Not applicable.
Message Bus	Deploying Unified Operations Message Bus	Not applicable.
OpenSearch	Deploying OpenSearch and OpenSearch Dashboard	Oracle OCI OpenSearch has to be used in OKE Cluster environment.
SmartSearch	Deploying SmartSearch	Not applicable.
ATA	Deploying the Active Topology Automator Service	Not applicable.
UIM	Overview of the UIM Cloud Native Deployment	After UIM CN instance is created, redeploy the <code>inventory.ear</code> from admin console to update the new roles for NPD.
Migrate UIM DB to ATA DB	Installing ATA Service Schema Dynamic Data Mapping from UIM	ATA DB Schema has to be created before migrating UIM Data to Graph DB.
Migrate UIM DB to OpenSearch	Data Migration and Dynamic Attribute Mapping between UIM and SmartSearch	Data from UIM DB to OpenSearch NoSQL DB will be migrated with the help of SmartSearch and OpenSearch services.
Validation and Sanity Testing	Validation and Sanity Testing	Not applicable.

Planning UIM Cloud Native Upgrade

The following workflow helps you with information required for UIM Cloud Native upgrade.

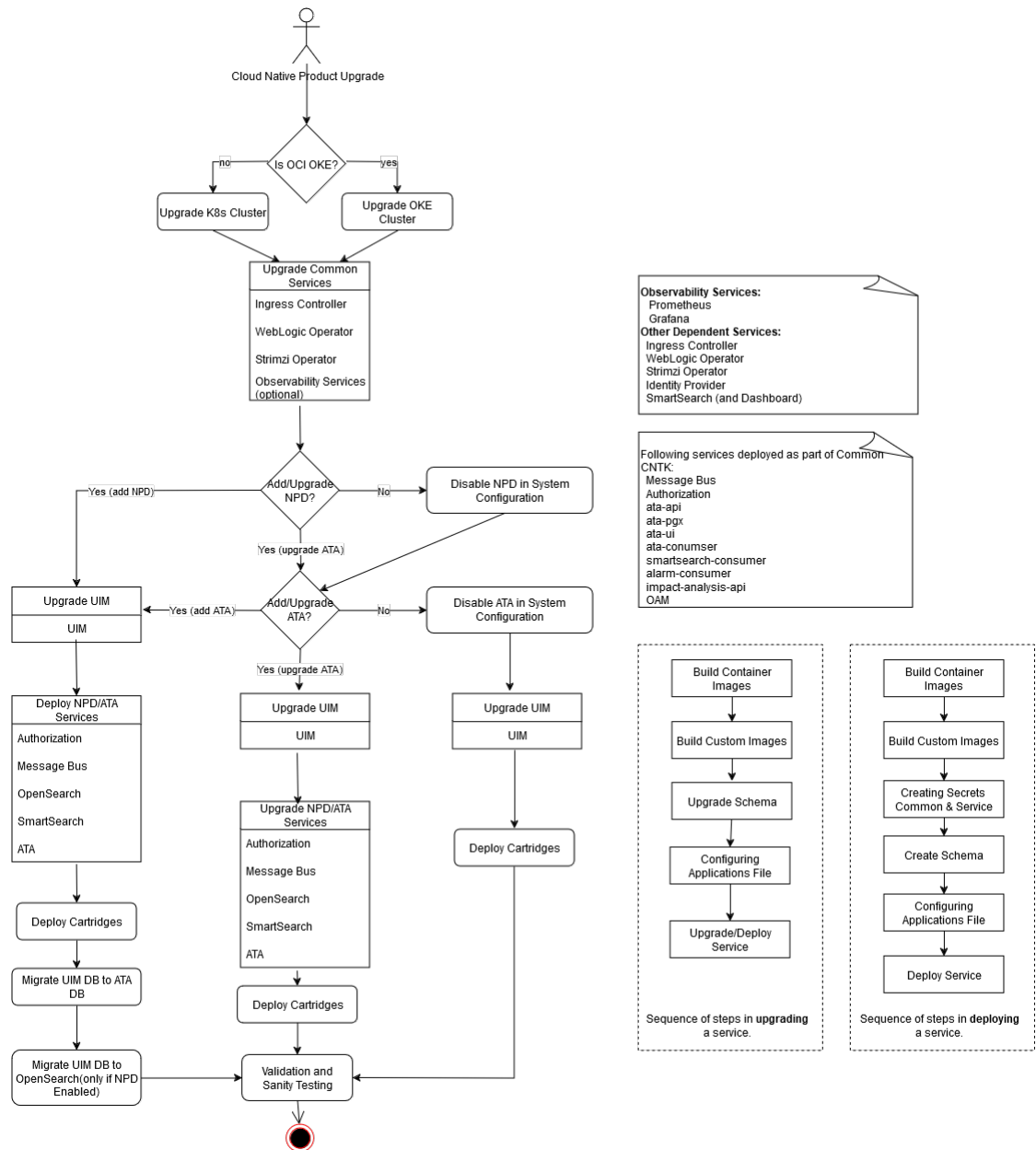


Table 1-3 Planning UIM Cloud Native Upgrade Workflow

Workflow Action	Reference	Description
Upgrade Traditional UIM	Upgrading Unified Inventory Management	Provides information on installing traditional UIM using an on-premise installer.

Table 1-3 (Cont.) Planning UIM Cloud Native Upgrade Workflow

Workflow Action	Reference	Description
Setup K8s Cluster	Planning and Validating Your Cloud Environment Installing Oracle Property Graph Plugin in Database https://strimzi.io/docs/operators/latest/deploying#considerations-for-data-storage-str	To deploy cloud native services, you must set up and validate a list of prerequisite software. Before starting the service deployments: • Install property graph plugins on the PDB that are used for ATA • Configure the Storage Class in Kubernetes to provision Persistent Volumes dynamically to be used for the Message Bus service and OpenSearch service.
Deploy Common Services	About the Unified Inventory and Topology Toolkit About the UIM Cloud Native Toolkit	Download the required software and set the environment variables.
Ingress Controller and External Load Balancer	About Load Balancing and Ingress Controller Installing the Ingress Controller SSL Certificates	You can use any Ingress Controller that conforms to the standard Kubernetes ingress API and that supports annotations required for UIM. Samples for Nginx are included in the toolkit. For a secure access of services, you must set up an Ingress Controller with TLS termination. TLS Termination setup for services is provided in deployment of each service..
WebLogic Operator	Installing the WebLogic Kubernetes Operator Container Image	The WebLogic Kubernetes Operator (operator) supports running your WebLogic Server and Fusion Middleware Infrastructure domains on Kubernetes,
Strimzi Operator	Strimzi Operator	Required only if ATA or NPD should to be enabled. The Strimzi Operator supports deployment of Apache Kafka cluster on Kubernetes or OpenShift.
Identity Provider	Configuring Authentication for Services	
Observability Services	Setting Up Prometheus and Grafana Deploying OpenSearch and OpenSearch Dashboard	Optionally, deploy services such as Grafana, Prometheus and OpenSearch for Metrics and Log Monitoring.
Disable NPD in System Configuration	Not applicable.	Modify \$UIM_CNTK/charts/uim/config/system-config/custom-config.properties to disable NPD: <pre>#If true, render new canvas in network visualization tab. uim.ui.createNetworkGuidedFlow.canvas.enabled=false openSearchEnabled=false</pre>

Table 1-3 (Cont.) Planning UIM Cloud Native Upgrade Workflow

Workflow Action	Reference	Description
Disable ATA in System Configuration	Not applicable.	Modify <code>\$UIM_CNTK/charts/uim/config/system-config/custom-config.properties</code> to disable ATA: # Topology MicroService disableTopology=true microServiceEnabled=false
Upgrade UIM	Moving to UIM Cloud Native from a Traditional Deployment Creating the UIM Cloud Native Images Creating a Basic UIM Cloud Native Instance Upgrading ATA	Not applicable.
Deploy UIM		Not applicable.
Build Container Images	Creating UIM Cloud Native Images	Not applicable.
Build Custom Images	Customizing Images	This is optional. Required while extending the base image.
Create Secrets	Creating Secrets	Not applicable.
Create DB Schema	Installing the UIM and RCU Schemas	Not applicable.
Update Application Configurations	Setting System Properties	Not applicable.
Deploy Service	Creating a Basic UIM Instance	Not applicable.
Deploy NPD/ATA Services		Not applicable.
Authorization	Deploying Authorization Service	Not applicable.
Message Bus	Deploying Unified Operations Message Bus	Not applicable.
OpenSearch	Deploying OpenSearch and OpenSearch Dashboard	Oracle OCI OpenSearch has to be used in OKE Cluster environment.
SmartSearch	Deploying SmartSearch	Not applicable.
ATA	Deploying the Active Topology Automator Service	Not applicable.
UIM	Overview of the UIM Cloud Native Deployment	After UIM CN instance is created, redeploy the inventory.ear from admin console to update the new roles for NPD.
Migrate UIM DB to ATA DB	Installing ATA Service Schema Dynamic Data Mapping from UIM	ATA DB Schema has to be created before migrating UIM Data to Graph DB.
Migrate UIM DB to OpenSearch	Data Migration and Dynamic Attribute Mapping between UIM and SmartSearch	Data from UIM DB to OpenSearch NoSQL DB will be migrated with the help of SmartSearch and OpenSearch services.
Validation and Sanity Testing	Validation and Sanity Testing	Not applicable.

Installing Oracle Property Graph Plugin in Database

ATA uses Oracle Property Graph of Oracle Database that offers a powerful graph support to explore and discover complex relationships within ATA graphs.

Graph Server and Client is a software package that is required for Property Graph.

To install Property Graph:

1. Download Oracle Graph Server, **oracle-graph-plsql-<version>.zip**, from Oracle E-Delivery: <https://www.oracle.com/database/technologies/spatialandgraph/property-graph-features/graph-server-and-client/graph-server-and-client-downloads.html>

 Note:

The versions are available at: [Oracle Graph Server](#). See "UIM Software Compatibility" in *UIM Compatibility Matrix* for the corresponding version of Oracle Graph PL/SQL Patch.

2. Extract **oracle-graph-plsql-<version>.zip** and open the **19c and above** folder.
3. Follow the instructions in the **readme.md** file to install Property Graph.

2

About the Unified Inventory and Topology Toolkit

This chapter describes the components required for Unified Inventory and Topology.

Unified Inventory and Topology Toolkit

From Oracle Software Delivery Cloud, download the following:

- Oracle Communications Unified Inventory Management Cloud Native Toolkit
- Oracle Communications Unified Inventory Management Cloud Native Image Builder
- Oracle Communications Unified Inventory Management ATA Image Builder
- (Optional) Oracle Communications Unified Inventory Management OHS Image Builder
- Oracle Communications Unified Inventory Management Common Toolkit
- Oracle Communications Unified Inventory Management SmartSearch Image
- Oracle Communications Unified Inventory Management Authorization Image Builder

Perform the following tasks:

1. Copy the above downloaded archives into directory **workspace** and unzip the archives.
2. Export the unzipped path to the WORKSPACEDIR environment variable.
3. On Oracle Linux, where Kubernetes is hosted, download and extract the tar archive on each host. This host has a connectivity to the Kubernetes cluster.
4. Alternatively, on OKE, for an environment where Kubernetes is running, extract the contents of the tar archive (on each OKE client host). The OKE client host is the bastion host that is set up to communicate with the OKE cluster.

```
$ mkdir workspace
$ export WORKSPACEDIR=$(pwd) /workspace
//Untar UIM Builder
$ tar -xf $WORKSPACEDIR/uim-image-builder.tar.gz --directory workspace
//Untar UIMCN Toolkit
tar -xf $WORKSPACEDIR/uim-cntk.tar.gz --directory workspace
//(optional) Untar OHS Builder, only if you are planning to install OAM
otherwise not required
tar -xf $WORKSPACEDIR/ohs-builder.tar.gz --directory workspace
//Untar ATA Builder
$ tar -xf $WORKSPACEDIR/ata-builder.tar.gz --directory workspace
//Untar Authorization Builder
$tar -xf $WORKSPACEDIR/authorization-builder.tar.gz --directory workspace
//Untar Common Toolkit
$ tar -xf $WORKSPACEDIR/common-cntk.tar.gz --directory workspace
$ export COMMON_CNTK=$WORKSPACEDIR/common-cntk
$ export UIM_CNTK=$WORKSPACEDIR/uim-cntk
```

Assembling the Specifications

To assemble the specifications:

1. Create a directory (either in local machine or version control system where the deployment pipelines are available) to maintain the specification files needed to deploy the service. Export the directory to `SPEC_PATH` environment variable.
2. Copy the Strimzi Operator deployment specification file (**strimzi-operator-override-values.yaml**) to your `$SPEC_PATH/<STRIMZI_PROJECT>`. `<STRIMZI_PROJECT>` is the Kubernetes namespace in which Strimzi Operator is planned to deploy or install.

```
cp $COMMON_CNTK/samples/strimzi-operator-override-values.yaml $SPEC_PATH/  
<STRIMZI_PROJECT>/strimzi-operator-override-values.yaml
```

3. Copy the OpenSearch deployment specification files (**os_board_values.yaml** and **os_engine_values.yaml**) to your `$SPEC_PATH/opensearch/` directory as follows:

```
cp $COMMON_CNTK/samples/charts/opensearch/os_board_values.yaml $SPEC_PATH/  
opensearch/  
cp $COMMON_CNTK/samples/charts/opensearch/os_engine_values.yaml $SPEC_PATH/  
opensearch/  
#For development use the applications-dev.yaml for have minimal virtual  
resoruces  
cp $COMMON_CNTK/samples/applications-dev.yaml $SPEC_PATH/<PROJECT>/  
<INSTANCE>/applications-dev.yaml
```

4. Copy the Micro Services deployment application specification file (**applications.yaml**) to your `$SPEC_PATH/<PROJECT>/<INSTANCE>`. `<PROJECT>` is the Kubernetes namespace where the services will be deployed/installed. The `<INSTANCE>` is the unique identifier provided for the services deployed. This will be added as one of the contacted string in the generate service name

```
cp $COMMON_CNTK/samples/applications.yaml $SPEC_PATH/<PROJECT>/<INSTANCE>/  
applications.yaml
```

5. Copy the Micro Services database specification file (**database.yaml**) to your `$SPEC_PATH/<PROJECT>/<INSTANCE>`.

```
cp $COMMON_CNTK/samples/database.yaml $SPEC_PATH/<PROJECT>/<INSTANCE>/  
database.yaml
```

6. Copy other specification files as required:

- Persistent volumes and persistent volume claims files from `$COMMON_CNTK/samples/nfs`
- Role and role bindings from `$COMMON_CNTK/samples/rbac`
- Credential files from `$COMMON_CNTK/samples/credentials`

7. Copy Common configuration file to **`$SPEC_PATH/$PROJECT/$INSTANCE/common/common-config.yaml`**

```
cp $COMMON_CNTK/samples/credentials/common-config.yaml $SPEC_PATH/<PROJECT>/  
<INSTANCE>/common/common-config.yaml
```

Image Builders

The following image builders are required to build the corresponding services for an end-to-end integrated environment:

- UIM Image Builder: This includes archive `uim-image-builder.tar.gz`, which is required to build UIM, UIM DB Installer Images. See "Creating the UIM Cloud Native Images" in *UIM Cloud Native Deployment Guide* for more information.
- (Optional) OHS Builder: This includes `ohs-builder.tar.gz`, required to build OHS image. See "[Building the OHS Image](#)" for more information.
- Authorization Builder: This includes `authorization-builder.tar.gz`, required to build Authorization images. For more information, see "[Creating Authorization Images](#)".
- ATA Builder: This includes `ata-builder.tar.gz`, required to build ATA API, ATA UI, ATA PGX, ATA Consumer, and the ATA DB Installer images.

All builder toolkits include manifest files and scripts to build the images.

About the Manifest File

A manifest file can be found in directory path `$WORKSPACEDIR/<service-builder>/bin/<service>_manifest.yaml`. The manifest file describes the input that goes into the *service* images. It is consumed by the image build process. The default configuration in the latest manifest file provides all necessary components for creating the *service* images easily. A *service* can be ATA, Authorization, SmartSearch, OpenSearch, UIM, or OHS.

You can also customize the manifest file. This enables you to:

- Specify any Linux image as the base, as long as it is a binary and is compatible with Oracle Linux.
- Upgrade the Oracle Enterprise Linux version to a newer version to uptake a quarterly CPU.
- Upgrade the JDK version to a newer JDK version to uptake a quarterly CPU.
- Choose a different **userid** and **groupid** for **oracle:oracle user:group** that the image specifies. The default is 1000:1000.



Note:

The `schemaVersion` and `date` parameters are maintained by Oracle. Do not modify these parameters. Version numbers provided here are only examples. The manifest file specifies the actual versions that Oracle recommends.

There are various sections in the manifest file such as:

- **Service Base Image:** The Service Base image is a necessary building block of the final *service* container images. However, it is not required by the *service* to create or manage any service instances.

Linux parameter: The `Linux` parameter specifies the base Linux image to be used as the base Docker or Podman image. The version is the two-digit version from `/etc/redhat-release`:

```
linux:
  vendor: Oracle
  version: 8-slim
  image: <container>/os/oraclelinux:8-slim
```

The vendor and the version details are used for validating while an image is being built and for querying at run-time.

 Note:

To troubleshoot issues, Oracle support requires you to provide these details in the manifest file used to build the image.

- The `userGroup` parameter that specifies the default **userId** and **groupId**:

```
userGroup:
  username: <username>
  userid: <userID>
  groupname: <groupname>
  groupid: <groupID>
```

- The `jdk` parameter that specifies the JDK vendor, version, and the staging path:

```
jdk:
  vendor: Oracle
  version: <jdk_version>
  path: $CN_BUILDER_STAGING/downloads/java/jdk-<jdk_version>_linux-
x64_bin.tar.gz
```

- The `Tomcat` parameter specifies the Tomcat version and its staging path.

 Note:

This is applicable only for the ATA service.

```
tomcat:
  version: <tomcat_version>
  path: $CN_BUILDER_STAGING/downloads/tomcat/tomcat-<tomcat_version>.tar.gz
```

- A `serviceImage` parameter, where **tag** is the tag name of the *service* image.

```
serviceImage:
  tag: latest
```

**Note:**

See "UIM Software Compatibility" in *UIM Compatibility Matrix* for software versions.

Deployment Toolkits

The following toolkits are required to deploy the services for an end-to-end integrated environment:

- **UIM Cloud Native toolkit:** Includes `uim-cntk.tar.gz` file that is required to deploy UIM in cloud native environment. See "Creating a Basic UIM Cloud Native Instance" in *UIM Cloud Native Deployment Guide*, for more information.
- **Common Cloud Native toolkit:** Includes `common-cntk.tar.gz` file that is required to deploy the OAM (optional), Authorization, ATA, SmartSearch, OpenSearch, and Message Bus services in the cloud native environment.

Common Cloud Native Toolkit

The Common cloud native toolkit (Common CNTK) includes:

- Helm charts to manage the ATA, Common Authentication (optional), Authorization, SmartSearch, OpenSearch, and Message Bus services.
- Scripts to manage secrets for the services.
- Scripts to manage schemas for the services.
- Scripts to create, update, and delete the ATA and Message Bus services.
- Scripts to create and delete the Common Authentication service.
- Sample `pv` and `pvc` `yaml` files to create persistent volumes.
- Sample charts to install Traefik.
- Scripts to register and un-register the namespaces with Traefik and Strimzi operator.
- The **`applications.yaml`** and **`database.yaml`** files that provide the required configuration for the services which can be used for a production environment.
- The **`applications-dev.yaml`** file that contains the required configuration for the services which can be used for a development environment.
- The **`strimzi-operator-override-values.yaml`** file that enables you to override the configuration for deploying strimzi operator which is used for message bus service.

The **`applications.yaml`** and **`database.yaml`** files have common values that are applicable for all services in Common CNTK along with the values that are applicable for specific services.

For customized configurations to override the default values, update the values under the specific application sections in `$SPEC_PATH/<PROJECT>/<INSTANCE>/applications.yaml`.

While executing the scripts, the *project* and *instance* values should be provided, where *project* indicates the namespace of the Kubernetes environment where the service is deployed and *instance* is the identifier of the corresponding *service* instance, if multiples instances are created within the same namespace.

**Note:**

As multiple instances of Message Bus cannot exist in the same namespace, only one instance is created for all services within the same namespace.

While creating a basic instance for all these services, the project name is considered as **sr** and the instance name is considered as **quick**.

**Note:**

- Project and Instance names must not contain any special characters.
- There are common values specified in the **applications.yaml** and **database.yaml** files for the services. To override the common value user can specify that value under the chart name of a service. If the value under the chart is empty, then common value is considered.

Deploying the Services

You must deploy and configure all services in the following sequence:

1. (Optional) Deploy Authentication Service (OAM along with OHS).

**Note:**

Authentication service is only needed for deployment if you do not have any Identity Provider that supports SAML 2.0 and OIDC or OAuth 2.0 protocols.

2. Deploy Authorization service.
3. Deploy Message Bus.
4. Deploy OpenSearch.
5. Deploy SmartSearch.
6. Deploy UIM (traditional or cloud native).
7. Configure Traditional UIM with Message Bus and ATA, and restart UIM. See "Setting System Properties" in *UIM System Administrator's Guide*, for more information.
8. (Optional) Configure OAM for ATA client creation.
9. Deploy ATA.

**Note:**

Ensure that each individual service is deployed successfully and verified in the above mentioned order as there are dependencies between these services. Ensure that for production instance, for High Availability, the Message Bus is set up with at least 3 replicas for kafka-cluster.

Setting Up Prometheus and Grafana

Message Bus has been tested with Prometheus and Grafana server installed and configured using the Helm charts.

- Prometheus Community is available at <https://prometheus-community.github.io/helm-charts> and uses the **prometheus-community/prometheus** chart.
- Grafana Community is available at <https://grafana.github.io/helm-charts> and uses the **grafana/grafana** chart.

3

Configuring Authentication for Services

This chapter describes how to configure authentication for Unified Inventory and Topology services such as UIM, ATA, Message Bus, SmartSearch, and OpenSearch.

About Authentication

This section provides instructions for setting up Single Sign-On (SSO) authentication for Unified Inventory and Topology services.

These services implement the Single Sign-On (SSO) authentication solution using OIDC protocol from any supported Identity Provider (IdP), which enables you to seamlessly access multiple applications without being prompted to authenticate for each application separately. The main advantage of SSO is that you are authenticated only once, which is when you log in to the first application and then you are not required to authenticate again when you subsequently access different applications. However, these applications must be with the same (or lower) authentication level (as the first application) and opened within the same web browser session.

These services also support the Single Logout (SLO) feature. If you access multiple applications using SSO within the same web browser session, and then if you log out of any one of the applications, you are logged out of all the applications.



Note:

UIM requires an IdP that supports SAML 2.0 along with OIDC.

As UIM is a WebLogic application, it provides support only for SAML 2.0 protocol. For more information about how to enable authentication, see *UIM Cloud Native Deployment Guide*. OIDC is supported for all other services such as Message Bus, ATA, Authorization, SmartSearch and OpenSearch.

Ensure IdP users are assigned below groups for ATA access:

- **AtaAdministrator**: This group has the privileges of **Administrator** and **AdvancedUser** roles. The users with this group can:
 - Create, view, and search topology graphs
 - Edit and delete all saved searches
 - Navigate to all summary pages
 - Create, view, edit, and delete icons and colors customization
- **AtaAdvancedUser**: This group has the privileges of **AdvancedUser** role. The users with this group can:
 - Create, view, and search topology graphs
 - Edit and delete saved searches created by the corresponding user

- Navigate to all summary pages

To configure authentication for all other services, perform the steps mentioned in the following sections:

- [Adding Common OAuth Secret and ConfigMap](#)
- [Common Configuration Options For all Services](#)

Sample references are provided as Appendix, see the following content for the corresponding authentication type:

- [Deploying the OAM Service](#)
- Configuring KeyCloak as Identity Provider for UIM, ATA, and Message Bus
- Setting Up Unified Inventory Management for Single Sign-On Authentication

Adding Common OAuth Secret and ConfigMap

To add COMMON OAUTH secret and ConfigMap:

1. Run the following command to create or update truststore by passing the Identity Provider SSL certificate:

```
keytool -importcert -v -alias <param> -file <path to IDP cert file> -
keystore <truststorename>.jks -storepass <password>
```

A sample is as follows:

```
keytool -importcert -v -alias idpcert -file identityprovidercert.pem -
keystore truststore.jks -storepass ****
```

Note:

You must add the corresponding certificates for UIM and Identity Providers. If the Identity Provider and UIM certificates are not common, add both in the same truststore.

2. Run the following script to create the OAuth configuration as secrets and ConfigMap:

```
$COMMON_CNTR/scripts/manage-app-credentials.sh -p sr -i quick -
f $SPEC_PATH/sr/quick/applications.yaml create oauthConfig
```

Enter the values as prompted:

```
Provide Oauth credentials for 'sr-quick' ...
Client Id: topologyClient #Provide Client ID
Client Secret: xxxxxx #Provide Client Secret
Identity Provider Uri: <Identity-Provider-Uri>
Client Scope: <oauth-client-scope> (if scope is not configured for oidc-
client keep blank)
Client Audience: <oauth-client-audience> (if audience not configured for
oidc-client keep blank)
Token Endpoint Uri: <token_endpoint_uri> #Provide oauth token endpoint URI
```

```

Valid Issue Uri: <valid issue uri> #Provide the valid issue URI
Introspection Endpoint Uri: <introspection_endpoint_uri> #Provide the
Introspection Endpoint URI
JWKS Endpoint Uri: <JWKS_endpoint_uri> #Provide JWKS Endpoint URI
Cookie Name: <Cookie-Name>
Cookie Encryption Password: <Cookie-Encryption-Password>

Provide Truststore details ...
Certificate File Path (ex. ./idpcert.pem): ./commoncert.pem      #provide
Certificate file path
Truststore File Path (ex. truststore.jks): ./commontrust.jks    #provide
Truststore file path
Truststore Password: xxxx   #provide Truststore password

```

Sample for IDCS is as follows:

```

Provide Oauth credentials for 'sr-quick' ...
Client Id: xxxxxxxxxxxxxxxx
Client Secret: xxxx-xxxx-xxxx-xxxx
Identity Provider Uri: https://<IDCS URL>:443
Client Scope: https://quick.sr.topology.uim.org:30443/first_scope
Client Audience: https://quick.sr.topology.uim.org:30443/
Token Endpoint Uri: https://<IDCS URL>:443/oauth2/v1/token
Valid Issue Uri: https://identity.oraclecloud.com/
Introspection Endpoint Uri: https://<IDCS URL>:443/oauth2/v1/introspect
JWKS Endpoint Uri: https://<IDCS URL>:443/admin/v1/SigningCert/jwk
Cookie Name: OIDC_SESSION
Cookie Encryption Password: <Cookie Encryption Password>

Provide Truststore details ...
Certificate File Path (ex. idpcert.pem): ./idpcert.pem #provide identity
provider certificate to be used by Message Bus
Truststore File Path (ex. truststore.jks): ./truststore.jks
Truststore Password: xxxxxx   #provide Truststore password

```

Sample for OAM is as follows:

```

Token Endpoint Uri: https://<instance>.<project>.ohs.<oam-host-
suffix>:<port>/oauth2/rest/token #Provide oauth token endpoint URI
Valid Issue Uri: https:// <instance>.<project>.ohs .<oam-host-
suffix>:<port>/oauth2 #Provide oauth valid issue URI
Introspection Endpoint Uri: https:// <instance>.<project>.ohs .<oam-host-
suffix>:<port> /oauth2/rest/token/introspect #Provide Oauth Introspection
Endpoint URI
JWKS Endpoint Uri: https://<instance>.<project>.ohs.<oam-host-
suffix>:<port>/oauth2/rest/security #Provide JWKS Endpoint URI

```

3. Verify the following:

```

$kubectl get secret -n sr
sr-quick-oauth-credentials

$kubectl get cm -n sr
sr-quick-oauth-config-cm

```

**Note:**

The **oauthConfig** secret is used by both Message Bus and ATA applications. If you are creating them in different namespaces or instances, you need to create this secret in both namespaces or instances.

Common Configuration Options For all Services

You can provide configurations that are common across all services in the **common-config.yaml** file and run the **commonConfig** command.

You can use this option to provide any configuration for ATA (api, ui, impact-analysis-api) and Authorization service. The Mandatory Identity Provider configuration details are passed using **oauthConfig** secret. If you want to override that configuration or to supply any additional configuration, you can use this option.

**Note:**

Before running the command, make sure you copy **common-config.yaml** from **\$COMMON_CNTK/samples/credentials/common-config.yaml** to **\$SPEC_PATH/<PROJECT>/<INSTANCE>/common/common-config.yaml**.

#In case of IDCS as IdP, you have to provide the following additional provider details

```
security:
  providers:
    - abac:
    - oidc:
    - idcs-role-mapper:
      multitenant: false #update this as per the IDCS instance used.
      oidc-config:
        client-id: "${security.properties.idp-client-id}"
        client-secret: "${security.properties.idp-client-secret}"
        identity-uri: "${security.properties.idp-uri}"
        audience: "${security.properties.idp-audience}"
```

4

Deploying Authorization Service

This chapter describes how to optionally deploy and manage the Authorization service.

Overview

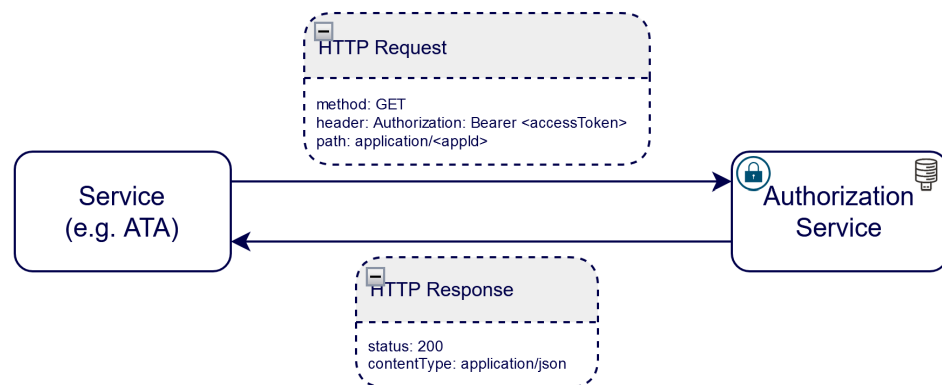
The Authorization service defines a simplified and centralized approach for managing the authorization configurations for services.

The consuming service (for example, ATA) sends an HTTP request with access token (from IdP) as Authorization Header to get the allowed resources for the authenticated users. Based on the response, users are allowed to perform certain actions on the consuming service.

For example, users with `AtaAdministrator` role are allowed to customize the icons and colors on the ATA canvas.

The users with `AtaAdvancedUser` role are allowed to access the advance settings of ATA canvas, but are not allowed to customize the icons and colors on the ATA canvas.

The architecture diagram of Authorization service is as follows:



Creating Authorization Images

You must install the prerequisite software and tools for creating the Authorization images.

Prerequisites for Creating Authorization Images

You require the following prerequisites for creating the Authorization images:

- Podman on the build machine (if Linux version is greater than or equal to 8).
- Docker on the build machine (if Linux version is lesser than 8).
- Authorization Builder Toolkit. For the toolkit, see "[Unified Inventory and Topology Toolkit](#)".

- Install Maven and update the path variable with **Maven Home** as follows:

```
set PATH variable export PATH=$PATH:$MAVEN_HOME/bin
```

- Install Java with **JAVA_HOME** set in the environment as follows:

```
Set PATH variable export PATH=$PATH:$JAVA_HOME/bin
```

- Bash, to enable the `<tab>` command.



Note:

See UIM Software Compatibility for software versions.

Configuring Authorization Images

The corresponding manifest file describes the input that goes into the Authorization images. The default configuration in the latest manifest file provides the necessary components for creating the Authorization images. See "[About the Manifest File](#)" for more information.

Creating Authorization and Schema Images

To create the Authorization and schema images:

1. Set the **JAVA_HOME** variable in your environment to match the location of your Java installation as follows:

```
export JAVA_HOME=<location of jdk-21>
```

2. Go to WORKSPACEDIR.
3. Download the JDK 21 (**jdk-<version>_linux-x64_bin.tar.gz**) for linux and copy it to **\$WORKSPACEDIR/authorization-builder/staging/downloads/java**.
4. (Optional) If there is a change in the JDK version or in the file name, update the version and path accordingly in the manifest file as follows:

```
$vi $WORKSPACEDIR/authorization-builder/bin/authorization_manifest.yaml
```

```
jdk:
  vendor: Oracle
  version: <JDK Version>
  path: $CN_BUILDER_STAGING/downloads/java/jdk-<version>_linux-
x64_bin.tar.gz
```

5. Set the proxy environment variables for running Gradle. For example:

```
#The eth0 is sample. replace "eth0" with your specific interface name.
export ip_addr=`ip -f inet addr show eth0|egrep inet|awk '{print $2}'|awk -
F/ '{print $1}'`
export http_proxy=
export https_proxy=$http_proxy
export no_proxy=localhost,$ip_addr
export HTTP_PROXY=
```

```
export HTTPS_PROXY=$HTTP_PROXY
export NO_PROXY=localhost,$ip_addr
```

6. Update **\$WORKSPACEDIR/authorization-builder/bin/gradle.properties** with required proxies:

```
systemProp.http.proxyHost=
systemProp.http.proxyPort=
systemProp.https.proxyHost=
systemProp.https.proxyPort=
systemProp.http.nonProxyHosts=localhost|127.0.0.1
systemProp.https.nonProxyHosts=localhost|127.0.0.1
```

7. Run **build-all-images.sh** in **bin** to build all the images (authorization, authorization-schema):

```
cd $WORKSPACEDIR/authorization-builder/bin
./build-all-images.sh
```

**Note:**

You can include the above procedure into your CI pipeline as long as the required components are already downloaded to the staging area.

Post-build Image Management

The Authorization image builder creates images with names and tags based on the settings in the manifest file. By default, this results in the following images:

- authorization-base-1.0.0.0.0:latest
- authorization-schema-1.0.0.0.0:latest
- authorization-1.0.0.0.0:latest

Creating an Authorization Service Instance

This section describes how to create an Authorization service instance in your cloud native environment using the operational scripts and the configuration provided in the common cloud native toolkit.

Before you can create an Authorization service instance, you must validate cloud native environment. See "[Planning UIM Installation](#)" for details on prerequisites.

In this section, while creating a basic instance, the project name is considered as **sr** and instance name is considered as **quick**.

**Note:**

Project and instance names cannot contain any special characters.

Installing Authorization Cloud Native Artifacts and Toolkit

Build container images for the following using the Authorization cloud native image builder:

- Authorization application
- Authorization schema installer

See "[Deployment Toolkits](#)" to download the Common cloud native toolkit archive file. Set the variable for the installation directory by running the following command, where \$WORKSPACEDIR is the installation directory of the COMMON cloud native toolkit:

```
export COMMON_CNTK=$WORKSPACEDIR/common-cntk
```

Setting up Environment Variables

The Authorization service relies on access to certain environment variables to run seamlessly. Ensure the following variables are set in your environment:

- Path to your common cloud native toolkit
- Traefik namespace

To set the environment variables:

1. Set the COMMON_CNTK variable to the path of directory where the Common cloud native toolkit is extracted as follows:

```
$ export COMMON_CNTK=$WORKSPACEDIR/common-cntk
```

2. Set SPEC_PATH variable to the location where application and database YAML files are copied. See "[Assembling the Specifications](#)" to copy specification files if not already copied.

```
$ export SPEC_PATH=$WORKSPACEDIR/spec_dir
```

For example:

```
$ mkdir -p $SPEC_PATH/$PROJECT/$INSTANCE/common
$ cp $COMMON_CNTK/samples/applications.yaml $SPEC_PATH/$PROJECT/$INSTANCE/
applications.yaml

$ cp $COMMON_CNTK/samples/database.yaml $SPEC_PATH/$PROJECT/$INSTANCE/
database.yaml
$ cp $COMMON_CNTK/samples/credentials/common-
config.yaml $SPEC_PATH/$PROJECT/$INSTANCE/common/common-config.yaml
```

Creating Secrets

You must store sensitive data and credential information in the form of Kubernetes Secrets that the scripts and Helm charts in the toolkit consume. Managing secrets is out of the scope of the toolkit and must be implemented while adhering to your organization's corporate policies. Additionally, ATA service does not establish password policies.

Creating Secrets for Authorization Database Credentials

The database secret specifies the connectivity details and the credentials for connecting to the Authorization PDB (Authorization schema). This is consumed by the Authorization DB installer and Authorization runtime.

To create secrets for authorization database credentials:

1. Run the following script to create the required secrets:

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p <project-name> -i  
<instance-name> -a authorization -f $SPEC_PATH/$PROJECT/$INSTANCE/  
applications.yaml create database
```

<project-name> -> This value should match with the namespace in which you want to run the helm install.

<instance-name> -> This value should be matching with the instance that you are going to specify while doing the helm install.

For example:

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p sr -i quick -  
f $SPEC_PATH/sr/quick/applications.yaml -a authorization create database
```

2. Enter the corresponding values as prompted:

- Authorization DB Admin(sys) Username: Provide Authorization Database admin username
- Authorization DB Admin(sys) Password: Provide Authorization Database admin password
- Authorization Schema Username: Provide username for Authorization schema to be created
- Authorization Schema Password: Provide Authorization schema password
- Authorization DB Host: Provide Authorization Database Hostname
- Authorization DB Port: Provide Authorization Database Port
- Authorization DB Service Name: Provide Authorization Database Service Name

3. Verify that the following secret is created:

```
$ kubectl get secret -n <namespace>  
<project-name>-<instance-name>-authorization-db-credentials
```

Creating Secrets for Common Identity Provider Credentials

The OAuth (common identity provider) secret specifies the OIDC details of your identity provider. It is used by the Authorization service to protect the admin endpoints and for fetching the user profile information (subject, roles or groups, and so on) from access token. If authentication is enabled, ensure that you create an **oauthConfig** secret with the appropriate OIDC details of your identity provider.

To create secrets for common identity provider credentials, see "[Adding Common OAuth Secret and ConfigMap](#)" and "[Common Configuration Options For all Services](#)".

Installing Authorization Service Schema

To install the Authorization service schema:

1. Update values under authorization-schema in **\$SPEC_PATH/sr/quick/database.yaml** file with values required for authorization schema creation.

Note:

- The YAML formatting is case-sensitive. Use a YAML editor to ensure that you do not make any syntax errors while editing. Follow the indentation guidelines for YAML.
- Before changing the default values provided in the specification file, verify that they align with the values used during PDB creation. For example, the default tablespace name should match the value that you used while creating PDB.

2. Edit the **database.yaml** file and update the Authorization schema installer image to point to the location of your image as follows:

```
authorization-schema:
  #imagePullPolicy: IfNotPresent
  schema:
    image:
      name: "authorization-schema-1.0.0.0.0"
      tag: latest

  db:
    defaultTablespace: SYSTEM
    tempTablespace: TEMP
```

3. If your environment requires a password to download the container images from your repository, create a Kubernetes secret with the Docker pull credentials. See "[Kubernetes documentation](#)" for details. Refer the secret name in the **database.yaml**. Provide the image pull secret and image pull policy details.

```
authorization-schema:
  imagePullPolicy: IfNotPresent
  # The image pull access credentials for the "docker login" into Docker
  # repository, as a Kubernetes secret.
  # Uncomment and set if required.
  # imagePullSecret: ""
```

4. Run the following script to start the Authorization Schema installer, which instantiates a Kubernetes pod resource. The pod resource lives until the Schema installation operation completes.

```
$COMMON_CNTK/scripts/install-database.sh -p <project-name> -i
<instance-name> -f $SPEC_PATH/<project-name>/<instance-name>/database.yaml
-a authorization -c 1
```

<project-name> -> This value should match with the namespace in which you are running the helm install.
<instance-name> -> This value should be matching with the instance that you specified while creating the secret.

For Example:

```
$COMMON_CNTK/scripts/install-database.sh -p sr -i quick -f $SPEC_PATH/sr/quick/database.yaml -a authorization -c 1
```

5. Check the console to see if the Schema installer is installed successfully.
6. If the installation has failed, run the following command to review the error message in the log:

```
kubectl logs -n sr sr-quick-authorization-schema
```

7. Clear the failed pod by running the following command:

```
helm uninstall sr-quick-authorization-schema -n sr
```

8. Run the **install-database** script again to install the Authorization schema installer.

Creating an Authorization Service Instance in Your Environment

To create an Authorization service instance in your environment using the scripts that are provided with the toolkit:

1. Run the following command to create an Authorization service instance:

```
$COMMON_CNTK/scripts/create-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a authorization
```

The create-applications script uses the helm chart located in **\$COMMON_CNTK/charts/authorization-app** to create and deploy an authorization service.

2. If the scripts fail, run the following command to review the error message in the log:

```
kubectl logs -n sr sr-quick-authorization
```

3. Clear the failed pod by running the following command:

```
helm uninstall sr-quick-authorization -n sr
```

4. Fix the issues, if any, and run the script again to deploy the Authorization service.

Upgrading the Authorization Instance

Upgrading Authorization is required when there are updates made to **applications.yaml** or other configuration files.

To upgrade the Authorization instance:

1. Run the following command:

```
$COMMON_CNTK/scripts/upgrade-applications.sh -p sr -i quick -  
f $COMMON_CNTK/sr/quick/applications.yaml -a  
authorization
```

2. After running the script, validate the Authorization service by running the `application-status` script.

Restarting the Authorization Instance

To restart the Authorization instance:

1. Run the following command to restart Authorization service:

```
$COMMON_CNTK/scripts/restart-applications.sh -p sr -i quick -  
f $SPEC_PATH/sr/quick/applications.yaml -a authorization
```

2. After running the script, validate the Authorization service by running the `application-status` script.

Deleting the Authorization Service Instance and Authorization Schema

To delete the Authorization instance:

1. Run the following command to delete the Authorization service instance:

```
$COMMON_CNTK/scripts/delete-applications.sh -p <project-name> -i <instance-  
name> -f  
$COMMON_CNTK/<project-name>/<instance-name>/applications.yaml -a  
authorization
```

2. Run the following script to delete the Authorization Schema installed, which instantiates a Kubernetes pod resource. The pod resource stays until the Schema deletion completes:

```
$COMMON_CNTK/scripts/install-database.sh -p <project-name> -i <instance-  
name> -f $COMMON_CNTK/<project-name>/<instance-name>/database.yaml -a  
authorization -c 2
```

5

Deploying OpenSearch and OpenSearch Dashboard

This chapter describes how to deploy the OpenSearch service and OpenSearch dashboard.

Configuring OpenSearch and OpenSearch Dashboard Images

The Common CNTK has a sample that provides deployment instructions for OpenSearch on Kubernetes cluster using Helm charts. For more information, see <https://opensearch.org/docs/latest/install-and-configure/install-opensearch/helm/>



Note:

You can install any OpenSearch available in the market. Oracle recommends you to use OCI OpenSearch or OpenSearch with the configuration parameters provided under samples directory in **common-cntk**.

Installing OpenSearch Helm Charts

To install OpenSearch Helm charts, run the following commands:

```
helm repo add opensearch https://opensearch-project.github.io/helm-charts/  
helm repo update  
helm search repo opensearch //you should see 2 charts opensearch/opensearch &  
opensearch/opensearch-dashboard
```

Creating an OpenSearch and OpenSearch Dashboard Instance without SSL and Oauth Enablement

This section provides information on creating an OpenSearch and OpenSearch Dashboard instance without having SSL and Oauth enablement.

Setting up Environment Variables

OpenSearch and OpenSearch Dashboard rely on access to certain environment variables to run seamlessly across different environments. The OpenSearch charts are available at **\$COMMON_CNTK/samples/charts/opensearch**.

The environment variables are configured in **\$COMMON_CNTK/samples/charts/opensearch/scripts/env.sh**.

Configure **OPENSEARCH_CHART_VERSION**, **OPENSEARCH_DASHBOARD_CHART_VERSION**, and **OS_NAMESPACE** in **env.sh** script.

To set up the environmental variables:

1. Set the OpenSearch namespace as follows:

```
export OS_NAMESPACE=sr
```

2. Set the OpenSearch chart version as follows:

```
export OPENSEARCH_CHART_VERSION=<chart version>
```

3. Set the OpenSearch dashboard chart version as follows:

```
export OPENSEARCH_DASHBOARD_CHART_VERSION=<OpenSearch Dashboard chart version>
```



Note:

For the corresponding OpenSearch chart versions, see Unified Inventory and Topology Microservices.

Installing OpenSearch

For OpenSearch configuration overrides, see "[Assembling the Specifications](#)". To override the default values, copy the **\$COMMON_CNTK/samples/charts/opensearch/os_board_values.yaml** and **\$COMMON_CNTK/samples/charts/opensearch/os_engine_values.yaml** files to the **\$SPEC_PATH/opensearch** directory.

Install OpenSearch as follows:

```
$COMMON_CNTK/samples/charts/opensearch/scripts/create-opensearch.sh
```

To configure Persistence and Storage for OpenSearch, provide storage class name under `storageClass` as follows:

```
persistence:
  storageClass: <storageclass>
```

If you use a private or alternative Docker registry, provide the registry URL in the following command. For example: "myregistry.example.com":

```
global:
  dockerRegistry: ""
```

Installing OpenSearch Dashboard

Install the OpenSearch dashboard using the following command:

```
$COMMON_CNTK/samples/charts/opensearch/scripts/create-opensearch-dashboard.sh
```

Accessing the OpenSearch Dashboard Service

Access the OpenSearch dashboard using the node port of the OpenSearch dashboard service in the namespace.

```
export NODE_PORT=$(kubectl get --namespace $OPENSEARCH_NS -o
jsonpath="{.spec.ports[0].nodePort}" services os-board-opensearch-dashboards)
export NODE_IP=$(kubectl get nodes --namespace $OPENSEARCH_NS -o
jsonpath="{.items[0].status.addresses[0].address}")
echo http://$NODE_IP:$NODE_PORT
```

Installing FluentD

Update the **\$COMMON_CNTK/samples/charts/fluentd/template/fluentd-config-map.yaml** file with OpenSearch details such as type, host, port, scheme, user, password, and ssl_verify as follows:

```
#Export the kubernetes namespace to be used for OpenSearch installation
helm install fluentd-logging $COMMON_CNTK/samples/charts/fluentd --
values $COMMON_CNTK/samples/charts/fluentd/values.yaml
```

Creating an OpenSearch and OpenSearch Dashboard Instance with SSL and Oauth Enablement

This section provides information on creating an OpenSearch and OpenSearch Dashboard Instance with SSL and Oauth enablement.

Setting up Environment Variables

To set up environmental variables, see [Setting up Environment Variables](#).

Configuring config.yml

While configuring **\$COMMON_CNTK/samples/charts/opensearch/config.yml** for OpenSearch with an Identity Provider (IdP), set up authentication parameters to enable seamless and secure integration.

To configure config.yml:

1. Define the `openid_connect_idp` settings to include the discovery URL, client ID, and client secret of the IdP, which are essential for OpenID Connect (OIDC) authentication.
2. Specify the authorization and token endpoints provided by the IdP to handle user logins and configure role mapping to assign user roles based on the IdP attributes.

This setup allows OpenSearch to authenticate users through the IdP, easing access management while enhancing the security and compliance using:

- `openid_connect_url`: The OpenID configuration URL of IdP.
- `client_id` and `client_secret`: To securely authenticate OpenSearch with the Identity Provider (IdP) for OpenID Connect.

Creating Secrets in OpenSearch

To create secrets in OpenSearch:

1. Create a Kubernetes secret for the IdP trust certificate as follows:

```
kubectl create secret generic <opensearch-namespace>-opensearch-idp-cert
--from-file idp-chain-cert.pem=<IDP chain cert path> -n <opensearch-
namespace>
```

2. Create a Kubernetes secret for OpenSearch IdP configuration after providing the required information in config.yml as follows:

```
kubectl create secret generic <opensearch-namespace>-opensearch-idp-
config-secret --from-file config.yml=<path/config.yml> -n <opensearch-
namespace>
```

3. Configure rolesMappingSecret for OpenSearch roles mapping as follows:

```
kubectl create secret generic <opensearch-namespace>-opensearch-
rolesmapping-secret --from-file roles_mapping.yml=<path/role_mapping.yml> -
n <opensearch-namespace>
```

4. Configure internalUsersSecret for OpenSearch internal users as follows:

```
kubectl create secret generic <opensearch-namespace>-opensearch-
internalusers-secret --from-file internal_users.yml=<path/
internal_users.yml> -n <opensearch-namespace>
```

Note:

The default username and password are used.

Implement Custom Certificates in OpenSearch

To implement custom certificates in OpenSearch:

1. Create the common certificates and common keys.
2. Create a secret from the common certificate and common key as follows:

```
kubectl create secret generic <opensearch-namespace>-opensearch-keystore-
cert --from-file=commoncert.pem=<path/commoncert.pem> --from-
file=commonkey.pem=<path/commonkey.pem> -n sr
```

3. Provide the secretName under secretMounts in os_engines_values.yml as follows:

```
- name: commoncertandkey
  secretName: <opensearch-namespace>-opensearch-keystore-cert
  path: /usr/share/opensearch/config/certs
```

4. Provide the Distinguished Names (DNs) for authorized admin users in **plugins.security.authcz.admin_dn** and for trusted nodes in **plugins.security.nodes_dn** to control the access and secure node communication in OpenSearch.
5. Configure disabling of the installation of demo configuration settings that include demo users, roles, and certificates as follows:

```
env:
  name: DISABLE_INSTALL_DEMO_CONFIG
  value: true
```

6. Update **os_engine_values.yaml** to enable Security Plugin for OpenSearch. Comment the following section or set the value to **false**:

```
extraEnvs:
- name: DISABLE_SECURITY_PLUGIN
  value: "false"
```

Create an OpenSearch Instance

To create an OpenSearch instance:

1. Run the following command to create opensearch instance:

```
$COMMON_CNTK/samples/charts/opensearch/scripts/create-opensearch.sh
```

2. Run the `runsecurity-admin.sh` script to apply the changes that are made while implementing the custom certificates as follows:

```
$COMMON_CNTK/samples/charts/opensearch/scripts/runsecurity-admin.sh
```

Configuring opensearch_dashboards.yml for OpenSearch Dashboards Settings

The **opensearch_dashboards.yml** configuration file is essential for setting up and customizing the behavior of OpenSearch Dashboards. This file contains various settings that control how the dashboards interact with OpenSearch, including authentication, security, and connection parameters as follows:

- `opensearch.password`: The Basic Authentication password for accessing OpenSearch.
- `opensearch_security.openid.base_redirect_url`: The redirect URL for OpenSearch authentication.
- `opensearch_security.openid.connect_url`: The OpenID configuration URL of IdP.
- `opensearch_security.openid.client_id`: The client ID for OpenSearch authentication with the IdP.
- `opensearch_security.openid.client_secret`: The client secret to secure communication with the IdP.
- `opensearch_security.openid.scope`: The authentication scope.

Creating Secrets in Opensearch Dashboard

To create secrets for OpenSearch Dashboard:

1. Create a Kubernetes Secret with the IdP trust Certificate and mount the secret in **os_board_values.yml** under **secretMounts** as follows:

```
kubectl create secret generic <opensearch-namespace>-opensearch-idp-cert --  
from-file idp-chain-cert.pem=<Path/IDP chain cert path> -n <opensearch-  
namespace>
```

 Note:

You may skip this step if you have created a Kubernetes secret for OpenSearch earlier.

2. Create a Kubernetes secret containing the OpenSearch Dashboards configuration and the corresponding location within the container:

```
kubectl create secret generic <opensearch-namespace>-opensearch-dashboard-  
config --from-file=opensearch_dashboards.yml=<path/  
opensearch_dashboards.yml> -n <opensearch-namespace>
```

Setting up Ingress Controller for OpenSearch Dashboard

Using NGINX as an Ingress Controller for OpenSearch Dashboards provides a highly configurable and stable solution for managing external access to your OpenSearch environment. By deploying NGINX as the ingress, you can direct traffic to OpenSearch Dashboards using custom routing rules, including domain-based and path-based routing, allowing a better traffic control. You can use any Generic Ingress Controller that is available in the market. The following samples are for NGINX.

The OpenSearch Dashboards integrate seamlessly with NGINX ingress in Kubernetes environments to provide secure and scalable access. By leveraging the NGINX ingress controller, administrators can share the Dashboards service externally, allowing users to interact with the OpenSearch data through a web-based interface.

To setup NGINX for dashboard, configure below values in **os_board_values.yml**:

- **ingressClassName**: Provides the ingress class name value under the **ingress.ingressClassName** field.
- **secretName**: Defines the TLS secret that contains the SSL certificate for HTTPS.
- **tls.host**: Specifies the domain for accessing OpenSearch Dashboards over HTTPS.
- **hosts.host**: Specifies the domain for accessing OpenSearch Dashboards over HTTPS.

Run the following to create the secret:

```
kubectl create secret tls <project>-<instance>-opensearch-ingress-tls-cert-  
secret --cert=<path/commoncert.pem> --key=<path/commonkey.pem> -n <os-  
namespace>
```

Registering OpenSearch or OpenSearch Dashboard in Identity Provider

You must create OAuth 2.0 client in your IDP. You can use the same client created for ATA service. For more information, see "[Registering ATA in Identity Provider](#)".

In addition to the steps you perform while registering ATA in IdP, add the redirect URI: **https://<opensearch-instance>.<opensearch-namespace>.opensearch.uim.org:<LB-PORT>/auth/openid/login**

Add the following Post Logout Redirect URI:

https://<opensearch-instance>.<opensearch-namespace>.opensearch.uim.org:<LB-PORT>

Create OpenSearch Dashboard Instance

To create a OpenSearch dashboard instance, run the following command:

```
$COMMON_CNTK/samples/charts/opensearch/scripts/create-opensearch-dashboard.sh
```

Accessing the OpenSearch Dashboard

Access the OpenSearch dashboard URL that should redirect to the IdP login page. After you successfully log in, the OpenSearch dashboard appears.

Dashboard URI: https://<instance>.<project>.opensearch.<hostSuffix>:<nginx-port>/app/home#/

Example: https://quick.sr.opensearch.uim.org:30543/app/home#/



Note:

Make sure you add the entry in the hosts file: <k8s cluster ip or external loadbalancer ip> <instance>.<project>.opensearch.<hostSuffix>

Upgrading the OpenSearch and OpenSearch Dashboard Service

This section provides information about upgrading the OpenSearch and OpenSearch dashboard services.

Upgrade OpenSearch Service

Upgrading OpenSearch is required when there are updates in the OpenSearch values yaml file.

To upgrade the OpenSearch instance:

```
$COMMON_CNTK/samples/charts/opensearch/scripts/upgrade-opensearch.sh
```

Upgrade OpenSearch Dashboard Service

Upgrading OpenSearch dashboard is required when there are updates in the OpenSearch dashboards values yml file.

To upgrade OpenSearch dashboard service:

```
$COMMON_CNTK/samples/charts/opensearch/scripts/upgrade-opensearch-dashboard.sh
```

After running the script, verify the OpenSearch dashboard service by accessing it on a browser.

Deleting the OpenSearch and OpenSearch Dashboard Service

This section provides information on deleting the OpenSearch and OpenSearch dashboard services.

Deleting OpenSearch Service

To delete the OpenSearch instance:

```
$COMMON_CNTK/samples/charts/opensearch/scripts/delete-opensearch.sh
```

Deleting OpenSearch Dashboard Service

To delete the OpenSearch dashboard instance:

```
$COMMON_CNTK/samples/charts/opensearch/scripts/delete-opensearch-dashboard.sh  
helm uninstall fluentd-logging --namespace=$OPENSEARCH_NS
```

Alternate Configuration Options for OpenSearch and OpenSearch Dashboard

This section provides alternate configuration options for OpenSearch and OpenSearch dashboard.

Setting up Traefik Ingress Controller for OpenSearch Dashboard

Using Traefik as an Ingress Controller for OpenSearch Dashboards provides a robust, flexible way to manage and route external traffic to your OpenSearch environment. By setting up Traefik, you enable seamless access control and traffic routing through HTTP or HTTPS, helping secure and balance traffic flow to your OpenSearch Dashboards. Traefik supports dynamic configuration, allowing you to set up rules based on domain names, paths, or other criteria, making it highly adaptable to different deployment environments.

While using Traefik as an Ingress Controller for OpenSearch Dashboards, you can configure the required strategies in your **traefik.yml** file based on whether TLS is enabled or disabled. If TLS is enabled, you can specify the TLS certificates for secure HTTPS connections, ensuring encrypted communication between users and OpenSearch Dashboards. If TLS is disabled, Traefik routes the traffic over HTTP, bypassing the encryption step.

To setup Traefik for dashboard, configure below values in `traefik.yml`:

- `name`: Configure the Traefik Ingress Controller with a specific name. Replace `<project>` and `<instance>` with your project and instance identifiers to apply this setting specifically to your OpenSearch Dashboards setup.
- `match`: Replace `<instance>`, `<project>`, and `<hostSuffix>` with your specific instance, project name, and domain suffix to ensure accurate routing within your Traefik setup.
- `TLSOptions.name`: Replace `<project>` and `<instance>` with your project and instance names to create a dedicated TLS configuration for your OpenSearch deployment.

To access the OpenSearch Dashboard:

You can access OpenSearch dashboard using: `https://`

`<instance>.<project>.opensearch.<hostSuffix>:<traefik-port>/app/home#/`

Changing the Default OpenSearch Basic Auth Password

To enhance security, update the default admin password in `internal_users.yml` by generating a hashed password using the OpenSearch hash script.

To change the default OpenSearch basic auth password:

1. Navigate to the OpenSearch Security plugin directory in `opensearch` pod as follows:

```
cd /usr/share/opensearch/plugins/opensearch-security/tools
```

2. Run the following:

```
./hash.sh "<your-password>"
```

3. Copy the hashed password and update `internal_users.yml`.
4. Set the same password in `opensearch_dashboards.yml`.
5. Replace the existing password hash with the new hashed value to secure the admin account.
6. To ensure compatibility, add the same password (in plain text) under `opensearch.password` in `opensearch_dashboards.yml`.
This configuration allows OpenSearch Dashboards to authenticate with the updated credentials, aligning password settings across both files.

Creating Ingest Pipeline for OpenSearch

Login to OpenSearch Dashboard and navigate to **DevTools** on the top-right corner of the Home page and run the following to add the `lang_pipeline` in OpenSearch:

```
PUT _ingest/pipeline/lang_pipeline
{
  "description": "Pipeline to ensure documents have a lang field",
  "processors": [
    {
      "script": {
        "lang": "painless",
        "source": ""
        if (ctx.lang == null) {
          throw new IllegalArgumentException('Document does not have the
```

```
*lang* field');  
    }  
    ""  
  }  
}  
]  
}
```

Debugging and Troubleshooting

OpenSearch pods restarting with error, related to max virtual memory areas

When you get the error: **vm.max_map_count [65530] is too low, increase it to at least [262144]**. In OpenSearch pods, you need to set **vm.max_map_count** to **262144** on each worker node where the OpenSearch pod is getting scheduled. Run the following commands on the nodes:

```
sudo sysctl -w vm.max_map_count=262144  
  
# Alternatively you can run the following to save changes permanently  
echo "vm.max_map_count=262144" >> /etc/sysctl.conf  
sysctl -p
```

After logging in to the OAuth-enabled OpenSearch dashboard, seeing user ID instead of username

If you get a user ID instead of a username in the user-info section, you can configure a custom property mapper to map the username to the **sub** claim of the access token and add it to your scope configured with the OAuth client.

In the case of Keycloak, you can create a user property mapper.

6

Deploying SmartSearch

This chapter describes how to deploy the SmartSearch service.

About SmartSearch

SmartSearch is a micronaut application, when integrated with OpenSearch, offers a powerful, flexible, and feature-rich search experience that can be tailored to specific business and user needs. Using OpenSearch as the underlying engine, SmartSearch can handle large volumes of data, perform real-time indexing, and support complex querying to enhance search relevancy. Features such as autocomplete, fuzzy matching, synonym recognition, and intelligent ranking make it easier for users to locate precise information, even if search terms are partially matched or misspelled.

Creating a SmartSearch Instance

This section describes how to create a SmartSearch service instance in your cloud native environment using the operational scripts and the configuration provided in the Common cloud native toolkit (Common CNTK).

Before you create a SmartSearch instance, you must validate cloud native environment. See "[Planning UIM Installation](#)" for details on prerequisites.

In this section, while creating a basic instance, the project name is considered as `sr` and instance name is considered as `quick`.



Note:

The project and instance names cannot contain any special characters.

Creating SmartSearch Schema

The SmartSearch schema in OpenSearch is structured to optimize search performance and relevance, using six main indexes: Location, Logical Device, Physical Device, Equipment, Communication, and Events. Each index is defined by mappings that specify field types such as text for full-text search and keyword for exact matches and may include custom analyzers for handling text processing tasks such as tokenization and synonyms. Additionally, metadata is configured for each index to control search behavior, supporting features such as filters, sorting, and autocomplete to enhance user experience. All indexes are accessed using aliases, providing a flexible way to query and manage data. This setup ensures fast, accurate, and relevant search results tailored to user needs.

Prerequisites

Ensure the following environment variables are set:

- **SMARTSEARCHDOMAIN:** Set this to the SmartSearch service endpoint (format: `export SMARTSEARCHDOMAIN=<host:port/appVersion>`), using the corresponding version .

 Note:

For SmartSearch appVersion, see UIM Compatibility Matrix.

- **CLIENT_SECRET, CLIENT_ID, SCOPE, and IDP_TOKEN_URL:** These are necessary for generating the access token for the SmartSearch service.
- Ensure **SMARTSEARCHDOMAIN** and **IDP_TOKEN_URL** are accessible and included in the **NO_PROXY** settings or that the proxy is disabled.
- Ensure the relevant domain entries are present in the **/etc/hosts** file. For example:
`<instance>.<project>.topology.<hostSuffix>`

Creating Index and Metadata

To create index and metadata:

1. Navigate to the **smartsearch** directory:

```
cd $COMMON_CNTRK/scripts/smartsearch
```

2. Run the script to create indexes and metadata for NPD:

```
./refreshIndexes.sh --ssl-cert-smartsearch <path-to-cert> --ssl-cert-oauth  
<path-to-cert>
```

3. (Optional) For non-secure deployments, use the `--security-enable false` flag.

Validating the Indexes

To validate the indexes:

1. Access the OpenSearch dashboard and navigate to **DevTools**.
2. Run the following command to verify if the required indexes are created:

```
GET /_cat/indices
```

3. Check if the following indexes with any suffixes are present:

- `smartsearch-location-{*}`
- `smartsearch-communication-{*}`
- `smartsearch-physicaldevice-{*}`
- `smartsearch-logicaldevice-{*}`
- `smartsearch-equipment-{*}`
- `smartsearch-event-{*}`

 Note:

If any of these indexes are missing, rerun the script.

Accessing the SmartSearch Service

To access SmartSearch service, use the SmartSearch endpoint in the format: `http://<topology-instance>.<topology-project>.topology.<hostSuffix>:<port>/<appVersion>/<uri-endpoint>`

For example: SmartSearch API endpoint is `http://quick.sr.topology.uim.org:30309/20240801/health`



Note:

Make sure you add entry in **/etc/hosts**: `<k8s cluster ip or external loadbalancer ip> quick.sr.topology.uim.org`.

For SmartSearch appVersion, see UIM Compatibility Matrix.

Validating the SmartSearch Instance

To validate the SmartSearch instance, run the following to check the status of the deployed SmartSearch instance:

```
$COMMON_CNTK/scripts/application-status.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a smartsearch application-status
```

This script returns the status of the SmartSearch service deployments and pods status.

Monitoring the SmartSearch Health

Use the following command to monitor the SmartSearch endpoint health:

```
https://<loadbalancerhost>:<loadbalancerport>/<appVersion>/health
```

Configure Logging for SmartSearch

To update log level for SmartSearch, check the following steps:

1. Update **SmartSearch.env.LOGLEVEL** value with the appropriate Log level (ERROR, INFO, DEBUG, TRACE) in **\$SPEC_PATH/sr/quick/applications.yaml**.
2. Upgrade SmartSearch instance as follows:

```
$COMMON_CNTK/scripts/upgrade-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a smartsearch
```

Managing SmartSearch SSL Certificates

To renew SmartSearch ingress SSL certificates or to import any new Egress certificate in SmartSearch truststore, see "[Managing Certificate Expiry](#)".

Setting up Environment Variables

The SmartSearch service relies on access to certain environment variables to run seamlessly. Ensure the following variables are set in your environment:

- Path to your common cloud native toolkit
- Traefik namespace (Optional)

To set the environment variables:

1. Set the `COMMON_CNTK` variable to the path of directory where common cloud native toolkit is extracted as follows:

```
$ export COMMON_CNTK=$WORKSPACEDIR/common-cntk
```

2. In case Traefik is used as ingress, set the `TRAEFIK_NS` variable for Traefik namespace as follows:

```
$ export TRAEFIK_NS=Traefik Namespace
```

3. Set the variable for Traefik Helm chart version. For the corresponding version, see UIM Compatibility Matrix. The following is a sample for Traefik chart version 15.1.0.

```
$ export TRAEFIK_CHART_VERSION=15.1.0
```

4. Set `SPEC_PATH` variable to the location where application and database yamls are copied. See "[Assembling the Specifications](#)" to copy specification files if not already copied.

```
$ export SPEC_PATH=$WORKSPACEDIR/spec_dir
```

Registering the Namespace

After you set the environment variables, register the namespace if Traefik is used as Ingress Controller.

To register the namespace, run the following command:

```
$COMMON_CNTK/scripts/register-namespace.sh -p sr -t targets
# For example, $COMMON_CNTK/scripts/register-namespace.sh -p sr -t traefik
# Where the targets are separated by a comma without extra spaces
```



Note:

`traefik` is the name of the target for registration of the namespace `sr`. The script uses `TRAEFIK_NS` to find these targets. Do not provide the Traefik target if you are not using Traefik.

For Generic Ingress Controller, you do not have to register the namespace. To select the ingress controller, provide the **ingressClassName** value under the **ingress.className** field in the **applications.yaml** file. For more information about `ingressClassName`, see <https://kubernetes.io/docs/concepts/services-networking/ingress/>

Creating Secrets

To create secrets:

1. Run the following command to generate the `openSearchCredentials` secret and enter the basic auth credentials of OpenSearch as prompted:

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p sr -i quick -a
smartsearch -f $SPEC_PATH/samples/applications.yaml create
openSearchCredentials

#Enter the values appropriately against prompts:
opensearch username: admin    #opensearch basic oauth credentials
opensearch password: xxxxxx
```

2. Verify if the secrets are created as follows:

```
sr-quick-open-search-credentials
```

Secret for Authentication Details

The SmartSearch service uses configuration values from Kubernetes secret (`<namespace>-<instance>-oauth-credentials`) and Config Map (`<namespace>-<instance>-oauth-config-cm`) objects from the same namespace. This Secret and Configuration Map Kubernetes objects have to be created before deploying the SmartSearch service for authentication. See ["Adding Common OAuth Secret and ConfigMap"](#) for creating the secret.

Secret to Pass Egress Certificates to SmartSearch

You have to create a `commonTrust` secret to provide SSL certificates of IdP, OpenSearch, and so on to SmartSearch.

To create `commonTrust` secret:

1. Generate **truststore.jks** that contains the required certificates as follows:

```
#generate truststore with idp cert (applicable only if authentication is
enabled )
keytool -importcert -v -alias <param> -file <path to IDP cert file> -
keystore <truststorename>.jks -storepass <password>

#add opensearch ssl trust certificate in truststore
keytool -importcert -v -alias <param> -file <path to opensearch cert file>
-keystore <truststorename>.jks -storepass <password>
```

2. Run the below command to generate the Kubernetes secret. The system will prompt for the truststore file path and password of truststore. Provide the details accordingly.

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p project -i instance -
f $SPEC_PATH/project/instance/applications.yaml create commonTrust
```

Configuring applications.yaml

In `$SPEC_PATH/sr/quick/applications.yml`, the SmartSearch image and tag are configured to specify the container image used for the SmartSearch service. The `image` tag can be updated as new version of the image are released, allowing easy upgrades and ensuring the application runs the latest features and security patches. To apply a new image version, simply change the tag in `applications.yml` to the desired version, facilitating version control and deployment management.

To configure the `applications.yaml` file:

1. Download the Oracle Communications Unified Inventory Management SmartSearch image from Oracle Software Delivery Cloud.
2. Load the image from tar file and push the image to container repository. Refer "**About Container Image Management**" in *UIM Cloud Native Deploy Guide*.

```
podman load -I <smart-search-latest.tar>
podman tag smart-search:latest <container repository>/smart-search:latest
podman push <container repository>/smart-search:latest
```

3. Update the corresponding values under the `smartsearch` section in `$SPEC_PATH/PROJECT/INSTANCE/applications.yaml`.
4. Edit the `applications.yaml` file and enter the name and tag of the SmartSearch image from your repository as follows:

```
smartSearch:
  image:
    name: <container repository>/smart-search
    tag: 0.3.11
```

5. You can provide an image pull secret as follows to pull images from your private repository:

```
# The image pull access credentials for Private repository, as a
# Kubernetes secret.
# uncomment and set if required.

# imagePullSecret:
#   imagePullSecrets:
#     - name: regcred
```

6. Set `pullPolicy` for SmartSearch images in `applications.yaml` as follows:

```
smartSearch:
  #Provide imagePullPolicy i.e Always, IfNotPresent, Never
  imagePullPolicy: IfNotPresent
```

7. Update `loadbalancerport` in `applications.yaml` as follows:

```
# For Generic and Traefik Ingress Controllers:
# If ssl is enabled this would be loadbalancer's ssl port.
# IF ssl is disabled this would be loadblancer's non ssl port.
# For example ssl and non-ssl ports for external loadbalancer would be 443
# and 80 respectively.
```

```
# If loadbalancer is not created, provide nodePort of Nginx/Traefik or any
other Generic Ingress Controller
```

```
loadBalancerPort: 30505
```

8. For Generic ingress controller update as follows:

- Update **applications.yaml** as follows to provide the following annotations to enable stickiness through cookies:

```
# Valid values are TRAEFIK, GENERIC
ingressController: "GENERIC"
```

- Annotations for NGINX is as follows:

```
ingress:
  className: nginx ##provide ingressClassName value, default value for
nginx ingressController is nginx.
  # This annotation is required for nginx ingress controller.
  annotations:
    nginx.ingress.kubernetes.io/affinity: "cookie"
    nginx.ingress.kubernetes.io/affinity-mode: "persistent"
    nginx.ingress.kubernetes.io/session-cookie-name:
"nginxingresscookie"
    nginx.ingress.kubernetes.io/proxy-body-size: "50m"

smartSearch:
  #uncomment and provide applications specific annotations if
required, these will get added to list of annotations specified in
common section.
  ingress:
    annotations:
      nginx.ingress.kubernetes.io/rewrite-target: /$2
```

9. Set the **authentication.enabled** flag to true to enable authentication as follows:

```
# The enabled flag is to enable or disable authentication
authentication:
  enabled: true
```

Creating a SmartSearch Instance

To create an SmartSearch service instance in your environment using the scripts that are provided with the toolkit:

1. Run the following command to create an SmartSearch service instance:

```
$COMMON_CNTK/scripts/create-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/
applications.yaml -a smartsearch
```

The `create-applications` script uses the Helm chart located in **\$COMMON_CNTK/charts/smartsearch-app** to create and deploy a SmartSearch service.

2. (Optional) If the scripts fail, run the following command to review the error message in the log:

```
kubectl logs -n sr sr-quick-smartsearch
```

3. Clear the failed pod by running the following command:

```
helm uninstall sr-quick-smartsearch-n sr
```
4. Fix the issues if any and run the script again to deploy the SmartSearch service.

Upgrading the SmartSearch Service

Upgrading SmartSearch is required when there are updates made to **applications.yaml** or other configuration files.

To upgrade the SmartSearch instance:

1. Run the following command to upgrade the SmartSearch service:

```
$COMMON_CNTK/scripts/upgrade-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a smartsearch
```
2. After script is run, validate the SmartSearch service by running the `application-status` script.

Restarting the SmartSearch Instance

To restart the SmartSearch instance:

1. Run the following command to restart the SmartSearch service:

```
$COMMON_CNTK/scripts/restart-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a smartsearch
```
2. After running the script, validate the SmartSearch service by running the `application-status` script.

Deleting the SmartSearch Service

To delete the SmartSearch instance, run the following command to delete the SmartSearch service instance:

```
$COMMON_CNTK/scripts/delete-applications.sh -p <project-name> -i <instance-name> $SPEC_PATH/sr/quick/applications.yaml -a smartsearch
```

Alternate Configuration Options for SmartSearch

You can configure SmartSearch using the following alternate options.

Setting Up a Secure Communication using TLS

To set up a secure communication using TLS:

1. Edit the **\$COMMON_CNTK/samples/applications.yaml** and set the TLS enabled to true.

```
tls:
  # The enabled flag is to enable or disable the TLS support for the smart
  search m-s end points
  enabled: true
```

Smartsearch API endpoint: `https://quick.sr.topology.uim.org:<LB Port>/<appVersion>/<uri-endpoint>`

2. Generate common certificates `commoncert.pem` and `commonkey.pem`. Refer "SSL Certificates" in Appendix.
3. Create IngressTLS secret to pass the generated certificate and key pem files:

```
$COMMON_CNTR/scripts/manage-app-credentials.sh -p sr -i quick -
f $SPEC_PATH/sr/quick/applications.yaml -a smartsearch create ingressTLS
```

The script prompts for the following detail:

- Ingress TLS Certificate Path (PEM file): `<path_to_cert.pem>`
 - Ingress TLS Key file Path (PEM file): `<path_to_key.pem>`
4. Verify that the following secrets are created successfully:

```
sr-quick-smart-search-ingress-tls-cert-secret
```

5. Create a SmartSearch Instance as usual and access the SmartSearch endpoints using `hostname <instance>.<instance>.topology.uim.org`
6. Add entry in `/etc/hosts` `<k8s cluster ip or external loadbalancer ip> quick.sr.topology.uim.org`.
The SmartSearch API endpoint is `https://quick.sr.topology.uim.org:<LB Port>/<appVersion>/<uri-endpoint>`

Supporting Wildcard Certificates

SmartSearch supports wildcard certificates. You can generate the wildcard certificates with the `hostSuffix` value provided in **applications.yaml**. The default is `uim.org`.

Change the `subDomainNameSeparator` value from period(.) to hyphen(-) so that incoming hostnames match the wildcard DNS pattern.

Make the following modifications to the **\$SPEC_PATH/project/instance/applications.yaml** file.

Uncomment and provide the value of `subDomainNameSeparator`. The default is ".".

```
#Value can be changed as "-" to match wild-card pattern of ssl certificates.
#Example hostnames for "-" quick-sr-topology.uim.org
subDomainNameSeparator: "-"
```

Scaling Up or Down the SmartSearch Service

To scale up or down the SmartSearch service:

1. Provide the replica count in **applications.yaml** to scale up or down the SmartSearch pods.
2. Update **applications.yaml** to increase replica count to 3 for topology-api deployment as follows:

```
smartSearch:
  replicas: 3
```


3. Apply the change in replica count to the running Helm release by running the upgrade-applications script as follows:

```
$COMMON_CNTK/scripts/upgrade-applications.sh -p sr -i quick -  
f $SPEC_PATH/sr/quick/applications.yaml -a smartsearch
```

Deploying Unified Operations Message Bus

This chapter describes how to deploy Unified Operations Message Bus.

Unified Operations Message Bus Overview

The Oracle Communications Unified Operations Message Bus (OCUOMB) service is a distributed event store and stream-processing platform service. The Message Bus clients send or receive the events or messages to or from the Message Bus through a specific channel called **Topic**. This enables that the source and target clients or services are loosely coupled and asynchronous. Message Bus uses Apache Kafka in its platform to support the event store and stream-processing and for packaging. For deployment, Message Bus uses Strimzi.

Strimzi simplifies the process of running Apache Kafka in a Kubernetes cluster. Strimzi provides container images and operators for running Apache Kafka on Kubernetes. Strimzi operators are fundamental for the smooth running of Strimzi. These operators are software extensions to Kubernetes that make use of custom resources to manage applications and their components. These operators simplify the process of:

- Deploying, running, and upgrading the Kafka cluster and its components.
- Configuring and securing access to Kafka.
- Creating and managing Kafka topics.

Operators are a method of packaging, deploying, and managing a Kubernetes application. The Strimzi operators extend Kubernetes functionality and automate common and complex tasks related to a Kafka deployment. By implementing knowledge of Kafka operations in code, Kafka administration tasks are simplified and require less manual intervention. See <https://strimzi.io/docs/operators/latest/overview.html> for more details on the Strimzi operators. Strimzi has the following operators:

- *Cluster Operator*: Deploys and manages the Apache Kafka clusters, Kafka Connect, Kafka Mirror Maker, Kafka Bridge, Kafka Exporter, Cruise Control, and the Entity Operator.
- *Entity Operator*: Comprises the Topic Operator and User Operator
- *Topic Operator*: Manages Kafka topics

See the following websites for more information on Strimzi and Apache Kafka:

- Strimzi: <https://strimzi.io/>
- Apache Kafka: <https://kafka.apache.org/>

The Message Bus service provides scripts and helm charts to deploy and manage the Apache Kafka cluster in Kubernetes by using the Strimzi operator and Kubernetes Custom Resources definitions. The Message Bus service does not provide any image builder toolkits to build the container images and by default, Helm charts pull the required container images from the quay.io/strimzi container repository.

Table 7-1 Container Images and Purposes

Container Image	Purpose
quay.io/stimzi/operator:<Stimzi_Operator_version>	Container Image with Stimzi Operator.
quay.io/stimzi/kafka:<Stimzi_Operator_version>-kafka-<Kafka_version>	Container Image with Apache Kafka and Stimzi distribution. In the following sections, the reference to the container image is named as STRIMZI_KAFKA_IMAGE_NAME



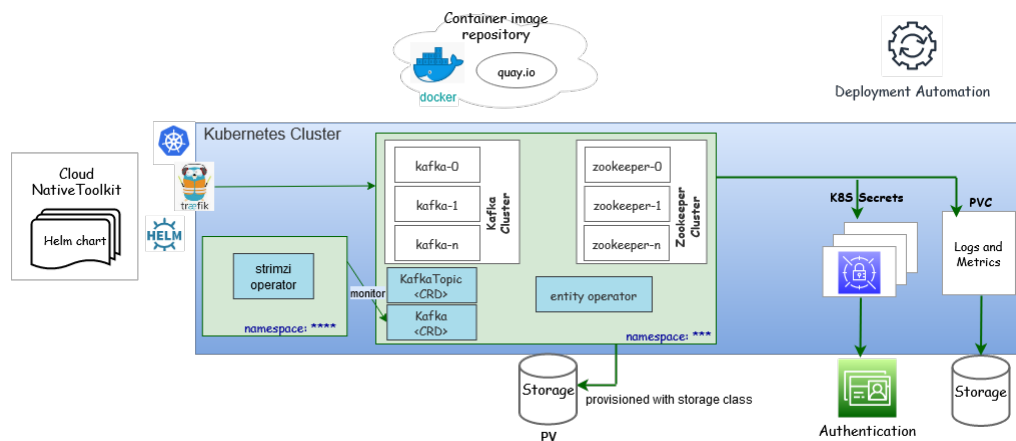
Note:

See "UIM Software Compatibility" in *UIM Compatibility Matrix* for the latest versions of software.

Message Bus Cloud Native Architecture

The Message Bus service uses Apache Kafka as a distributed event store platform. To run an Apache Kafka cluster on Kubernetes, the Message Bus service uses the Stimzi operator. Stimzi is an open-source project that provides container images and operators for running Apache Kafka on Kubernetes.

Figure 7-1 Message Bus Cloud Native Architecture



Access to Message Bus

While deploying the Message Bus Service in Kubernetes namespace, the following Kubernetes service objects are created to access the Message Bus pods either internally or externally (through an ingress controller). The external access is provided through the ingress controller by IngressRouteTCP objects.



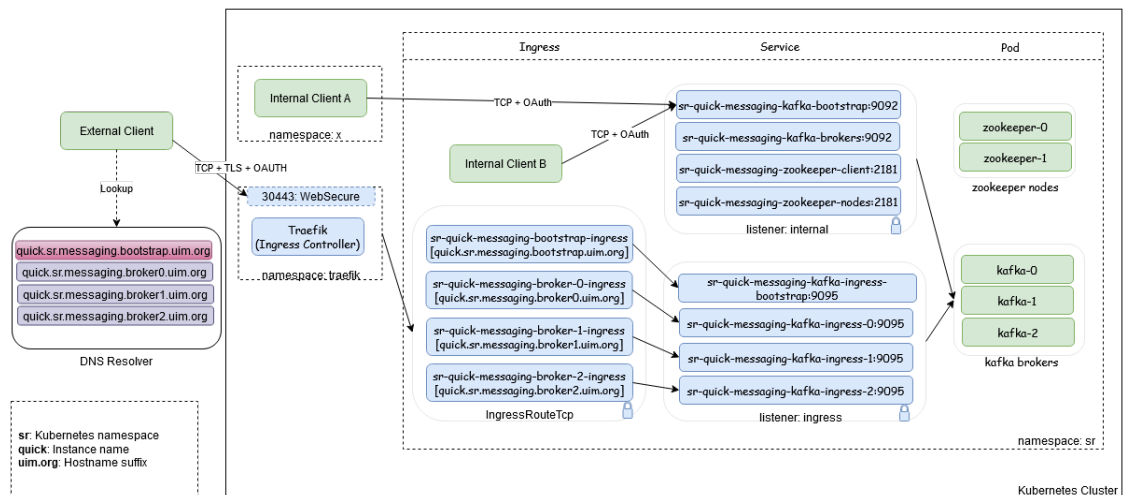
Note:

You can override the value of **subDomainNameSeparator**. The default separator is ".", This value can be modified as "-" to match the wild-card pattern of SSL certificates.

To override, uncomment and change the value in **applications.yaml** as follows:

```
#subDomainNameSeparator: "."
#Example hostnames for "-" : quick-sr-messaging-bootstrap.uim.org
```

Figure 7-2 Process of Accessing the Message Bus



The external access to Message Bus service is supported with **TCP+TLS+OAuth 2.0 Authentication** through Traefik ingress controller or a Generic ingress controller. The internal access to Message Bus Service is also supported with **TCP+TLS+OAuth 2.0 Authentication** where TLS can be configurable. Access to Message Bus service is configured through the listeners section in **applications.yaml** file.



Note:

- If the client is in the same Kubernetes cluster, the **internal** listener is used.
- If the client is outside the Kubernetes cluster, the **ingress** listener is used.

The Message Bus is deployed using the scripts provided in Common CNTK. For deployment prerequisites, see "[Planning UIM Installation](#)".

The following steps need to be followed to deploy a Kafka cluster in a Kubernetes namespace in a cluster:

1. Deploy the Strimzi operator to manage your Kafka cluster.

 Note:

This is an administrative one-time activity where additional cluster roles are required.

- a. Create a namespace to deploy Strimzi Operator.
 - b. Deploy Strimzi Operator in the namespace. See "[Deploying Strimzi Operator](#)" for more information.
2. Deploy the Message Bus that has Kafka cluster, ZooKeeper cluster, and entity operator.
 - a. Create a namespace to deploy the Kafka cluster.
 - b. Register the namespace with Strimzi Operator. See "[Register namespaces with Strimzi Operator](#)" for more information.
 - c. Register the namespace with Traefik. See "[Registering the Namespaces with Strimzi Operator](#)" for more information.

 Note:

- The ingress controller (Traefik or Generic) has to be available.
- Register the namespace with Traefik ingress controller. If you use Generic Ingress controller, ensure that **ingress.className** is set in the **applications.yaml** file.

- d. Deploy Kafka Cluster in the namespace. See "Deploy Kafka Cluster and Kafka Topic" for more information.
3. Validate the deployment with sample standalone producer and consumer clients. See the "Validating the Kafka cluster" and "Internal access - same namespace - plain" for more information.

Strimzi Operator

Export the Strimzi operator namespace environment variable to run the deployment script using the COMMON_CNTK:

```
export STRIMZI_NS=<STRIMZI_OPERATOR_NAMESPACE>
```

Configuration

The configurable parameters of the Strimzi Operator charts and their default values are listed in the corresponding subsections within this document.

To override the default values, copy the **\$COMMON_CNTK/samples/strimzi-operator-override-values.yaml** file to the directory **\$SPEC_PATH/<STRIMZI_PROJECT>**, where **<STRIMZI_PROJECT>** is the Kubernetes namespace where the Strimzi operator is being deployed.

Create Global Resources

While deploying multiple Strimzi operators in the same Kubernetes cluster, ensure that one operator has **createGlobalResources** set to `true` in the **strimzi-operator-override-values.yaml** file, and all other operators are set to `false`. While other operators can use an earlier version of Strimzi Operator, Oracle recommends you to keep all operators on the same version to avoid potential compatibility issues with CRDs and the corresponding shared resources.

Private Container Repository

The Strimzi operator pulls the Strimzi component container images from **quay.io** registry. If you want to maintain private container registry, **pull** the images from the **quay.io** registry and **push** them into the private container registry. It is mandatory to push the images with same name and tag, the repository path can be different. For Strimzi image and tag names, see "Unified Operations Message Bus Overview" for more information.

See "About Container Image Management" section from *UIM Cloud Native Deployment Guide* for more information on private container repository management.

To use the private container registry, uncomment and modify the values in **\$SPEC_PATH/ <STRIMZI_PROJECT>/strimzi-operator-override-values.yaml** file. Provide the modified **strimzi-operator-override-values.yaml** file path as an `-f` option to the Strimzi operator create/upgrade command.

If the private container registry requires authentication, create the Kubernetes secret in the namespace and provide the secret name as part of **strimzi-operator-override-values.yaml** file. Create the secret with same name in the namespace where the Kafka cluster is planned to deploy.

strimzi-operator-override-values.yaml file (Sample)

```
defaultImageRegistry: <Image registry>
defaultImageRepository: <Image Repository>
image:
  imagePullSecrets: <Pull Secret>
```

The following is a sample command to create Kubernetes secret for the registry. Create the secret in the namespace where the Strimzi operator is being deployed. See <https://kubernetes.io/docs/tasks/configure-pod-container/pull-image-private-registry/> for creating secret.

```
kubectl create secret docker-registry <secret-name> --docker-server=<Image
Registry> \
                                         --docker-
username=<Username> \
                                         --docker-
password=<Password> \
                                         -n
<STRIMZI_OPERATOR_NAMESPACE>
```

ImagePullPolicy

The following sample of **ImagePullPolicy** for Strimzi Operator is provided. To create the policy using a different procedure, see <https://kubernetes.io/docs/concepts/containers/images/#image-pull-policy>

strimzi-operator-override-values.yaml file (Sample)

```
image:
  imagePullPolicy: IfNotPresent
```

Resources

These resources are used for configuring the virtual resources (limits and requests). Uncomment or add the blow resources section with new values in the **strimzi-operator-override-values.yaml** file.

```
resources:
  requests:
    memory: <Mi>
    cpu: <m>
  limits:
    memory: <Gi>
    cpu: <"1">

fullReconciliationIntervalMs: 120000
operationTimeoutMs: 300000
```

The default values are as follows:

```
resources.limits.memory: 500Mi
resources.limits.cpu: 500m
resources.requests.memory: 1Gi
resources.requests.cpu: 1
```

Along with the above resources, you can provide the following additional configurations:

```
# Full reconciliation interval in milliseconds
fullReconciliationIntervalMs: 120000
# Operation timeout in milliseconds
operationTimeoutMs: 300000
```

Deploying Strimzi Operator

Run the following script to deploy the Strimzi operator in the Kubernetes namespace:

```
$COMMON_CNTK/scripts/strimzi-operator.sh -p <STRIMZI_OPERATOR_NAMESPACE> -c
create
```

Optionally, run the following script to deploy the Strimzi operator in Kubernetes namespace with custom image registry and repository:

```
$COMMON_CNTK/scripts/strimzi-operator.sh -p <STRIMZI_OPERATOR_NAMESPACE> -c  
create -f $SPEC_PATH/<STRIMZI_OPERATOR_NAMESPACE>/strimzi-operator-override-  
values.yaml
```

Upgrading Strimzi Operator

Run the following script to upgrade the Strimzi Operator in Kubernetes namespace:

```
$COMMON_CNTK/scripts/strimzi-operator.sh -p <STRIMZI_OPERATOR_NAMESPACE> -c  
upgrade
```



Note:

While upgrading **strimzi-cluster-operator** to a newer version, use the old toolkit for the older version of strimzi (the one already deployed) and new toolkit for upgrading to a newer version, in the case of **Create, Upgrade, Delete, Register** and **Unregister** operations.

Optionally, run the following script to deploy the Strimzi operator in Kubernetes namespace with custom image registry and repository:

```
$COMMON_CNTK/scripts/strimzi-operator.sh -p <STRIMZI_OPERATOR_NAMESPACE> -c  
upgrade -f $SPEC_PATH/<STRIMZI_OPERATOR_NAMESPACE>/strimzi-operator-override-  
values.yaml
```

Uninstalling Strimzi Operator

Run the following script to uninstall the Strimzi Operator from Kubernetes namespace:

```
$COMMON_CNTK/scripts/strimzi-operator.sh -p <STRIMZI_OPERATOR_NAMESPACE> -c  
delete
```

Validating Strimzi Operator

Validate the Strimzi operator that is installed in the provided namespace by running the following command:

```
$kubectl get pod -n <STRIMZI_OPERATOR_NAMESPACE>
```

NAME	READY	STATUS	RESTARTS	AGE
strimzi-cluster-operator-*****-***	1/1	Running	0	6m55s

Validate the Helm release installed for the Strimzi operator in the provided namespace by running the following command:

```
$helm list -n <STRIMZI_OPERATOR_NAMESPACE>
```

NAME	NAMESPACE	REVISION
STATUS	CHART	APP VERSION
strimzi-operator	<STRIMZI_OPERATOR_NAMESPACE>	1
deployed	strimzi-kafka-operator-x.y.z	x.y.z

Restarting the Strimzi Operator

Run the following script to restart the Strimzi Operator:

```
$COMMON_CNTK/scripts/strimzi-operator.sh -p <STRIMZI_OPERATOR_NAMESPACE> -c  
restart
```

Registering the Namespaces with Strimzi Operator

To create and manage the Kafka cluster in a Kubernetes namespace, this namespace must be registered with the Strimzi operator to monitor the CRDs.

Run the following script to register the namespace(s) with the Strimzi operator to monitor and create or manage the Kafka cluster and its components:

```
$COMMON_CNTK/scripts/register-namespace.sh -p <Namespace to be monitored> -t  
strimzi
```

Unregistering the Namespaces with Strimzi Operator

Run the following script to unregister the namespaces from the Strimzi operator:

```
$COMMON_CNTK/scripts/unregister-namespace.sh -p <Namespace to be un-  
monitored> -t strimzi
```

Configuring the applications.yaml File for Message Bus

Modify the values in the **applications.yaml** file and upgrade or create the Message Bus service. The following configurations are available for the Message Bus service:

- Image Pull Secrets
- Security Context
- Cluster Size
- Storage
- Broker Defaults
- JVM Options
- Kafka Topics
- Accessing Kafka Cluster

- Authentication

Using Image Pull Secrets

You use the Image Pull Secrets sample only while using the private container repository that requires authentication. These authentication details have to be provided as Kubernetes secret object in the namespace where the Kafka cluster is planned to be deployed. This process is also followed while deploying Strimzi Operator.



Note:

Provide the secret name in the **kafka-cluster** section, if using different secret name than in the Strimzi Operator's namespace.

Image Pull Secrets (Sample)

```
imagePullSecret:  
  imagePullSecrets:  
    - name: <secret name>
```

The sample command to create secret object for registry authentication is as follows:

```
kubectl create secret docker-registry <secret-name> --docker-server=<Image  
Registry> \  
                                         --docker-  
username=<Username> \  
                                         --docker-  
password=<Password> \  
                                         -n <Kafka-Namespace>
```

See <https://kubernetes.io/docs/tasks/configure-pod-container/pull-image-private-registry/> to create the secret object.

Security Context

The **userSecurity** section that has **securityContext** is applicable only when you want to define privilege and access control settings for a pod or container. The pod security context which is configured at the pod-level is provided as a sample and is applied to all containers in given pod.



Note:

If a value is commented, it cannot be used, To use a different key-value, uncomment the corresponding value in **applications.yaml**.

See <https://strimzi.io/blog/2022/09/09/configuring-security-context-in-pods-managed-by-strimzi/> and <https://kubernetes.io/docs/tasks/configure-pod-container/security-context/> for more information.

Security-Context (Sample)

```
userSecurity:
  securityContext:
    runAsNonRoot: <true/false>
    runAsUser: <userID>
    runAsGroup: <groupID>
    fsGroup: <fsGroup>
```

Cluster Size

The Message Bus cluster consists of Kafka Brokers and Zookeeper nodes. Modify the replicas count for the Kafka Brokers and Zookeeper nodes according to the usage. For high availability of Message Bus service, make sure the number of replicas is minimum **3** for Kafka and Zookeeper, in production instance and adjust Kafka Broker configuration accordingly:

```
kafka-cluster:
  replicas:
    kafka: 3
    zookeeper: 3
```

Storage

The Message Bus uses Strimzi to deploy the Apache Kafka cluster in Kubernetes cluster. For Strimzi to work as required, an efficient data storage infrastructure is essential. Oracle recommends using a block storage as Strimzi is tested for using with block storage. For more information on data storage, see <https://strimzi.io/docs/operators/latest/deploying#considerations-for-data-storage-str>

The Message Bus Service stores the events (or messages) in block storage using the Kubernetes Persistent Volumes. Modify the values for class, size, and **isDeleteClaim** values in storage section under the Kafka cluster. The storage class must have dynamic persistent volume provision capability:

```
kafka-cluster:
  #storage:
    #When storage.type below is set as "persistent-claim", the storage class
    name & size are mandatory to be set
    #type: persistent-claim
    #class: psrnfsn1
    #size: 1Gi
    #isDeleteClaim: false
```

For development to use ephemeral (that is, temporary container storage), do not change the values. These values must be commented for ephemeral.

Broker Defaults

The following configuration is applied when the Topics are auto created. Modify the following settings in the **kafkaConfig** section under the Kafka cluster accordingly:

```
kafka-cluster:
  kafkaConfig:
```

```
#The default replication factor for automatically created topics
defaultReplicationFactor: 2
offsetsTopicReplicationFactor: 2
transactionStateLogReplicationFactor: 2
transactionStateLogMinIsr: 2
minInsyncReplicas: 2
logRetentionMinutes: 30
numPartitions: 3
```

The values for replicationFactors and minimum in-sync replicas must be entered according to the values entered in the Kafka Cluster. These values must be less than or equal to the Kafka Cluster replica values.

For more information on the values, see the Kafka documentation at: <https://kafka.apache.org/081/documentation.html#brokerconfigs>

JVM Options

The Message Bus cluster consists of Kafka Brokers and Zookeeper nodes. Modify the **jvmOptions** for Kafka Brokers and Zookeeper nodes according to the usage. See <https://strimzi.io/docs/operators/latest/full/configuring.html#con-common-configuration-jvm-reference> for more details.

```
jvmOptions:
  kafka:
    -Xms: 1024m
    -Xmx: 1024m
    # javaSystemProperties:
    #   - name: <placeholder>
    #     value: <value>

  zookeeper:
    -Xms: 1024m
    -Xmx: 1024m
    # javaSystemProperties:
    #   - name: <placeholder>
    #     value: <value>
```

Kafka Topics

Add or update the Kafka Topics in the **applications.yaml** file in the **kafkaTopics** section which are required for the Message Bus service clients (producers or receivers).

For example:

```
kafka-topic:
  #List of Kafka topics
  kafkaTopics:
    - name: <topic1>
      partitions: <no_partitions>
      replicas: <no_replicas>
      config:
        retention: 7200000
        segmentBytes: 1073741824
```

The following topics are required for the ATA integration which are defined in the **applications.yaml** file within the Common CNTK samples. These topics are created during the deployment of Message Bus service using Common CNTK:

Table 7-2 Topic, producer, and consumer details.

Topic	Producer	Consumer	Additional Details
ora-uim-topology	UIM	ATA	See Unified Inventory Management System Administration Overview in <i>UIM System Administrator's Guide</i> for more details.
ora-alarm-topology	Assurance System	ATA	For more information, see "Deploying the Active Topology Automator Service"
ora-retry-topology	ATA	ATA	For more information, see "Deploying the Active Topology Automator Service"
ora-dlt-topology	ATA	ATA	For more information, see "Deploying the Active Topology Automator Service"
ora-sol005-lcm	Sol Adapter	External sol5 consumer	
ora-alarm-retry	ATA	ATA	For more information, see "Deploying the Active Topology Automator Service"
ora-alarm-dlt	ATA	ATA	For more information, see "Deploying the Active Topology Automator Service"
ora-test-topic	Standalone Test Client	Standalone test client	



Note:

Do not use the default topics (ora-uim-topology, ora-fault-topology, ora-retry-topology and ora-dlt-topology) for a standalone testing. Use only the **ora-test-topic** to test the deployment of Message Bus service.

Accessing Kafka Cluster

There are various listener type configurations available to access the Message Bus service internally and externally. The Authentication configuration is applied across all listener types. As part of Kafka cluster deployment, the Kubernetes service objects are created to provide access to Kafka cluster pods. This service objects are created based on the listener type configuration in the **applications.yaml** file for message-bus section. You can access the Message Bus service in any of the following ways:

- Accessing within the same cluster (Internal access)
- Accessing from outside of the cluster (External access)

**Note:**

When a Message Bus service is deployed, it autogenerates the certificates of TLS for server and client. You must use the custom certificates so that the certificates are retained when the service is terminated and created again. See ["Using Wild Card Certificates"](#) for more information.

Accessing the Message Bus service from within the same cluster (Internal access)

The **internal** listener configuration in the **applications.yaml** file is used when the client services are in the same Kubernetes cluster, which can be in the same namespace or a different namespace. This configuration is enabled by default.

```
kafka-cluster:
  listeners:
    #Plain is for internal access within the same k8s cluster.
    internal:
      # Enable the tls to true if encryption/decryption is needed for
internal access
      #tls: false
```

See ["Configuring Message Bus Listeners"](#) for more information.

Accessing the Message Bus service from outside of the cluster (External access)

The **ingress** listener configuration in the **applications.yaml** file is used when the client services are outside of the Kubernetes cluster. This access is achieved using the ingress controller.

```
# To expose the kafka-cluster to external kafka clients via ingress
controller uncomment the following and modify accordingly.

# Valid values are TRAEFIK, GENERIC
ingressController: <INGRESS_CONTROLLER>

#ingress:
# #specify className field for ingressClassName of generic ingress
controller.
# #In case of nginx the default values is nginx
# className: "nginx"

#provide loadbalancer port
# if TLS is enabled in global section, then loadbalancerport will be used as
external port for Generic or Traefik.
loadbalancerport: <loadBalancer-port>

kafka-cluster:
  listeners:
    #To expose the kafka-cluster to external kafka clients via ingress
controller (traefik or generic) uncomment the following and modify
accordingly.
    #ingress:
```

```
# #The secure port of either ingress controller or external load-
balancer. If TLS is Disabled in global, then below ingressSslPort will be
used as external port.
# ingressSslPort: <LOADBALANCER_PORT>
# #If using Generic Ingress controller, below given annotations are
mandatory for Message-Bus external access.
# #These annotations are required for nginx ingress controller.
# annotations:
#   nginx.ingress.kubernetes.io/ingress.allow-http: "false"
#   nginx.ingress.kubernetes.io/backend-protocol: "HTTPS"
#   ingress.kubernetes.io/ssl-passthrough: "true"
#   nginx.ingress.kubernetes.io/ssl-passthrough: "true"
```

See ["Configuring Message Bus Listeners"](#) for more information.

Accessing the Message Bus service using a nodeport listener

The **nodeport** listener configuration in **applications.yaml** file configuration is also used when the client services are outside of the Kubernetes cluster. The access is directly with the Kubernetes work node's port.



Note:

Oracle does not recommend this listener for production. It must be used only for debugging where ingress controller is not deployed.

```
kafka-cluster:
  listeners:
    #To expose the kafka-cluster to external kafka clients without ingress
    controller, uncomment the following section and modify accordingly
    #nodeport:
      #default is true. can be turned off if needed
      #tls: true
      #if need to expose on a static nodeport, please uncomment the below
      section and provide values
      #nodePort: 32100
```

See ["Configuring Message Bus Listeners"](#) for more information.

Configuring Authentication

Kafka 2.0.0 or later supports an extensible OAuth 2.0 compatible token-based mechanism available, called **SASL OAUTHBEARER**. Strimzi has developed extensions that provide integration with OAuth 2.0 compliant authorization servers. That means, in principle, you can use any OAuth 2.0 compliant authorization server to enable centrally managed users for authentication with Kafka.

The Message Bus service uses a Strimzi operator to deploy Kafka brokers and in-turn use OAuth 2.0 token-based authentication while establishing a session to a Kafka broker. With this authentication, Message Bus clients (or Kafka clients) and Kafka brokers communicate with a central OAuth 2.0 compliant authorization server. These Kafka clients use the authorization server to obtain access tokens and are configured with access tokens issued by the server. Kafka brokers communicate with authorization server to validate the tokens presented by the

clients, thus confirming their identities. You can perform the validation of access token using a fast local JWT validation or a token validation using an **introspection endpoint**.

To configure OAuth 2.0 support for Kafka Brokers in the Message Bus service, you need to update **applications.yaml** file and create or upgrade the service.

Prerequisites

- The Authorization server (**OAuth 2.0 compliant**) is up and running. See "[Deploying OAM along with OHS for Authentication Service](#)" in Authentication Service
- Configure the client for Kafka broker in the authorization server. See "[Creating a Client](#)" section in Authentication Service
- Configure the clients for Kafka producer or consumer application in the authorization server. See "[Creating a Client](#)" section in Authentication Service
- Kafka cluster is configured with **oauth** type Authentication. See the following sections.

Enable Authentication on Kafka Cluster:

This procedure describes how to configure Kafka brokers so that the broker listeners are enabled to use OAuth 2.0 authentication by using an authorization server.



Note:

Oracle recommends to use OAuth 2.0 over an encrypted interface through a listener with **tls**. Plain listeners are not recommended.

To enable authentication on the Kafka cluster:

1. In **applications.yaml**, un-comment or add the following configurations:
 - a. Set the **authentication.enabled** flag to **true** and update the **loadbalancerhost**, **loadbalancerport** and **ohsHostname** in **\$SPEC_PATH/sr/quick/applications.yaml** file.
 - b. To use fast local JWT validation, set **useFastLocalJWTvalidation** value to **true** under **kafka-cluster.listeners.authentication**. If not set, the introspection endpoint is used for validation.

```
# The enabled flag is to enable or disable authentication
authentication:
  enabled: true

#Uncomment the below host aliases section and provide hostname to
ipaddressss mappings
#This will add entries to POD's /etc/hosts file for hostname resolution
when DNS and other options are not applicable.
#For more details see https://kubernetes.io/docs/tasks/network/
customize-hosts-file-for-pods/

#hostAliases:
#- ip: <ip-address>
#  hostnames:
#    #- <hostname-1> # Ex. quick.sr.ohs.uim.org
```



```
#Sample sub-section for using fast local jwt validation
kafka-cluster:
  listeners:
    authentication:
      useFastLocalJWTvalidation: true
```

2. The Message Bus service uses other configuration values from Kubernetes Secret (**<namespace>-<instance>-oauth-credentials**) and Config Map (**<namespace>-<instance>-oauth-config-cm**) objects from the same namespace. This Secret and Configuration Map Kubernetes objects have to be created before deploying the Message Bus service for authentication. See "[Adding Common OAuth Secret and ConfigMap](#)" for creating the secret. The configuration values used are:

- **clientId**: The client ID to identify the client.
- **clientSecret**: The client secret used for authentication.
- **validIssuerUri**: The URI of the token issuer used for authentication.
- **introspectionEndpointUri**: The URI of the token introspection endpoint.
- **jwksEndpointUri**: The endpoint with public keys of authentication server that has to be used for fast local JWT validation.
- **tlsTrustedCertificate**: The trusted certificates for TLS connection to the authorization server.

The following optional values are supported for authentication. See Strimzi documentation <https://strimzi.io/docs/operators/in-development/configuring.html#type-KafkaListenerAuthenticationOAuth-reference> for details on each value. Add the following optional values as required, under the **kafka-cluster.listeners.authentication** section in applications.yaml file:

```
# Additional optional authentication values
kafka-cluster:
  listeners:
    authentication:
      oauthConfig:
        #Enable or disable audience checking
        checkAudience:
        #Enable or disable issuer checking. By default issuer is checked
        using the value configured by validIssuerUri
        checkIssuer:
        #The audience to use when making requests to the authorization
        server's token endpoint
        clientAudience:
        #The scope to use when making requests to the authorization server's
        token endpoint
        clientScope:
        #The connect timeout in seconds when connecting to authorization
        server
        connectTimeoutSeconds:
        #Enable or disable TLS hostname verification. Default value is false.
        disableTlsHostnameVerification:
        #The read timeout in seconds when connecting to authorization server.
        readTimeoutSeconds:
        #URI of the User Info Endpoint to use as a fallback to obtaining the
        user id
        userInfoEndpointUri:
```

```
#Name of the claim from the JWT authentication token
userNameClaim:
```

Using GC Logs

By default, GC logs are disabled, you can enable it and view the logs on `stdout` by using `kubectl logs <kafka-cluster-pod-name>`.

To Enable GC logs, update `$SPEC_PATH/<project>/<instance>/applications.yaml` file as follows:

1. Under `gcLogs` make `enabled` as `true`.
2. Uncomment the `gcLogs` option under `kafka-cluster` to override common values.

```
gcLogs:
  enabled: true
```



Note:

You do not have to configure `fileSize` and `noOfFiles` as the logs are printed on the `stdout`.

Deploying and Managing Message Bus

Kafka cluster consists of Kafka Brokers and Zookeeper nodes. Once the Strimzi operator is successfully installed in the Kubernetes cluster and a namespace for the Kafka cluster is registered to monitor, you can deploy and manage the Kafka cluster.

Update the `applications.yaml` file as per your requirement and verify the following configuration elements in the yaml file before deploying the Kafka cluster:



Note:

If `applications.yaml` is not copied from Common CNTK, copy the `$COMMON_CNTK/samples/applications.yaml` file to your local directory, for example: `$SPEC_PATH/sr/quick`, where the `sr` is the Kubernetes namespace and `quick` is the instance name.

- The Storage class name that is used to create persistent volumes.
- The Kafka cluster replicas, which is the number of Kafka Brokers and Zookeeper nodes.
- Virtual Resource sizing.
- The Kafka Broker default settings.
- The listeners to be exposed with authentication and TLS.
- Authentication details.
- Metrics enablement.

- Affinity settings
 - Update partitions, replicas, and retention period values for the default Kafka Topics.
- See "[Configuring the applications.yaml File for Message Bus](#)" for more details.

Deploying Message Bus

Run the following commands to deploy the Kafka cluster with Kafka Topics in a Kubernetes namespace:

```
$COMMON_CNTK/scripts/create-applications.sh \  
-p <kafka cluster namespace> \  
-i <kafka cluster instance name> \  
-f <path to override values yaml file> \  
-a messaging-bus
```

For example:

In the following command, **sr** is a namespace and **quick** an instance name:

```
$COMMON_CNTK/scripts/create-applications.sh -p sr -i quick -f $SPEC_PATH/sr/  
quick/applications.yaml -a messaging-bus
```

Upgrading Message Bus

The Kafka cluster upgrade requires persistent storage enabled for rolling update. Oracle recommends you have multiple replicas so that the service is not down while upgrading.

Update the Kafka cluster configuration in the **applications.yaml** file:

```
$COMMON_CNTK/scripts/upgrade-applications.sh \  
-p <kafka cluster namespace> \  
-i <kafka cluster instance name> \  
-f <path to override values yaml file> \  
-a messaging-bus
```

For example, run the following command to upgrade the Kafka cluster and Kafka topic running in sr namespace with instance as quick:

```
$COMMON_CNTK/scripts/upgrade-applications.sh -p sr -i quick -f $SPEC_PATH/sr/  
quick/applications.yaml -a messaging-bus
```

Deleting Message Bus

Run the following script to delete or uninstall the Kafka cluster and Kafka Topic from the Kubernetes namespace:

```
$COMMON_CNTK/scripts/delete-applications.sh \  
-p <kafka cluster namespace> \  
-i <kafka cluster instance name> \  
-f <path to override values yaml file> \  
-a messaging-bus
```

For example: Run the following command to delete the Kafka cluster with Kafka topic running in sr namespace with instance as quick:

```
$COMMON_CNTK/scripts/delete-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a messaging-bus
```

Validating Message Bus

Check the pods created for the Kafka cluster. The following sample output shows the internal listener configuration. If it has any external listener settings, the additional service objects appear:

```
$kubectl get svc -n sr
```

NAME	TYPE	CLUSTER-IP	EXTERNAL-
IP PORT(S)	AGE		
sr-quick-messaging-kafka-bootstrap	ClusterIP	<clusterIP>	
<none> 9091/TCP,9092/TCP	22m		
sr-quick-messaging-kafka-brokers	ClusterIP	None	
<none> 9090/TCP,9091/TCP,9092/TCP	22m		
sr-quick-messaging-zookeeper-client	ClusterIP	<clusterIP>	
<none> 2181/TCP	23m		
sr-quick-messaging-zookeeper-nodes	ClusterIP	None	
<none> 2181/TCP,2888/TCP,3888/TCP	23m		

Check the Service object created for the Kafka cluster. The following sample output shows the Kafka and ZooKeeper replica as **1**.

```
$kubectl get pod -n sr
```

NAME	READY	STATUS
RESTARTS AGE		
sr-quick-messaging-entity-operator-*****-****	3/3	Running
0 27h		
sr-quick-messaging-kafka-0	1/1	Running
0 27h		
sr-quick-messaging-zookeeper-0	1/1	Running
0 27h		

Check the Helm release:

```
$helm list -n sr
```

NAME	NAMESPACE	REVISION	UPDATED
STATUS CHART		APP VERSION	
sr-quick-messaging	sr	1	*****
deployed	kafka-cluster-<x.y.z>	<x.y.z>	

Check the persistent volume claims created:

```
$kubectl get pvc -n sr`
```

NAME	STATUS
------	--------

VOLUME		CAPACITY	ACCESS	MODES
STORAGECLASS	AGE			
data-sr-quick-messaging-kafka-0		Bound	<volume>	1Gi
RWO	sc	27h		
data-sr-quick-messaging-zookeeper-0		Bound	<volume>	1Gi
RWO	sc	27h		

Run a standalone producer or consumer. See "Internal access - same namespace – plain" to run standalone producer and consumer pods in a Kafka cluster namespace.



Note:

As part of deploying, upgrading, and deleting the Message Bus, the Kafka topics are also created, upgraded, and deleted from the configuration provided in the input yaml file.

Restarting Message Bus

The **restart-application.sh** script with application name as **messaging-bus** restarts all the subcomponents such as Kafka, ZooKeeper, and Entity Operators of the Message Bus. Run the following command to restart:

```
$COMMON_CNTK/scripts/restart-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a messaging-bus
```



Note:

The Message Bus service restart requires to have multiple replicas so that the service is not down while upgrading and the replica count should be greater than or equal to 2.

To validate the restart option, see "[Validating Message Bus](#)".

Alternate Configuration Options

There are various alternate options for configuring the Message Bus.

Log Level

Kafka uses Apache log4j. By default, it is enabled with `INFO`. Update this in **applications.yaml** file for debugging with the `INFO` level:

```
logging:
  kafka:
    logLevel: INFO
  zookeeper:
    logLevel: INFO
```

Choosing Worker Nodes for Running Message Bus Service

Update the Message Bus service configuration section in the **applications.yaml** file to node affinity or pod affinity and anti-affinity to constrain which nodes your pod can be scheduled. Alternatively, co-locate the pods in same node (or separate) and run either create or upgrade script.

Node Affinity

Node affinity is conceptually similar to **nodeSelector**, that enables you to constrain which nodes your pod can be scheduled, based on the node labels.

There are two types of node affinities:

- Schedule a pod using required node affinity: The scheduler cannot schedule the pod unless the rule is met.
- Schedule a pod using preferred node affinity: The scheduler tries to find a node that meets the rule. If a matching node is not available, the scheduler continues to schedule the pod.

Preferred node affinity

The sample configuration for enabling preferred node affinity is as follows:

```
kafka-cluster:
  affinity:
    nodeAffinity:
      preferredDuringSchedulingIgnoredDuringExecution:
        - weight: 1
          preference:
            matchExpressions:
              - key: name
                operator: In
                values:
                  - south_zone
```

Kubernetes pod is scheduled on the node with label name as *south_zone*. If node with label name: *south_zone* is not available, pod will still be scheduled on another node.

Pod Affinity and Anti-Affinity

The Pod Affinity or anti-affinity allows you to constrain which node your pod is eligible to be scheduled, based on the labels on other pods.

Similar to node affinity, there are two types of pod affinity and anti-affinity:

- `requiredDuringSchedulingIgnoredDuringExecution`
- `preferredDuringSchedulingIgnoredDuringExecution`

Pod Affinity

Assign a Kubernetes pod to a node based on the labels on other pods using the Pod Affinity in a Kubernetes cluster. Modify the Kafka cluster override values yaml file.

The sample configuration for enabling the **required** pod affinity is as follows:

```
kafka-cluster:
  affinity:
```

```

podAffinity:
  requiredDuringSchedulingIgnoredDuringExecution:
    - labelSelector:
        matchExpressions:
          - key: app.kubernetes.io/name
            operator: In
            values:
              - kafka
        topologyKey: "kubernetes.io/hostname"

```

Kubernetes pod is scheduled on the node which contains a pod with label `http://app.kubernetes.io/name: kafka`.

Modify the Kafka cluster override values yaml file. The sample configuration for enabling the **preferred** pod affinity is as follows:

```

kafka-cluster:
  affinity:
    podAffinity:
      preferredDuringSchedulingIgnoredDuringExecution:
        - weight: 1
          podAffinityTerm:
            labelSelector:
              matchExpressions:
                - key: app.kubernetes.io/name
                  operator: In
                  values:
                    - kafka
            topologyKey: "kubernetes.io/hostname"

```

The Kubernetes pod is scheduled on the node which contains a pod with label `http://app.kubernetes.io/name: kafka`. If the node is not available, pod will still be scheduled on another node.

Pod anti-affinity

Assign a Kubernetes pod to a node based on the labels on other pods using pod anti affinity in a Kubernetes cluster.

Modify the Kafka cluster override values yaml file. The sample configuration with **required** pod anti-affinity is as follows:

```

kafka-cluster:
  affinity:
    podAntiAffinity:
      requiredDuringSchedulingIgnoredDuringExecution:
        - labelSelector:
            matchExpressions:
              - key: app.kubernetes.io/name
                operator: In
                values:
                  - kafka
            topologyKey: "kubernetes.io/hostname"

```

Kubernetes pod is scheduled on the node which does not contain a pod with label `http://app.kubernetes.io/name: kafka`.

Modify the Kafka cluster's override values yaml file. The sample configuration with **preferred** pod anti-affinity is follows:

```
kafka-cluster:
  affinity:
    podAntiAffinity:
      preferredDuringSchedulingIgnoredDuringExecution:
        - weight: 1
          podAffinityTerm:
            labelSelector:
              matchExpressions:
                - key: app.kubernetes.io/name
                  operator: In
                  values:
                    - kafka
            topologyKey: "kubernetes.io/hostname"
```

Kubernetes pod is scheduled on the node which does not contains a pod with label `http://app.kubernetes.io/name: kafka`. If node is not available, pod will still be scheduled on another node.

Managing Message Bus Metrics

Metrics in Message Bus are configured by enabling the JMX Exporter and Kafka Exporter. JMX Exporter can be enabled to get JVM metrics of Kafka cluster and Kafka Exporter can be enabled on a Kafka cluster to extract additional Prometheus metrics data from Kafka brokers, which is related to offsets, consumer groups, consumer lag, and topics.

See https://strimzi.io/docs/operators/latest/overview.html#metrics-overview_str for more information on metrics from Strimzi.

Enable metrics

Enable Kafka Exporter and JMX Exporter in the `$SPEC_PATH/sr/quick/applications.yaml` file and upgrade or create the Message Bus service. The sample content is as follows:

```
kafka-cluster:
  metrics:
    kafkaExporter:
      enable: true
    jmxExporter:
      enable: true
```

The above configuration exposes the Prometheus metrics for Kafka Brokers, Topics, and Consumer Groups components on metrics end-point on the pods. You can view these details on Prometheus UI by configuring the Scrape job. You can view this information in the form of graphs using the Grafana dashboard.

See https://github.com/danielqsj/kafka_exporter#metrics to see the exposed metrics.

Prometheus and Grafana setup

See [Setting Up Prometheus and Grafana](#) for more information.

Adding scrape Job in Prometheus

Add the following Scrape job in Prometheus Server. This can be added by editing the config map used by the Prometheus server:

```

- job_name: Message_bus
  kubernetes_sd_configs:
  - role: pod
    namespaces:
      names:
      - 'sr'
  relabel_configs:
  - separator: ";"
    regex: __meta_kubernetes_pod_label_(strimzi_io_.+)
    replacement: $1
    action: labelmap
  - source_labels: [__meta_kubernetes_namespace]
    separator: ";"
    regex: (.*)
    target_label: namespace
    replacement: $1
    action: replace
  - source_labels: [__meta_kubernetes_pod_name]
    separator: ";"
    regex: (.*)
    target_label: kubernetes_pod_name
    replacement: $1
    action: replace
  - source_labels: [__meta_kubernetes_pod_node_name]
    separator: ";"
    regex: (.*)
    target_label: node_name
    replacement: $1
    action: replace
  - source_labels: [__meta_kubernetes_pod_host_ip]
    separator: ";"
    regex: (.*)
    target_label: node_ip
    replacement: $1
    action: replace

```

Sample Grafana dashboards

Add the Prometheus data source and import the sample Grafana dashboards from Strimzi github.

The sample Grafana dashboard for Kafka and JMX Exporters can be downloaded from the following links:

- JMX Exporter metrics: <https://github.com/strimzi/strimzi-kafka-operator/blob/main/examples/metrics/grafana-dashboards/strimzi-kafka.json>
- Kafka Exporter metrics: <https://github.com/strimzi/strimzi-kafka-operator/blob/main/examples/metrics/grafana-dashboards/strimzi-kafka-exporter.json>

Installing and Configuring Mirror Maker 2.0

This section describes the installation and configuration of Mirror Maker 2.0.

Configuring Source and Target Message Bus (Kafka cluster) Details

Update the `$COMMON_CNTK/samples/messaging-bus/kafka-mirror-maker/values.yaml` with source and target Kafka cluster details as follows:

```
sourceCluster:
  #Source Kafka cluster
  name: sr1-quick1-messaging
  #Bootstarp server for connection to the source Kafka cluster
  bootstrapServers: sr1-quick1-messaging-kafka-bootstrap:9092
targetCluster:
  #Target Kafka cluster
  name: sr2-quick2-messaging
  #Bootstarp server for connection to the target Kafka cluster
  bootstrapServers: sr2-quick2-messaging-kafka-bootstrap:9092
```

In the above command:

- **sourceCluster.name** is the helm release for source Kafka cluster (sr1-quick1-messaging)
- **sourceCluster.bootstrapServers** is the bootstrap server of source Kafka cluster (sr1-quick1-messaging-kafka-bootstrap:9092)
- **targetCluster.name** is the helm release for target Kafka cluster (sr2-quick2-messaging)
- **targetCluster.bootstrapServers** is the bootstrap server of target Kafka cluster (sr2-quick2-messaging-kafka-bootstrap:9092)

Note:

To enable geo replication between the Kafka clusters from different namespaces, we can use the hostname pattern as **servicename.namespace.svc.cluster.local** while updating

```
$COMMON_CNTK/samples/messaging/kafka-mirror-maker/values.yaml
```

If the **sr1-quick1-messaging-kafka-bootstrap** service is hosted in Strimzi namespace on 9092 port and the client application in another namespace, then the bootstrap-server URL should be used as **sr1-quick1-messaging-kafka-bootstrap.strimzi.svc.cluster.local**

If the target cluster is in another Kubernetes cluster, you must to use external listener for referring to the bootstrap server.

While using `Nodeport`, the worker node IP of the target cluster is to be used as the target cluster bootstrap address along with the exposed nodeport.

While using `Ingress`, the hostname of the target cluster is to be used as target cluster bootstrap address.

Installing Mirror Maker

Run the following command to install Mirror Maker in specific namespace:

```
helm install mirror-maker $COMMON_CNTK/samples/messaging/kafka-mirror-maker/ -n <namespace> --values $COMMON_CNTK/samples/messaging/kafka-mirror-maker/values.yaml
```

Validate that Mirror Maker is installed by running the following command:

```
kubectl get pods -n <namespace>
replication-mirror-maker-mirrormaker2-5c6d7dd7d7-r89cj          1/1
Running    0          67m
kubectl get svc -n <namespace>
replication-mirror-maker-mirrormaker2-api                    ClusterIP   <clusterIP>
<none>          8083/TCP          67m
```

Uninstalling Mirror Maker

Run the following command to uninstall Mirror Maker from specific namespace:

```
helm uninstall mirror-maker -n <namespace>
```

Delete topic mm2-offset-syncs.messaging-test.internal from the source cluster (dev1-messaging)

```
$kubectl -n <SourceKafkaClusterNamespace> run kafka-topic -ti --image=<STRIMZI_KAFKA_IMAGE_NAME> --rm=true --restart=Never -- bin/kafka-topics.sh --bootstrap-server <instance>-messaging-kafka-bootstrap:9092 --delete --topic mm2-offset-syncs.messaging-test.internal
```

Delete topics heartbeats, mirrormaker2-cluster-status, mirrormaker2-cluster-offsets, mirrormaker2-cluster-configs from the target cluster (dev2-messaging)

```
$kubectl -n <TargetKafkaClusterNamespace> run kafka-topic -ti --image=<STRIMZI_KAFKA_IMAGE_NAME> --rm=true --restart=Never -- bin/kafka-topics.sh --bootstrap-server <namespace>-<instance>-messaging-kafka-bootstrap:9092 --delete --topic heartbeats
```

```
$kubectl -n <TargetKafkaClusterNamespace> run kafka-topic -ti --image=<STRIMZI_KAFKA_IMAGE_NAME> --rm=true --restart=Never -- bin/kafka-topics.sh --bootstrap-server <namespace>-<instance>-messaging-kafka-bootstrap:9092 --delete --topic mirrormaker2-cluster-status
```

```
$kubectl -n <TargetKafkaClusterNamespace> run kafka-topic -ti --image=<STRIMZI_KAFKA_IMAGE_NAME> --rm=true --restart=Never -- bin/kafka-topics.sh --bootstrap-server <namespace>-<instance>-messaging-kafka-bootstrap:9092 --delete --topic mirrormaker2-cluster-offsets
```

```
$kubectl -n <TargetKafkaClusterNamespace> run kafka-topic -ti --image=<STRIMZI_KAFKA_IMAGE_NAME> --rm=true --restar
```

Client Access

Accessing Message Bus in events producer and consumers clients.

Internal Access in the Same namespace for Plain

When the message producer or consumer applications are in same namespace as the Message Bus service then they can access the Kafka cluster using the Bootstrap Kubernetes service object name and port.

Run the following command to test the standalone **producer**. Here the project namespace is **sr** and instance is **quick**.

```
$kubect1 -n sr run kafka-producer-plain -ti \
--image=<STRIMZI_KAFKA_IMAGE_NAME> \
--rm=true --restart=Never \
-- bin/kafka-console-producer.sh \
--bootstrap-server sr-quick-messaging-kafka-bootstrap:9092 \
--topic ora-test-topic
```

Type a few lines of text and each ENTER sends a message to Kafka broker. Type **CTRL-C** to quit.

Run the following command to test the standalone **consumer**. Here the project namespace is **sr** and instance is **quick**.

```
$kubect1 -n sr run kafka-consumer-plain -ti \
--image=<STRIMZI_KAFKA_IMAGE_NAME> \
--rm=true --restart=Never \
-- bin/kafka-console-consumer.sh \
--bootstrap-server sr-quick-messaging-kafka-bootstrap:9092 \
--group ora-uim-consumer-test --isolation-level read_committed \
--topic ora-test-topic --from-beginning
```

You get responses after the validation is successful.

Internal Access in a Different namespace for Plain

When the message producer or consumer applications are in different namespace than the Message Bus service then they can access the Kafka cluster using the bootstrap service name and port but need to suffix **<namespace>.svc.cluster.local** to the service name.

See "Internal access - same namespace - plain" section on running the standalone console test producer and consumer pods for testing. Replace the bootstrap-server url with **sr-quick-messaging-kafka-bootstrap.sr.svc.cluster.local**, where the namespace is **sr** and instance is **quick**.

Internal Access in the Same namespace for Authentication

When the message producer or consumer applications are in same namespace as the Message Bus service then they can access the Kafka cluster using the bootstrap Kubernetes service object name and port.

Create a test client pod definition.

1. Copy the following YAML content into the bastion host (or worker node) as **mb-test-client-deployment.yaml** file.
2. Update the **hostAliases** section according to your OAuth service environment.
3. Update the **STRIMZI_KAFKA_IMAGE_NAME**.
4. Update the **OAuth Endpoint, Client Id and Secret**.
5. Update the **OAuth Endpoint, Client Id, Client Secret, Scope, Audience**, and anything else that are applicable to your client configuration

```

apiVersion: apps/v1
kind: Deployment
metadata:
  name: mb-test-auth-client-deployment
  labels:
    app: mb-test-auth-client
spec:
  replicas: 1
  selector:
    matchLabels:
      app: mb-test-auth-client
  template:
    metadata:
      labels:
        app: mb-test-auth-client
    spec:
      # <Uncomment below and replace with your bootstrap and brokers DNS
      names>
      #hostAliases:
      #- ip: <LOADBALANCER_IP>
      # hostnames:
      #   - "<OHS_HOSTNAME>"
      containers:
      - name: mb-test-client
        image: <STRIMZI_KAFKA_IMAGE_NAME>
        command:
        - "tail"
        - "-f"
        - "/dev/null"
        imagePullPolicy: IfNotPresent
        env:
        - name: OAUTH_TOKEN_ENDPOINT_URI
          value: <Update the OAUTH_TOKEN_ENDPOINT_URI>
        - name: OAUTH_CLIENT_ID
          value: <Update the OAUTH_CLIENT_ID>
        - name: OAUTH_CLIENT_SECRET
          value: <Update the OAUTH_CLIENT_SECRET>
        # - name: OAUTH_SCOPE
        #   value: <Uncomment and update OAUTH_SCOPE>
        # - name: OAUTH_AUDIENCE
        #   value: <Uncomment and update OAUTH_AUDIENCE>
        ports:
        - containerPort: 9090
          name: http
          protocol: TCP

```

Create the authentication properties in a file (mb_test_client.properties).

```
sasl.jaas.config=org.apache.kafka.common.security.oauthbearer.OAuthBearerLogin
Module required;
security.protocol=SASL_PLAINTEXT
sasl.mechanism=OAUTHBEARER
sasl.login.callback.handler.class=io.strimzi.kafka.oauth.client.JaasClientOauthLoginCallbackHandler
```

Run the test client container and provide authentication properties

```
#Apply the test client pod definition in the namespace (say "sr").
$kubectl apply -f mb-test-client-deployment.yaml -n sr
```

```
#Get the newly created pod name
$kubectl get pod -n sr | grep mb-test-auth-client-deployment
```

```
#Sample Output
#mb-test-auth-client-deployment-*****-*****      1/1      Running
0          98s
```

```
#Copy the mb_authentication.properties file into the pod
$kubectl -n sr cp mb_test_client.properties mb-test-auth-client-deployment-
*****-*****:/home/kafka/mb_test_client.properties
```

Test for message bus producer client:

- Start an interactive shell process in the test client pod
- Export the environment variables needed for the authentication
- Run the console producer command.
- Enter some string messages

```
#Get the newly created pod name
kubectl get pod -n sr | grep mb-test-auth-client-deployment
```

```
#Exec into the newly created pod
kubectl exec -it mb-test-auth-client-deployment-*****-***** -n sr -- bash
```

```
#Run the following test console producer
bin/kafka-console-producer.sh \
--producer.config /home/kafka/mb_test_client.properties \
--bootstrap-server sr-quick-messaging-kafka-bootstrap:9092 \
--topic ora-test-topic
```

Test for message bus consumer client:

- Start an interactive shell process in the test client pod
- Export the environment variables needed for the authentication
- Run the console consumer command.

- You will see the previous string messages of producer

```
#Get the newly created pod name
kubectl get pod -n sr | grep mb-test-auth-client-deployment

#Sample Output
#mb-test-auth-client-deployment-*****-****          1/1      Running
0              98s

#Exec into the newly created pod
kubectl exec -it mb-test-auth-client-deployment-*****-**** -n sr -- bash

#Run the following test console consumer
bin/kafka-console-consumer.sh \
--consumer.config /home/kafka/mb_test_client.properties \
--bootstrap-server sr-quick-messaging-kafka-bootstrap:9092 \
--topic ora-test-topic \
--from-beginning
```

External ingress access - SSL and Authentication

The external access to Message Bus is provided through Ingress controller (Traefik or Generic) with TLS enabled. The following must be performed in clients for testing:

- Export and import the Message Bus service (that is sr-quick-messaging-cluster-ca-cert, where sr is namespace and quick is instance) certificate into clients.
- Export and import the certificate of OAuth service into the clients.

Note:

This is optional and is required only if OAuth is enabled for SSL.

- Update the bootstrap and brokers DNS names with load balancer IP in the **/etc/hosts** file of clients (that is, event producer or consumer applications).
- Update the DNS name of OAuth service with load balancer IP in **/etc/hosts** file of clients.

Note:

This is optional and is required only if the OAuth service requires DNS name to access.

- Run the producer or consumer script with SSL and Authentication details

In the following section, the external ingress access test is provided with Strimzi Kafka container. If you want to test the client code without Kubernetes cluster then you can download the Apache Kafka and perform the same.

Add Message Bus service and OAuth service certifications to trust store. See **Import/export of TLS certificates** section.

```
#Run the below command to export and import the Message Bus service
certificate into the trust store (mb-cert-keystore.jks) file.
$COMMON_CNTH/scripts/export-message-bus-cert.sh -p sr -i quick -l . -k ./mb-
```

```
test-client-cert-keystore.jks -a mb-cert
```

```
#Get the OAuth (OAM) service certificate and import into trust store (mb-test-
client-cert-keystore.jks) file (Optional, needed if OAuth is SSL)
keytool -importcert -alias oauth-server -file <Path to OAuth Server
certificate, the .pem file> -keystore ./mb-test-client-cert-keystore.jk --
trustcacerts -noprompt
```

Create the following authentication properties in a file (**mb_test_client.properties**).

```
sasl.jaas.config=org.apache.kafka.common.security.oauthbearer.OAuthBearerLogin
Module required;
security.protocol=SASL_SSL
sasl.mechanism=OAUTHBEARER
sasl.login.callback.handler.class=io.strimzi.kafka.oauth.client.JaasClientOaut
hLoginCallbackHandler
ssl.endpoint.identification.algorithm=
```

Create a test client pod definition.

1. Copy the following YAML content into the bastion host (or worker node) as "**mb-test-client-deployment.yaml**" file.
2. Update the Strimzi Kafka image.
3. Update the hostAliases section according to your OAuth and Message Bus service setup. This will add entries to /etc/hosts file.
4. Update the **OAuth Endpoint**, **Client Id**, **Client Secret**, and **Trust Store Password** in **env** section.



Note:

You can override the value of **subDomainNameSeparator**. The default is **..**. This value can be changed as **"-"** to match the wild card pattern of SSL certificates.

To override, uncomment and change this value in applications.yaml. See "[Using Wild Card Certificates](#)" for more information.

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: mb-test-client-deployment
  labels:
    app: mb-test-client
spec:
  replicas: 1
  selector:
    matchLabels:
      app: mb-test-client
  template:
    metadata:
      labels:
        app: mb-test-client
```



```

spec:
#   <Uncomment below and replace with your bootstrap and brokers DNS names>
#   hostAliases:
#   - ip: <Replace with your LOADBALANCER_IP>
#     hostnames:
#     - "<INSTANCE.PROJECT.messaging.broker0.uim.org>"
#     - "<INSTANCE.PROJECT.messaging.brokerN.uim.org>"
#     - "<INSTANCE.PROJECT.messaging.bootstrap.uim.org>"
#     - "<Replace with OHS_HOSTNAME>"
containers:
- name: mb-test-client
  image: quay.io/strimzi/kafka:0.34.0-kafka-3.4.0
  command:
  - "tail"
  - "-f"
  - "/dev/null"
  imagePullPolicy: IfNotPresent
  env:
  - name: OAUTH_TOKEN_ENDPOINT_URI
    value: <Replace with your OAUTH_TOKEN_ENDPOINT_URI>
  - name: OAUTH_CLIENT_ID
    value: <Replace with your OAUTH_CLIENT_ID>
  - name: OAUTH_CLIENT_SECRET
    value: <Replace with your OAUTH_CLIENT_SECRET>
  #- name: OAUTH_SCOPE
  #  value: <Uncomment and replace with your OAUTH_SCOPE>
  #- name: OAUTH_AUDIENCE
  #  value: <Uncomment and replace with yours OAUTH_AUDIENCE>
  - name: KAFKA_OPTS
    value: " \
      -Djavax.net.ssl.trustStore=/home/kafka/mb-test-client-cert-
keystore.jks \
      -Djavax.net.ssl.trustStorePassword=<Replace with your store
password> \
      -Djavax.net.ssl.trustStoreType=JKS"
  ports:
  - containerPort: 9090
    name: http
    protocol: TCP

```

Run the test client container and apply readiness for authentication and SSL.

```

#Apply the test client pod definition in the namespace (say "sr").
$kubectl apply -f mb-test-client-deployment.yaml -n sr

```

```

#Get the newly created pod name
$kubectl get pod -n sr | grep mb-test-client-deployment

```

```

#Sample Output
#mb-test-client-deployment-*****-****          1/1      Running    0
98s

```

```

#Copy the certificate store into the newly created pod. Replace the pod name
below
kubectl -n sr cp mb-test-client-cert-keystore.jks <Replace with mb-test-

```

```
client-deployment pod name>:/home/kafka/mb-test-client-cert-keystore.jks

#Copy the mb_test_client.properties file into the POD
kubectl -n sr cp mb_test_client.properties <Replace with mb-test-client-
deployment pod name>:/home/kafka/mb_test_client.properties
```

Start a shell session inside container for console **test producer**.

```
#Get the newly created pod name
$kubectl get pod -n sr | grep mb-test-auth-client-deployment

#Sample Output
#mb-test-auth-client-deployment-*****-*****          1/1      Running
0              98s

#Exec into the newly created pod
kubectl exec -it<Replace with mb-test-client-deployment pod name> -n sr --
bash

#Run the following producer command
bin/kafka-console-producer.sh \
--producer.config /home/kafka/mb_test_client.properties \
--bootstrap-server quick.sr.messaging.bootstrap.uim.org:30443 \
--topic ora-test-topic
```

Start start a shell session inside container for console **test consumer**:

```
#Exec into the newly created pod
kubectl exec -it <Replace with mb-test-client-deployment pod name> -n sr --
bash

#Run the following producer command. Replace the bootstrap-server url
accordingly to your environment
bin/kafka-console-consumer.sh \
--consumer.config /home/kafka/mb_test_client.properties \
--bootstrap-server sthatipa.sr.messaging.bootstrap.uim.org:30443 \
--consumer-property group.id=test-client-service \
--topic ora-test-topic --from-beginning
```

Clean-up the newly created test pod:

```
kubectl delete -f mb-test-client-deployment.yaml -n sr
```

External node port access

The nodeport listener type allows the external access from outside of the Kubernetes cluster using the load balancer or Kubernetes worker node ip address and nodePort(port of worker node).

The Bootstrap URL is constructed with worker node IP Address and node port of bootstrap service.

Get the host port of the external bootstrap service using the following command:

```
$kubectl get service sr-quick-messaging-kafka-nodeport-bootstrap -  
o=jsonpath='{.spec.ports[0].nodePort}{"\n"}' -n sr
```

Output: 32100

Get the IP Address of the Kubernetes worker node. Replace the <NODE_NAME> in the following with your node name:

```
$kubectl get node <NODE_NAME> -o=jsonpath='{range .status.addresses[*]}{.type}  
{"\t"}{.address}{"\n"}' -n sr
```

Output:

```
InternalIP  100.xx.xx.142  
Hostname    *****
```

Update the Kafka cluster Bootstrap URL as **100.xx.xx.142:32100** in the events producer and consumer applications.

To access with plain, see "Internal access - same namespace - plain" section. Replace the bootstrap URL with above constructed one.

To access with Authentication, see "Internal access - same namespace - authentication" section. Replace the bootstrap URL with above constructed one.

To access with SSL and Authentication, see "External ingress access - SSL & Authentication" section. Replace the bootstrap URL with above constructed one.

Import/export of TLS certificates

To enable TLS encrypted access, the ca-certs of Kafka cluster is needed to be extracted and imported into key store and the location of that key store is used as the producer or consumer properties in events application.

Export the ca-certs of the Kafka cluster using the following command:

```
$COMMON_CNTK/scripts/export-message-bus-cert.sh -p <Namespace of kafka  
cluster> \  
-i <instance name of kafka cluster> \  
-l <directory to export cluster certs temporarily> \  
-k <keystore-location> \  
-a <alias for cert>
```

For example:

```
$COMMON_CNTK/scripts/export-message-bus-cert.sh -p sr -i quick -l . -k ./mb-  
cert-keystore.jks -a mb-sr-quick-cert
```

The export-cluster-cert.sh script creates JKS type truststore by default in the provided key store location. If any other truststore type is created, specify that as producer or consumer property while running the clients. These exported artifacts can be used in Kafka client applications.

**Note:**

If custom certificates were used during cluster creation, then these can be directly provided through a keystore than extracting the generated certs.

Using custom certificates

Custom certificates can be used while creating the Kafka cluster:

Prerequisites:

- Certificates and keys are to be in PEM format.
- Key should not be encrypted. Encrypted keys are not supported since they need user interaction for entering the passphrase during access.

Creating a custom certificate

To create a custom certificate, see "[SSL Certificates](#)".

Create Kubernetes secret

Run the following command by replacing the placeholders:

```
kubectl create secret generic <secret-name> --from-file=<key-file-name> --  
from-file=<certificate-file-name>  
For example:  
kubectl create secret generic myCustomCertSecret --from-file=commonkey.pem --  
from-file=commoncert.pem
```

Update Kafka Cluster configuration

Update the customCerts configuration section in Kafka cluster's override values yaml file:

```
kafka-cluster:  
  ## to enable custom or owned certs for tls please create a kubernetes  
  secret with the cert and key if not already present, uncomment the below  
  section and add respective values.  
  ## please be advised that encrypted keys are not supported since they  
  require user interaction for the passphrase  
  customCerts:  
    # Secret in which cert and key are present  
    secretName: <secret-name created above>  
    certName: <certificate file used in the secret created above>  
    keyName: <key-file used in the secret created above>
```

Configuring Message Bus Listeners

Message Bus has three listeners (internal, ingress and nodeport) to access the service. These are described the in following sections.

Message Bus Internal Listener

The following is the configuration for **internal** listener type which can be commented or uncommented.

```
kafka-cluster:
  listeners:
    # plain is for internal access within the same k8s cluster.
    internal:
```

From same namespace in cluster

This is an internal access method that is used by the message producer or consumer clients (or applications) when they are deployed in same namespace as the Message Bus service. This is enabled by default with **internal** listener type. To access the Message Bus, the producer or consumer applications must get the Bootstrap service URL of the Kafka cluster.

To get the Bootstrap service URL of the Kafka cluster run the following command:

```
kubectl get svc -n sr | grep sr-quick-messaging-kafka-bootstrap
```

```
sr-quick-messaging-kafka-bootstrap      ClusterIP   <clusterIP>
<none>                                9091/TCP,9092/TCP
```



Note:

The project namespace is sr and instance is quick.

Use the **sr-quick-messaging-kafka-bootstrap:9092** URL in the producer and consumer client configuration in the applications.

From another namespace in cluster

This is an internal access method which is used by the producer or consumer client applications when they are deployed in different namespace than the message-bus service. This is enabled by default with internal listener type. To access the Message Bus, the producer or consumer client applications have to get the Bootstrap service URL of the Kafka cluster and convert the URL pattern as **serviceName.namespace.svc.cluster.local**.

If the *sr-quick-messaging-kafka-bootstrap* service is hosted in **sr** namespace on 9092 port and the client applications from different namespace can access the Kafka cluster with Bootstrap URL as **sr-quick-messaging-kafka-bootstrap.sr.svc.cluster.local:9092**

Message Bus Ingress Listener

This is an external access method which is used by message producer or consumer applications when they are deployed outside of the Kubernetes cluster. This is disabled by default and must be enabled in the **applications.yaml**. This external access is provided through the Traefik Ingress Controller and Generic Ingress Controller to the Kafka cluster. To enable this external access, the ingress listener type configuration must be enabled in the Kafka cluster configuration yaml file.

Ingress listener type

Un-comment the ingress listener type section in applications.yaml file to expose the Message Bus Service outside of Kubernetes cluster. Ingress controller (Traefik or Generic) should be deployed in order for this ingress listener type to work and Message Bus namespace must be registered with Traefik operator. In case of Generic Ingress, set **ingress.className** according to your Generic Ingress Controller.

In case of Generic Ingress controller (NGINX), annotations given under the **kafka-cluster.listeners.ingress.annotations** tag in applications.yaml are mandatory.

```
# To expose the kafka-cluster to external kafka clients via ingress
controller uncomment the following and modify accordingly. # Valid values are
TRAEFIK, GENERIC
ingressController: "TRAEFIK"

#ingress:
# #specify className field for ingressClassName of generic ingress
controller.
# #In case of nginx the default values is nginx
# className: "nginx"

#provide loadbalancer port
# if TLS is enabled in global section, then loadbalancerport will be used as
external port for Generic or Traefik
loadbalancerport: <loadBalancer-port>

kafka-cluster
  listeners:
    ingress:
      # if TLS is Disabled in global, then ingressSslPort will be used as
external port.
      ingressSslPort: <LoadBalancer_SSL_Port>
      # If using Generic Ingress controller, below given annotations are
mandatory for Message-Bus external access.
      # These annotations are required for nginx ingress controller in
Message-Bus.
      annotations:
        nginx.ingress.kubernetes.io/ingress.allow-http: "false"
        nginx.ingress.kubernetes.io/backend-protocol: "HTTPS"
        ingress.kubernetes.io/ssl-passthrough: "true"
        nginx.ingress.kubernetes.io/ssl-passthrough: "true"
```

In external producer or consumer messaging clients (or applications), the following must be done to access the Kafka cluster through Ingress controller.

- The Bootstrap server and advertised broker host names must be configured in DNS at client side.
- Import the TLS certificate and trust stores from the Kafka cluster into client configurations.
- Add required additional properties in Kafka producer or consumer client configuration.

DNS settings in client applications host

The Bootstrap server host name and advertised broker host names must be configured in /etc/hosts file in producer and consumer client applications with the Traefik or Load Balancer IP

Address. Hostnames are pre-configured when deployed with ingress listener type enabled with the following pattern:

```
bootstrap-server: <kafka-cluster-instance-name>.<kafka-cluser-project-
name>.messaging.bootstrap.uim.org
broker-0:          <kafka-cluster-instance-name>.<kafka-cluser-project-
name>.messaging.broker0.uim.org
broker-1:          <kafka-cluster-instance-name>.kafka-cluser-project-
name>.messaging.broker1.uim.org
```

For example if a instance is quick and namesapce is sr then the hostnames will be as follows:

```
bootstrap-server: quick.sr.messaging.bootstrap.uim.org
broker-0:         quick.sr.messaging.broker0.uim.org
broker-1:         quick.sr.messaging.broker1.uim.org
```



Note:

You can override the value of **subDomainNameSeparator**. The default value is ".", This value can be changed to "-" to match the wild card pattern of SSL certificates.

To override the value, uncomment and change it in **applications.yaml** as follows:

```
#subDomainNameSeparator: "."

#Example hostnames for "-" : quick-sr-messaging-bootstrap.uim.org
```

Importing certificates into client applications

See the "Import/export of TLS certificates" section in "Client Access" section for exporting the ca-certs of Kafka cluster to producer or consumer applications.

Message Bus NodePort Listener

This is another external access method which is used by events producer or consumer client applications when they are deployed out-side of the Kubernetes cluster and wants to access the message-bus service without ingress controller.

Node port

The following configuration in the application yaml file allows exposing the nodeport listener type to access the Message Bus externally with tls and OAuth 2.0 Authentication.

```
Kafka-cluster:
  listeners:
    #To expose the kafka-cluster to external kafka clients without ingress
    controller, uncomment the following section and modify accordingly.
    nodeport:
      tls: true
      # if need to expose on a static nodeport, please uncomment the below
      nodePort: 32100
      authentication: true
```

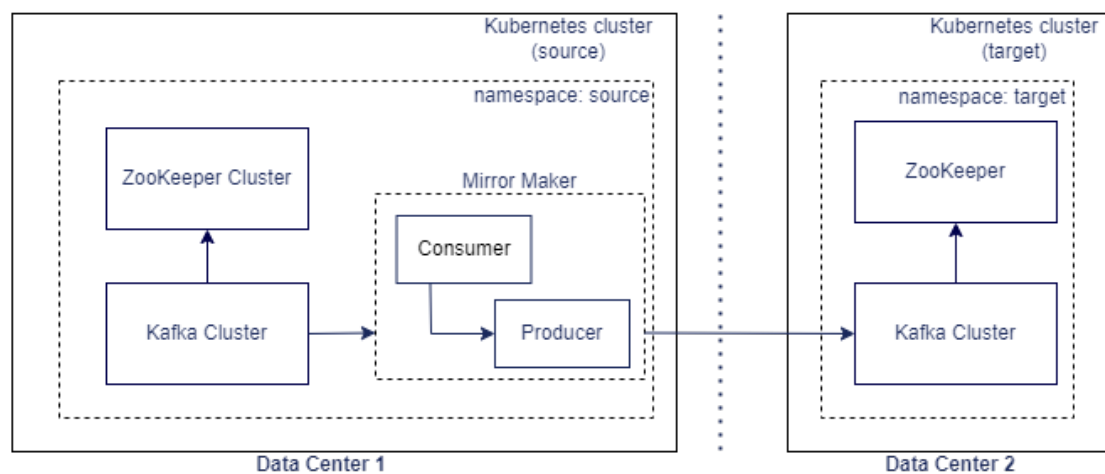
When the TLS is enabled the certificates of the Kafka cluster must be imported in the events producer and consumer clients to access the Kafka cluster.

See the "Import/export of TLS certificates" section in "Client Access" section for exporting the auto-generated ca-certs of Kafka cluster.

Geo Redundancy Support

The Geo Redundancy of Message Bus (which uses Kafka) is achieved with Mirror Maker tool. Apache Kafka Mirror Maker replicates data across two Kafka clusters, within or across data centers. See <https://strimzi.io/blog/2020/03/30/introducing-mirrormaker2/> for more details.

The following diagram shows an example of how mirror maker replicates the topics from source Kafka cluster to target Kafka cluster.



The prerequisites are as follows:

- The Strimzi operator should be up and running
- The source Message Bus service should be up and running
- The target Message Bus service should be up and running

Strimzi Operator

Validate that the Strimzi operator is installed by running the following command:

```
$kubectl get pod -n <STRIMZI_NAMESPACE>
```

NAME	READY	STATUS	RESTARTS	AGE
strimzi-cluster-operator-566948f58c-sfj7c	1/1	Running		
0	6m55s			

Validate installed helm release for Strimzi operator by running the following command:

```
$helm list -n <STRIMZI_NAMESPACE>
```

NAME	NAMESPACE	REVISION	STATUS
CHART	APP VERSION		


```
strimzi-operator          STRIMZI_NAMESPACE 1          deployed
strimzi-kafka-operator-0.X.0 0.X.0
```

Source Message Bus

The source Message Bus should be up and running (the Kafka cluster from which the topics should be replicated).

Validate the Kafka cluster is installed by running the following command:

```
$kubectl get pod -n srl
```

NAME	READY	STATUS
RESTARTS AGE		
srl-quick1-messaging-entity-operator-5f9c688c7-2jcjg	3/3	Running
0 27h		
srl-quick1-messaging-kafka-0	1/1	Running
0 27h		
srl-quick1-messaging-zookeeper-0	1/1	Running
0 27h		

Validate the persistent volume claims created for the Kafka cluster by running the following command:

```
$kubectl get pvc -n srl
```

NAME	STATUS	
VOLUME	CAPACITY	ACCESS MODES
STORAGECLASS AGE		
data-srl-quick1-messaging-kafka-0	Bound	<volume> 1Gi
RWO sc 27h		
data-srl-quick1-messaging-zookeeper-0	Bound	<volume> 1Gi
RWO sc		

Target Message Bus

The target Message Bus should be up and running (the Kafka cluster to which the topics should be replicated).

Validate the Kafka cluster is installed by running the following command:

```
$kubectl get pod -n sr2
```

NAME	READY	STATUS
RESTARTS AGE		
sr2-quick2-messaging-entity-operator-5f9c688c7-2jcjg	3/3	Running
0 27h		
sr2-quick2-messaging-kafka-0	1/1	Running
0 27h		
sr2-quick2-messaging-zookeeper-0	1/1	Running
0 27h		

Validate the persistent volume claims created for the Kafka cluster by running the following command:

```
$kubectl get pvc -n <kafka target namespace>
```

NAME		STATUS		
VOLUME		CAPACITY	ACCESS	MODES
STORAGECLASS	AGE			
data-sr2-quick2-messaging-kafka-0		Bound	<volume>	1Gi
RWO	sc	27h		
data-sr2-quick2-messaging-zookeeper-0		Bound	<volume>	1Gi
RWO	sc	27h		

Installing and configuring Mirror Maker 2.0

A sample is provided at `$COMMON_CNTK/samples/messaging/kafka-mirror-maker`.

Debugging and Troubleshooting

NotEnoughReplicasException

When you get the `org.apache.kafka.common.errors.NotEnoughReplicasException`: Messages are rejected since there are fewer in-sync replicas than required. The reason could be that the topics replicas is not meeting the default `minInsyncReplicas` value configured in the Message Bus service.

Asynchronous auto-commit of offsets failed

When you get the following error in the logs (for example: ATA Consumer). To resolve this make sure that `max.polling.interval.ms` is always greater than the last poll or else reduce the `max.poll.records`.

```
[Consumer clientId=consumer-ora-uim-topology-service-2, groupId=ora-uim-topology-service] Asynchronous auto-commit of offsets failed: Offset commit cannot be completed since the consumer is not part of an active group for auto partition assignment; it is likely that the consumer was kicked out of the group.. Will continue to join group.
```

Add these additional properties in the YAML file under the `mp.messaging.connector.helidon-kafka` section with override values.

```
mp.messaging:
  connector:
    helidon-kafka:
      # The following are default global configuration values which effects
      # for all the consumer groups.
      max.polling.interval.ms: 300000
      max.poll.records: 500

      # The following are channel specific configuration values
      incoming:
        # The toInventoryChannel effects only for ora-uim-topology-service
        # consumer group
        # uncomment and update the specific values
        #toInventoryChannel:
```

```

#max.polling.interval.ms: 300000
#max.poll.records: 500

# The toFaultChannel effects only for ora-uim-topology-retry-service
consumer group
# Uncomment and update the specific values
#toRetryChannel:
#max.polling.interval.ms: 300000
#max.poll.records: 200

# The toDltChannel effects only for ora-uim-topology-dlt-service consumer
group
# uncomment and update the specific values
#toDltChannel:
#max.polling.interval.ms: 300000
#max.poll.records: 100

```

Performance Tuning: Consumer Configurations

The following are some consumer configuration properties in message consumers which are related to performance. See <https://kafka.apache.org/documentation/#consumerconfigs> for all available consumer config properties.

- `max.poll.records` (default=500) defines the maximum number of messages that a consumer can poll at once.
- `max.partition.fetch.bytes` (default=1048576) defines the maximum number of bytes that the server returns in a poll for a single partition.
- `max.poll.interval.ms` (default=300000) defines the time a consumer must process all messages from a poll and fetch a new poll afterward. If this interval is exceeded, the consumer leaves the consumer group.
- `http://heartbeat.interval.ms` (default=3000) defines the frequency with which a consumer sends heartbeats.
- `http://session.timeout.ms` (default=10000) defines the time a consumer must send a heartbeat. If no heartbeat was received in that timeout, the member is considered dead and leaves the group.

Managing Consumer Groups

For more list of options available on the consumer groups see the apache kafka managing consumer groups section. The following sub-sections list some significant operations. See "Message Bus Client Access" for more information.

List consumer groups

```

#Exec into running message bus test client pod
kubectl exec -it mb-test-auth-client-deployment-*****-**** -n sr -- bash

#Run the below command to list all the consumer groups
bin/kafka-consumer-groups.sh \
--command-config /home/kafka/mb_test_client.properties \
--bootstrap-server <Your Bootstrap Server URL> \
--list

```

Describe consumer group

```
#Exec into running Kafka admin client pod
kubectl exec -it mb-test-auth-client-deployment-*****-**** -n sr -- bash

#Run the below command to describe specific consumer group to check topics,
partitions, offsets
#Replace the command-config, bootstrap, group values accordingly
bin/kafka-consumer-groups.sh \
--command-config /home/kafka/mb_test_client.properties \
--bootstrap-server <Your Bootstrap Server URL> \
--group test-client-service \
--describe
```

Reset offset of a consumer group

```
#Exec into running Kafka admin client pod
kubectl exec -it mb-test-auth-client-deployment-*****-**** -n sr -- bash

#Run the below command to reset offset for consumer group for topic to
latest. See Apache Kafka documentation for other available options.
#Replace the command-config, bootstrap, group and topic values accordingly
bin/kafka-consumer-groups.sh \
--command-config /home/kafka/mb_test_client.properties \
--bootstrap-server <Your Bootstrap Server URL> \
--group test-client-service \
--reset-offsets \
--topic ora-test-topic \
--to-latest \
--execute
```

Topics

For more detailed list of operations available on the topics see the "Apache Kafka Operations". The following sub-sections list some significant operations. See "Message Bus Client Access" for more information.

Create

Create a topic with three partitions and two replications.

```
#Exec into running Kafka admin client pod
kubectl exec -it mb-test-auth-client-deployment-*****-**** -n sr -- bash

#Run the below command to create a topic
bin/kafka-topics.sh \
--command-config /home/kafka/mb_test_client.properties \
--bootstrap-server <Your Bootstrap Server URL> \
--create \
--topic replicated-2 \
--replication-factor 2 \
--partitions 3
```

List

To list all topics:

```
#Exec into running Kafka admin client pod
kubectl exec -it mb-test-auth-client-deployment-*****-***** -n sr -- bash
```

```
#Run the below command to list all the topic
bin/kafka-topics.sh \
  --command-config /home/kafka/mb_test_client.properties \
  --bootstrap-server <Your Bootstrap Server URL> \
  --list
```

Describe

Describes the topic and its partition count, replicas factory along with leaders for the partition.

```
#Exec into running Kafka admin client pod
kubectl exec -it mb-test-auth-client-deployment-*****-***** -n sr -- bash
```

```
#Run the below command to describe the topic
bin/kafka-topics.sh \
  --command-config /home/kafka/mb_test_client.properties \
  --bootstrap-server <Your Bootstrap Server URL> \
  --topic replicated-2 \
  --describe
```

```
#Sample output
Topic: replicated-2      TopicId: vyalpP0mR0CtYt7Sc-gbxA
PartitionCount: 3      ReplicationFactor: 2      Configs:
min.insync.replicas=1,message.format.version=3.0-IV1
```

```
Topic: replicated-2      Partition: 0      Leader: 1      Replicas: 1,0
Isr: 1,0
Topic: replicated-2      Partition: 1      Leader: 0      Replicas: 0,1
Isr: 0,1
Topic: replicated-2      Partition: 2      Leader: 1      Replicas: 1,0
Isr: 1,0
```

Alter

You can alter a topic and increase the partitions to 2.

```
#Exec into running Kafka admin client pod
kubectl exec -it mb-test-auth-client-deployment-*****-***** -n sr -- bash
```

```
#Run the below command to alter the topic bin/kafka-topics.sh \
  --command-config /home/kafka/mb_test_client.properties \
  --bootstrap-server <Your Bootstrap Server URL> \
  --alter \
  --topic <Your Topic Name> \
  --partitions 1
```

Reassignment

The partition reassignment tool can also be used to selectively move replicas of a partition to a specific set of brokers. In the following example the partitions for topic (**replicated-2**) are reassigned to different brokers.

See the "Message Bus Client Access" section for more information on running the message bus test pod with required configuration such as Authentication and SSL.

Create a file called custom-reassignment.json file a terminal

```
{"version": "1", "partitions":
[{"topic": "replicated-2", "partition": "0", "replicas": "[0,1]"},
{"topic": "replicated-2", "partition": "1", "replicas": "[1,2]"},
{"topic": "replicated-2", "partition": "2", "replicas": "[0,2]"}]}
```

Run the following commands for reassignment:

```
#Copy the custom-reassignment.json file into the newly created pod under /
home/kafka directory
$kubectl cp custom-reassignment.json mb-test-auth-client-deployment-*****-
****:/home/kafka/custom-reassignment.json -n kafka

#Exec into running test pod
kubectl exec -it mb-test-auth-client-deployment-*****-**** -n sr -- bash
#Cd directory to /home/kafka

#Validate the topic ("replicated-2"
/opt/kafka/bin/kafka-topics.sh \
--command-config /home/kafka/mb_test_client.properties \
--bootstrap-server <Your Bootstrap Server URL> \
--topic replicated-2 --describe
Topic: replicated-2      TopicId: vyalpPOMR0CtYt7Sc-gbxA PartitionCount:
3      ReplicationFactor: 2      Configs:
min.insync.replicas=1,message.format.version=3.0-IV1
      Topic: replicated-2      Partition: 0      Leader: 1      Replicas:
1,0      Isr: 1,0
      Topic: replicated-2      Partition: 1      Leader: 1      Replicas:
0,1      Isr: 1,0
      Topic: replicated-2      Partition: 2      Leader: 1      Replicas:
1,0      Isr: 1,0

#Run reassign-partitions script to reassign the partitions according to the
json file
$/opt/kafka/bin/kafka-reassign-partitions.sh --bootstrap-server dev-messaging-
kafka-bootstrap:9092 --reassignment-json-file custom-reassignment.json --
execute

Current partition replica assignment

{"version":1,"partitions":[{"topic":"replicated-2","partition":0,"replicas":
[1,0],"log_dirs":["any","any"]},
{"topic":"replicated-2","partition":1,"replicas":[0,1],"log_dirs":
["any","any"]}, {"topic":"replicated-2","partition":2,"replicas":
```

```
[1,0],"log_dirs":["any","any"]]]}
```

```
Save this to use as the --reassignment-json-file option during rollback
Successfully started partition reassignments for
replicated-2-0,replicated-2-1,replicated-2-2
```

```
#Verify the reassignment status
$/opt/kafka/bin/kafka-reassign-partitions.sh --bootstrap-server dev-messaging-
kafka-bootstrap:9092 --reassignment-json-file custom-reassignment.json --
verify
```

```
Status of partition reassignment:
Reassignment of partition replicated-2-0 is complete.
Reassignment of partition replicated-2-1 is complete.
Reassignment of partition replicated-2-2 is complete.
```

```
Clearing broker-level throttles on brokers 0,1,2
Clearing topic-level throttles on topic replicated-2
```

```
# Validate the partition assignments
$/opt/kafka/bin//kafka-topics.sh \
  --command-config /home/kafka/mb_test_client.properties \
  --bootstrap-server <Your Bootstrap Server URL> \
  --topic replicated-2 --describe
Topic: replicated-2      TopicId: vyalpP0mR0CtYt7Sc-gbxA PartitionCount:
3      ReplicationFactor: 2      Configs:
min.insync.replicas=1,message.format.version=3.0-IV1
      Topic: replicated-2      Partition: 0      Leader: 1      Replicas:
0,1      Isr: 1,0
      Topic: replicated-2      Partition: 1      Leader: 1      Replicas:
1,2      Isr: 1,2
      Topic: replicated-2      Partition: 2      Leader: 0      Replicas:
0,2      Isr: 0,2
```

8

Deploying the Active Topology Automator Service

This chapter describes how to deploy and manage ATA service.

Overview of ATA

Oracle Communications Active Topology Automator (ATA) represents the spatial relationships among your inventory entities for the inventory and network topology.

- ATA provides a graphical representation of topology where you can see your inventory and its relationships at the level of detail that meets your needs.

See ATA Help for more information about the topology visualization.

Use ATA to view and analyze the network and service data in the form of topology diagrams. ATA collects this data from UIM.

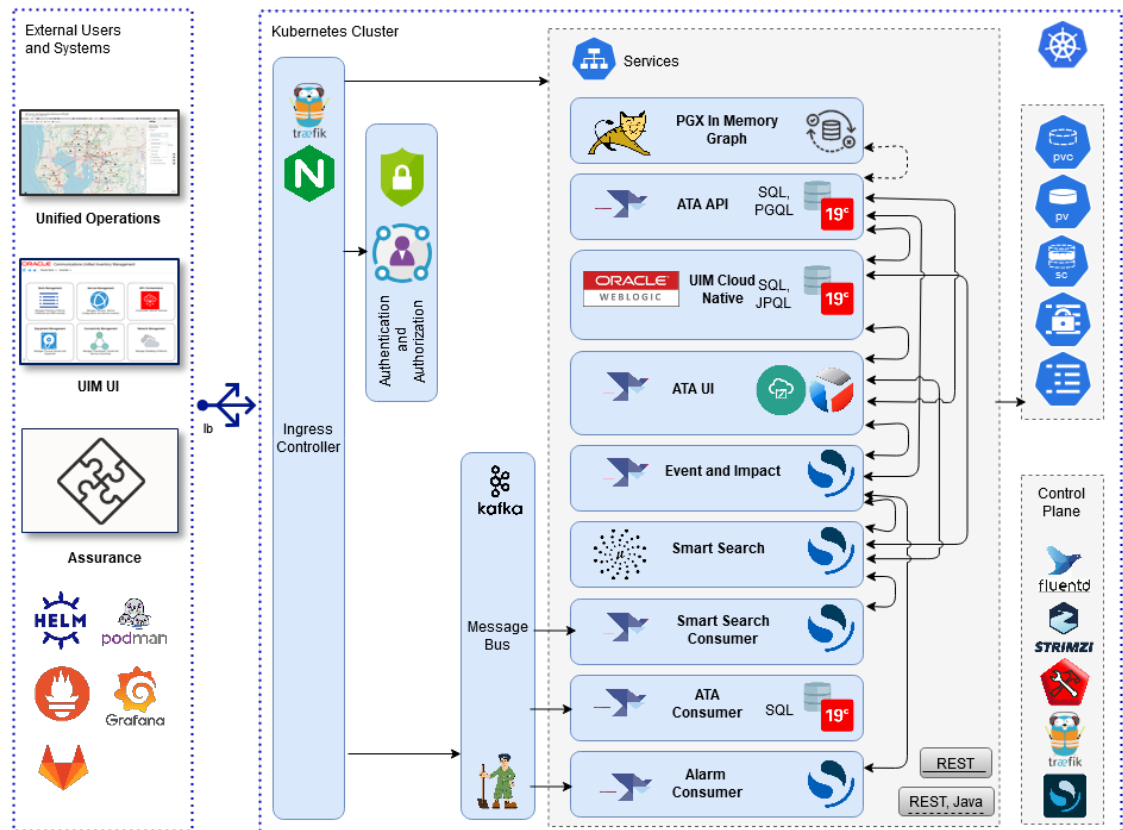
You use ATA for the following:

- Viewing the networks and services, along with the corresponding resources, in the form of topological diagrams and graphical maps.
- Planning the network capacity.
- Tracking networks.
- Viewing alarm information.

ATA Architecture

The following figure shows a high-level architecture of the ATA service.

Figure 8-1 ATA Architecture



UIM as the Producer

UIM communicates with the Topology Service using REST APIs and Kafka Message Bus. UIM is the Producer for Create, Update and Delete operations from UIM that impact Topology. UIM uses REST APIs to communicate directly with the ATA Service while building the messages and can also continue processing when the Topology Service is unavailable.

ATA Consumer

The ATA consumer service is a message consumer for topology updates from UIM using Message Bus service. ATA consumer processes the message of TopologyNodeCreate, TopologyNodeUpdate, TopologyNodeDelete, TopologyEdgeCreate, TopologyEdgeUpdate, TopologyEdgeDelete, TopologyProfileDelete, TopologyProfileDelete, and TopologyProfileUpdate event types. See "ATA Events and Definitions" chapter in *Active Topology and Automator Asynchronous Events Guide*.

Alarm Consumer

The ATA alarm consumer service consumes TMF642 wrapped in TMF688 messages from the Assurance systems. The alarm consumer supports processing of multiple messages of event types **AlarmCreateEvent**, **AlarmAttributeValueChangeEvent**, **ClearAlarmCreateEvent**, and **AlarmDeleteEvent**. In incoming alarm message from the Assurance system can be of two types, normal alarm (fault) and threshold crossing (performance) alarm. The alarm consumer

will extract the alarmed object identifier from the input message and creates and associates the event (alarm) to the inventory resource.

SmartSearch API

SmartSearch API enables you to search, filter, autocompletes, or aggregates the bulk API to batch process for insert, update, or delete top entries from the OpenSearch database.

SmartSearch Consumer

SmartSearch is a consumer for UIM. It processes multiple message events such as TopologyNodeCreate, TopologyNodeUpdate, TopologyNodeDelete, TopologyEdgeCreate, TopologyEdgeUpdate, TopologyEdgeDelete and so on.

OpenSearch

OpenSearch is NoSQL database it is an open-source search and analytics suite that makes it easy to ingest, search, visualize, and analyze data.

Topology Graph Database

The ATA Service communicates to the Oracle Databases using the Oracle Property Graph feature with PGQL and standard SQL. It can communicate directly to the database or with the In-Memory Graph for high performance operations. This converged database feature of Oracle Database makes it possible to utilize the optimal processing method with a single database. The Graph Database is isolated and a separate Pluggable Database (PDB) from the UIM Database but runs on the same 19c version for simplified licensing.

PGX In-Memory Graph

The ATA Service also uses the Oracle Labs Parallel Graph AnalytiX (PGX) In-Memory database. The PGX server is used for Path Analysis and is configured for periodic updates.

ATA User Interface

ATA provides a graphical representation of topology where you can see your inventory and its relationships at the level of detail that meets your needs. ATA is built using Oracle Redwood Design System.

Prerequisites and Configuration for Creating ATA Images

You must install the prerequisite software and tools for creating ATA images.

Prerequisites for Creating ATA Images

You require the following prerequisites for creating ATA images:

- Podman on the build machine if Linux version is greater than or equal to 8.
- Docker on the build machine if Linux version is lesser than 8
- ATA Builder Toolkit (ref about the deliverables)

- Install Maven and update path variable with Maven Home.

```
Set PATH variable export PATH=$PATH:$MAVEN_HOME/bin
```

- Java, installed with JAVA_HOME set in the environment.

```
Set PATH variable export PATH=$PATH:$JAVA_HOME/bin
```

- Bash, to enable the `<tab>` command complete feature.

See "UIM Software Compatibility" in *UIM Compatibility Matrix* for details about the required and supported versions of these prerequisite software.

Configuring ATA Images

The dependency manifest file describes the input that goes into the ATA images. It is consumed by the image build process. The default configuration in the latest manifest file provides the necessary components for creating the ATA images easily. See "[About the Manifest File](#)" for more information.

Creating ATA Images

To create the ATA images:



Note:

See "UIM Software Compatibility" in *UIM Compatibility Matrix* for the latest versions of software.

1. Go to WORKSPACEDIR.
2. Download graph server war file from Oracle E-Delivery (<https://www.oracle.com/database/technologies/spatialandgraph/property-graph-features/graph-server-and-client/graph-server-and-client-downloads.html>) → [Oracle Graph Server](#) <version> → Oracle Graph Webapps <version> for (Linux x86-64)) and copy graph server war file to directory \$WORKSPACEDIR/ata-builder/staging/downloads/graph. Ensure only one copy of PGX.war exists in .../downloads/graph path.



Note:

The log level is set to debug by default in graph server war file. If required, update the log level to **error/info** in **graph-server-webapp-23.3.0.war/WEB-INF/classes/logback.xml** before building images.

3. Download **tomcat-<tomcat_version>.tar.gz** and copy to \$WORKSPACEDIR/ata-builder/staging/downloads/tomcat.
4. Download **jdk-<jdk_version>_linux-x64_bin.tar.gz** and copy to \$WORKSPACEDIR/ata-builder/staging/downloads/java.

 Note:

For Tomcat and JDK versions, see Unified Inventory and Topology Microservices

5. Export proxies in environment variables, fill the details on proxy settings:

```
#The eth0 is sample. replace "etho" with your specific interface name.
export ip_addr=`ip -f inet addr show eth0|egrep inet|awk '{print $2}'|awk -F/ '{print $1}'`
export http_proxy=
export https_proxy=$http_proxy
export no_proxy=localhost,$ip_addr
export HTTP_PROXY=
export HTTPS_PROXY=$HTTP_PROXY
export NO_PROXY=localhost,$ip_addr
```

6. Update \$WORKSPACEDIR/ata-builder/bin/gradle.properties with required proxies.

```
systemProp.http.proxyHost=
systemProp.http.proxyPort=
systemProp.https.proxyHost=
systemProp.https.proxyPort=
systemProp.http.nonProxyHosts=localhost|127.0.0.1
systemProp.https.nonProxyHosts=localhost|127.0.0.1
```

7. Uncomment the proxy block and provide \$WORKSPACEDIR/ata-builder/bin/m2/settings.xml with required proxies.

```
<proxies>
  <proxy>
    <id>oracle-http-proxy</id>
    <host>xxxxx</host>
    <protocol>http</protocol>
    <nonProxyHosts>localhost|127.0.0.1|xxxxx</nonProxyHosts>
    <port>xxxxx</port>
    <active>true</active>
  </proxy>
</proxies>
```

8. Copy UI custom icons to directory older \$WORKSPACEDIR/ata-builder/staging/downloads/ata-ui/images if you have any customizations for service topology icon. For making customizations, see "[Customizing the Images](#)".
9. Update the image tag in \$WORKSPACEDIR/ata-builder/bin/ata_manifest.yaml
10. Run build-all-images script to create ATA images:

```
$WORKSPACEDIR/ata-builder/bin/build-all-images.sh
```

 Note:

You can include the above procedure into your CI pipeline as long as the required components are already downloaded to the staging area.

Post-build Image Management

The ATA image builder creates images with names and tags based on the settings in the manifest file. By default, this results in the following images:

- uim-7.7.0.0.0-ata-base-1.2.0.0.0:latest
- uim-7.7.0.0.0-ata-api-1.2.0.0.0:latest
- uim-7.7.0.0.0-ata-pgx-1.2.0.0.0:latest
- uim-7.7.0.0.0-ata-ui-1.2.0.0.0:latest
- uim-7.7.0.0.0-ata-dbinstaller-1.2.0.0.0:latest
- uim-7.7.0.0.0-ata-consumer-1.2.0.0.0:latest
- uim-7.7.0.0.0-alarm-consumer-1.2.0.0.0:latest
- uim-7.7.0.0.0-smartsearch-consumer-1.2.0.0.0:latest
- uim-7.7.0.0.0-impact-analysis-api-1.2.0.0.0:latest

Customizing the Images

Service topology can be customized using a JSON configuration file. See "Customizing Service Topology in ATA from UIM" in *UIM System Administrator's Guide* for more information. As a part of customization, if custom icons are to be used to represent nodes in service topology, they must be placed in the **\$WORKSPACEDIR/ata-builder/staging/downloads/ata-ui/images/** folder and **ata-ui** image must be rebuilt.

Localizing Specification Name in ATA

The specification names in the ATA application can be localized. To achieve this, export the specification bundle from UIM and build the image with customization.

The prerequisite for localizing specification name in ATA is that the specification displays names provided in Service Catalog and Design - Design Studio and deployed to UIM.

To localize the specification name:

1. Export UIM App Bundle:
 - a. In UIM UI, navigate to **Execute Rule** under **Administration** section in the left pane.
 - b. Select **EXPORT_SPECIFICATION_DISPLAY_NAMES_AS_JSON** from the dropdown, ignore the file upload option, and click **Process**.

Note:

The **ora_uim_baserulesets** must be deployed before performing this step.

- c. Download **uimAppBundle.tar.gz**.
2. Place **uimAppBundle.tar.gz** in **\$BUILDER_HOME/staging/downloads/ata-ui/uimAppBundle** builder for image building.
 3. Customize and build the image.

Creating an ATA Instance

This section describes how to create an ATA instance in your cloud native environment using the operational scripts and the configuration provided in the common cloud native toolkit.

Before you can create an ATA instance, you must validate cloud native environment. See "[Planning UIM Installation](#)" for details on prerequisites.

In this section, while creating a basic instance, the project name is considered as **sr** and instance name is considered as **quick**.



Note:

Project and Instance names cannot contain any special characters.

Installing ATA Cloud Native Artifacts and Toolkit

Build container images for the following using the ATA cloud native Image Builder:

- ATA Core application
- ATA PGX application
- ATA Consumer application
- Alarm Consumer application
- ATA User Interface application
- ATA database installer
- SmartSearch Consumer application

See "[Deployment Toolkits](#)" to download the Common cloud native toolkit archive file. Set the variable for the installation directory by running the following command, where \$WORKSPACEDIR is the installation directory of the COMMON cloud native toolkit:

```
export COMMON_CNTK=$WORKSPACEDIR/common-cntk
```

Setting up Environment Variables

ATA relies on access to certain environment variables to run seamlessly. Ensure the following variables are set in your environment:

- Path to your common cloud native toolkit
- Traefik namespace
- Path to your specification files

To set the environment variables:

1. Set the COMMON_CNTK variable to the path of directory where common cloud native toolkit is extracted as follows:

```
$ export COMMON_CNTK=$WORKSPACEDIR/common-cntk
```

2. Set the `TAEFIK_NS` variable for Traefik namespace as follows:

```
$ export TAEFIK_NS=Treafik Namespace
```

3. Set the `TAEFIK_CHART_VERSION` variable for Traefik helm chart version. Refer UIM Compatibility Matrix for appropriate version. The following is a sample for Traefik chart version 15.1.0.

```
$ export TAEFIK_CHART_VERSION=15.1.0
```

4. Set `SPEC_PATH` variable to the location where application and database yamls are copied. See "[Assembling the Specifications](#)" to copy specification files if not already copied.

```
$ export SPEC_PATH=$WORKSPACEDIR/ata_spec_dir
```

Registering the Namespace

After you set the environment variables, register the namespace.

To register the namespace, run the following command:

```
$COMMON_CNTK/scripts/register-namespace.sh -p sr -t targets  
# For example, $COMMON_CNTK/scripts/register-namespace.sh -p sr -t traefik  
# Where the targets are separated by a comma without extra spaces
```



Note:

`traefik` is the name of the target for registration of the namespace `sr`. The script uses `TAEFIK_NS` to find these targets. Do not provide the Traefik target if you are not using Traefik.

For Generic Ingress Controller, you do not have to register the namespace. To select the ingress controller, provide the **ingressClassName** value under the **ingress.className** field in the **applications.yaml** file. For more information about `ingressClassName`, see <https://kubernetes.io/docs/concepts/services-networking/ingress/>

Creating Secrets

You must store sensitive data and credential information in the form of Kubernetes Secrets that the scripts and Helm charts in the toolkit consume. Managing secrets is out of the scope of the toolkit and must be implemented while adhering to your organization's corporate policies. Additionally, ATA service does not establish password policies.



Note:

The passwords and other input data that you provide must adhere to the policies specified by the appropriate component.

As a prerequisite to use the toolkit for either installing the ATA database or creating a ATA instance, you must create secrets to access the following:

- ATA Database
- UIM Instance Credentials
- Common **oauthConfig** Secret for authentication

The toolkit provides sample scripts to perform this. These scripts should be used for manual and faster creation of an instance. It does not support any automated process for creating instances. The scripts also illustrate both the naming of the secret and the layout of the data within the secret that ATA requires. You must create secrets before running the `install-database.sh` or `create-applications.sh` scripts.

Creating Secrets for ATA Database Credentials

The database secret specifies the connectivity details and the credentials for connecting to the ATA PDB (ATA schema). This is consumed by the ATA DB installer and ATA runtime.

1. Run the following script to create the required secrets:

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p sr -i quick -  
f $SPEC_PATH/sr/quick/applications.yaml -a ata create database
```

2. Enter the corresponding values as prompted:

- TOPOLOGY DB Admin(sys) Username: Provide Topology Database admin username
- TOPOLOGY DB Admin(sys) Password: Provide Topology Database admin password
- TOPOLOGY Schema Username: Provide username for ATA schema to be created
- TOPOLOGY Schema Password: Provide ATA schema password
- TOPOLOGY DB Host: Provide ATA Database Hostname
- TOPOLOGY DB Port: Provide ATA Database Port
- TOPOLOGY DB Service Name: Provide ATA Service Name
- PGX Client Username: Provide username for PGX Client User to be created
- PGX Client Password: Provide PGX Client Password

3. Verify that the following secret is created:

```
sr-quick-ata-db-credentials
```

Creating Secrets for UIM Credentials

The UIM secret specifies the credentials for connecting to the UIM application. This is consumed by ATA runtime.

1. Run the following scripts to create the UIM secret:

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p sr -i quick -  
f $SPEC_PATH/sr/quick/applications.yaml -a ata create uim
```


2. Enter the credentials and the corresponding values as prompted. The credentials should be as shown in the following example:

```
Provide UIM credentials ...(Format should be http: //<host>:<port>)
UIM URL: Provide UIM Application URL, sample https://quick.sr.uim.org:30443
UIM Username: Provide UIM username
UIM Password: Provide UIM password
Is provided UIM a Cloud Native Environment ? (Select number from menu)
1) Yes
2) No
#? 1
Provide UIM Cluster Service name (Format <uim-project>-<uim-instance>-
cluster-uimcluster.<project>.svc.cluster.local)
UIM Cluster Service name: sr-quick-cluster-uimcluster.sr.svc.cluster.local
#Provide UIM Cluster Service name.
```

Note:

- If the OAM IdP is used for authentication, provide the UIM front-end hostname URL in the format: `https://<instance>.<project>.ohs.<oam-host-suffix>:<loadbalancerport>.`
- Provide the default UIM URL, if the SAML protocol is configured for authentication with any IDP (such as IDCS, Keycloak, and so on.) For example: `https://<instance>.<project>.<hostSuffix>:<loadbalancerport>.`

3. Verify that the following secret is created:

```
sr-quick-ata-uim-credentials
```

Creating Secrets for Authentication Server Details

The OAuth secret specifies details of the authentication server. It is used by ATA to connect to Message Bus. See ["Adding Common OAuth Secret and ConfigMap"](#) for more information.

If authentication is enabled on ATA, ensure that you create an **oauthConfig** secret with the appropriate OIDC details of your identity provider. To create an **oauthConfig** secret, see ["Adding Common OAuth Secret and ConfigMap"](#).

Creating Secrets for SSL enabled on traditional UIM truststore

The **inventorySSL** secret stores the truststore file of the SSL enabled on traditional UIM, it is required only if Authentication is not enabled on topology and to integrate topology with UIM traditional instance.

1. Create truststore file using UIM certificates and to enable SSL on UIM. See "ATA Inventory Management System Administration Overview" in *UIM System Administrator's Guide* for more information.

2. Once you have the certificate of traditional UIM run following command to create truststore:

```
keytool -importcert -v -alias uimonprem -file ./cert.pem -keystore ./
uimtruststore.jks -storepass *****
```

3. After creating **uimtruststore.jks** run following command to create **inventorySSL** secret and pass the truststore created above:

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p sr -i quick -
f $SPEC_PATH/sr/quick/applications.yaml -a ata create inventorySSL
```

The system prompts for the truststore file location and passphrase for truststore. Provide appropriate values.

Installing ATA Service Schema

To install the ATA schema:

1. Update values under **ata-dbinstaller** in **\$SPEC_PATH/sr/quick/database.yaml** file with values required for ATA schema creation.

Note:

- The YAML formatting is case-sensitive. Use a YAML editor to ensure that you do not make any syntax errors while editing. Follow the indentation guidelines for YAML.
- Before changing the default values provided in the specification file, verify that they align with the values used during PDB creation. For example, the default tablespace name should match the value used when PDB is created.

2. Edit the **database.yaml** file and update the DB installer image to point to the location of your image as follows:

```
ata-dbinstaller:
  dbinstaller:
    image: DB_installer_image_in_your_repo
    tag: DB_installer_image_tag_in_your_repo
```

3. If your environment requires a password to download the container images from your repository, create a Kubernetes secret with the Docker pull credentials. See "[Kubernetes documentation](#)" for details. Refer the secret name in the **database.yaml**. Provide image pull secret and image pull policy details.

```
ata-dbinstaller:
  imagePullPolicy: Never
# The image pull access credentials for the "docker login" into Docker
repository, as a Kubernetes secret.
# Uncomment and set if required.
# imagePullSecret: ""
```

4. Run the following script to start the ATA DB installer, which instantiates a Kubernetes pod resource. The pod resource lives until the DB installation operation completes.

```
$COMMON_CNTR/scripts/install-database.sh -p sr -i quick -f $SPEC_PATH/sr/quick/database.yaml -a ata -c 1
```

5. You can run the script with `-h` to see the available options.
6. Check the console to see if the DB installer is installed successfully.
7. If the installation has failed, run the following command to review the error message in the log:

```
kubectl logs -n sr sr-quick-ata-dbinstaller
```

8. Clear the failed pod by running the following command:

```
helm uninstall sr-quick-ata-dbinstaller -n sr
```

9. Run the install-database script again to install the ATA DB installer.

Configuring the applications.yaml File

The **applications.yaml** file is a Helm override values file to override default values of ATA chart. Update values under chart ata in `$SPEC_PATH/<PROJECT>/<INSTANCE>/applications.yaml` to override the default values.

The **applications.yaml** provides a section for values that are common for all microservices. Provide Values under that common section and it is reflected for all services.



Note:

There are common values specified in **applications.yaml** and **database.yaml** for the microservices. To override the common value, specify the value for the common value under chart name of microservice. If value under the chart is empty, then common value is considered.

To configure the project specification:

1. Edit the **applications.yaml** to provide the image in your repository (name and tag) by running the following command:

```
vi $SPEC_PATH/$PROJECT/$INSTANCE/applications.yaml

# edit the image names, to reflect the ATA image names and location in
your docker repository
# edit the image tags to reflect the ATA image names and location in your
docker repository

ata:
  name: "ata"
  image:
    topologyApiName: uim-7.7.0.0.0-ata-api-1.2.0.0.0
    pgxName: uim-7.7.0.0.0-ata-pgx-1.2.0.0.0
```

```

uiName: uim-7.7.0.0.0-ata-ui-1.2.0.0.0
topologyConsumerName: uim-7.7.0.0.0-ata-consumer-1.2.0.0.0
smartsearchConsumerName: uim-7.7.0.0.0-smartsearch-consumer-1.2.0.0.0
alarmConsumerName: uim-7.7.0.0.0-alarm-consumer-1.2.0.0.0
impactAnalysisApiName: uim-7.7.0.0.0-impact-analysis-api-1.2.0.0.0
topologyApiTag: latest
pgxTag: latest
uiTag: latest
topologyConsumerTag: latest
smartsearchConsumerTag: latest
alarmConsumerTag: latest
impactAnalysisApiTag: latest
repository:
repositoryPath:

```

2. If your environment requires a password to download the container images from your repository, create a Kubernetes secret with the Docker pull credentials. See the ["Kubernetes documentation"](#) for details. See the secret name in the **applications.yaml** for more information.

```

# The image pull access credentials for the "docker login" into Docker
repository, as a Kubernetes secret.
# uncomment and set if required.

```

```

ata:
#  imagePullSecret:
#    imagePullSecrets:
#      - name: regcred

```

3. Set Pull Policy for ATA images in **applications.yaml**. Set pullPolicy to **Always** in case image is updated.

```

ata:
  image:
    pullPolicy: Never

```

4. Update **loadbalancerport** in **applications.yaml**. If there is no external loadbalancer configured for the instance change the value of loadbalancerport to the **ingressController NodePort** . If SSL is enabled on ATA, provide SSL NodePort and if SSL is disabled, provide non-SSL NodePort.
If you use Oracle Cloud Infrastructure LBaaS, or any other external load balancer, if TLS is enabled set loadbalancerport to 443 else set loadbalancerport to 80 and update the value for loadbalancerhost appropriately.

```

#provide loadbalancer port
loadbalancerport: 30305

```

5. To enable authentication, set the flag **authentication.enabled** to **true**. If OAM is used for authentication, provide loadbalancer ip-address and ohs-hostname under **hostAliases**. The hostAliases are added under the pods within the **/etc/hosts** file. If you use any other IDP and it is not under the public dns server, you can provide the **hostAliases**.

```

# The enabled flag is to enable or disable authentication
authentication:
  enabled: true

```

```

hostAliases:
- ip: <ip-address>
  hostnames:
  - <oam-instance>.<oam-project>.ohs.<hostSuffix> (ex quick.sr.ohs.uim.org)

```

6. If Authentication is not enabled on ATA and want to integrate ATA with traditional SSL enabled UIM, you have to create **inventorySSL** secret and enable the **inventorySSL** flag in **applications.yaml** as shown below:

```

# make it true if using on prem inventory with ssl port enabled and
# authentication is not enabled on topology
# always false for Cloud Native inventory
# not required in production environment
isInventorySSL: true

```

Configuring ATA

Sample configuration files `topology-static-config.yaml.sample`, `topology-dynamic-config.yaml.sample` are provided as the sample files for ATA API service that are under **\$COMMON_CNTK/charts/ata-app/charts/ata/config/ata-api**

To override configuration properties, copy the sample static property file to **topology-static-config.yaml** and sample dynamic property file to **topology-dynamic-config.yaml**. Provide key value to override the default value provided out-of-the-box for any specific system configuration property. The properties defined in property files are fed into the container using Kubernetes configuration maps. Any changes to these properties require the instance to be upgraded. Pods are restarted after configuration changes to **topology-static-config.yaml**.

Max Rows

Modify the following setting to limit the number of records returned in LIMIT queries:

```

topology:
  query:
    maxrows: 5000

```

Date Format

Any modifications to the date format used by all dates must be consistently applied to all consumers of the APIs.

```

topology:
  api:
    dateformat: yyyy-MM-dd'T'HH:mm:ss.SSS'Z'

```

Alarm Types

The out of the box alarm types utilize industry standard values. If you want to display a different value, modify the value accordingly:

For example: To modify the COMMUNICATIONS_ALARM change the value to COMMUNICATIONS_ALARM: Communications

```
alarm-types:
  COMMUNICATIONS_ALARM: COMMUNICATIONS_ALARM
  PROCESSING_ERROR_ALARM: PROCESSING_ERROR_ALARM
  ENVIRONMENTAL_ALARM: ENVIRONMENTAL_ALARM
  QUALITY_OF_SERVICE_ALARM: QUALITY_OF_SERVICE_ALARM
  EQUIPMENT_ALARM: EQUIPMENT_ALARM
  INTEGRITY_VIOLATION: INTEGRITY_VIOLATION
  OPERATIONAL_VIOLATION: OPERATIONAL_VIOLATION
  PHYSICAL_VIOLATION: PHYSICAL_VIOLATION
  SECURITY_SERVICE: SECURITY_SERVICE
  MECHANISM_VIOLATION: MECHANISM_VIOLATION
  TIME_DOMAIN_VIOLATION: TIME_DOMAIN_VIOLATION
```

Event Status

ATA supports 3 types of events: 'Raised' for new events, 'Updated' for existing events with updated information and 'Cleared' for events that have been Closed.

To modify the 'CLEARED' event change the value to CLEARED: closed

```
event-status:
  CLEARED: CLEARED
  RAISED: RAISED
  UPDATED: UPDATED
```

Event Severity

ATA supports various types of event severity on a Device. The severity from most severe to least severe is CRITICAL(1), MAJOR(5), WARNING(10), INTERMEDIATE(15), MINOR(20), CLEARED(25) and None(999).

Internally, a numeric value is used to identify the severity hierarchy. The top three most severe events are tracked in ATA.

To modify the 'INTERMEDIATE' severity change the value to INTERMEDIATE: moderate

```
severity:
  CLEARED: CLEARED
  INDETERMINATE: INDETERMINATE
  CRITICAL: CRITICAL
  MAJOR: MAJOR
  MINOR: MINOR
  WARNING: WARNING
```

Path Analysis Cost Values

ATA supports 3 different types of numeric cost values for each edge/connectivity maintained in topology. The cost type label is configured based on your business requirements and data available.

You select the cost parameter to evaluate while using path analysis. The cost values are maintained externally using the REST APIs.

To modify 'costValue3' from Distance to Packet Loss change the value to costValue3: PacketLoss after updating the data values.

```
pathAnalysis:
  costType:
    costValue1: Jitter
    costValue2: Latency
    costValue3: Distance
```

Path Analysis Alarms

Alarms can be used by path analysis to exclude devices in the returned paths. The default setting is to exclude devices with any alarm.

To allow Minor and Greater alarms modify the setting to:

excludeAlarmTypes: Critical and Greater, Major and Greater

All Paths Limit

To improve the response time, modify the max number of paths returned when using 'All' Paths.

Configuring Topology Consumer

The sample configuration files **topology-static-config.yaml.sample** and **topology-dynamic-config.yaml.sample** are provided under **\$COMMON_CNTK/charts/ata-app/charts/ata/config/ata-api**.

To override configuration properties, copy the sample static property file to **topology-static-config.yaml** and sample dynamic property file to **topology-dynamic-config.yaml**. Provide key value to override the default value provided out-of-the-box for any specific system configuration property. The properties defined in property files are provided to the container using Kubernetes configuration maps. Any changes to these properties require the instance to be upgraded. Pods are restarted after configuration changes to topology-static-eexconfig.yaml.

Reduce the Poll size for Retry and dlT Topic

Uncomment or add the configuration values in **topology-config.yaml** and upgrade the Topology Consumer service.

Maximum Poll Interval and Records

Edit **max.poll.interval.ms** to increase or decrease the delay between invocations of **poll()** when using consumer group management and **max.poll.records** to increase or decrease the maximum number of records returned in a single call to **poll()**.

```
mp.messaging:
  incoming:
    toInventoryChannel:
      # max.poll.interval.ms: 300000
      # max.poll.records: 500
    toFaultChannel:
      # max.poll.interval.ms: 300000
      # max.poll.records: 500
    toRetryChannel:
      # max.poll.interval.ms: 300000
```

```
#      max.poll.records: 200
      toDltChannel:
#      max.poll.interval.ms: 300000
#      max.poll.records: 100
```

Partition assignment strategy

The **PartitionAssignor** is the class that decides which partitions are assigned to which consumer. While creating a new Kafka consumer, you can configure the strategy that can be used to assign the partitions amongst the consumers. You can set it using the configuration **partition.assignment.strategy**. The partition re-balance (moving partition ownership from one consumer to another) happens, in case of:

- Addition of new Consumer to the Consumer group.
- Removal of Consumer from the Consumer group.
- Addition of New partition to the existing topic.

To change the partition assignment strategy, update the *topology-config.yaml* for topology consumer and redeploy the POD. The below example configuration shows the **CooperativeStickyAssignor** strategy. For list of supported partition assignment strategies, see **partition.assignment.strategy** in Apache Kafka documentation.

```
mp.messaging
  connector:
    helidon-kafka:
      partition.assignment.strategy:
org.apache.kafka.clients.consumer.CooperativeStickyAssignor
```

Configuring Alarm Consumer

Sample configuration files **alarm-consumer-static-config.yaml.sample** and **alarm-consumer-dynamic-config.yaml.sample** are provided under **\$COMMON_CNTK/charts/ata-app/charts/ata/config/alarm-consumer**.

To override configuration properties, copy the sample static property file to **alarm-consumer-static-config.yaml** and sample dynamic property file to **alarm-consumer-dynamic-config.yaml**. Provide key value to override the default value provided out-of-the-box for any specific system configuration property. The properties defined in property files are provided to the container using Kubernetes configuration maps. Any changes to these properties require the instance to be upgraded. Pods are restarted after configuration changes to **alarm-consumer-static-config.yaml**.

Configuring Incoming Channel

For performance improvement tuning **tn-comment** or add the following in **alarm-consumer-static-config.yaml** file to override the default configuration:

- Edit **max.poll.interval.ms** to increase or decrease the delay between invocations of **poll()** while using the consumer group management.
- Edit **max.poll.records** to increase or decrease the maximum number of records returned in a single call to **poll()**.

```
mp.messaging:
  incoming:
    toFaultChannel:
```



```
#      max.poll.interval.ms: 300000
#      max.poll.records: 500
  toRetryChannel:
#      max.poll.interval.ms: 300000
#      max.poll.records: 150
  toDltChannel:
#      max.poll.interval.ms: 300000
#      max.poll.records: 100
```

Impact Analysis API

The impact analysis API is as follows:

```
impactAnalysis:
  url: http://localhost:8084
```

Customizing Device Mapping

ATA alarm consumer processes alarms that are based on TMF-642 specification. The TMF-642 alarm specification has the following section that has details about network entity on which the alarm is raised or problem has occurred.

```
"alarmedObject": {
  "@referredType": "OT_AID",
  "@type": "AlarmedObjectRef",
  "id": "LSN/EMS_XDM_33/9489:73:12295",
  "name": ""
}
```

In the **alarmedObject** JSON data, the **id** field will have the details for the network entity. In ATA alarm-consumer processing the **alarmedObject.id** field has device information of the topology managed by the ATA. By default, alarm consumer expects the **alarmedObject.id** to be a ":" delimited data. The delimiter is used to understand the device information of which the first part of ":" is expected to be the device name. Therefore, ATA alarm consumer will extract the first part of the ":" delimited data and then tries to find the device name in the database.

This mapping of **alarmedObject.id** as a device name in database is default in ATA alarm consumer. The default can be extended. The following section explains the customization of the device mapping.

```
deviceMapping:
  inventory:
    lookupFields: # ordered ascending, only four values supported
  [name,id,deviceId,ipv4,ipv6]
    - name #default
    - id
    - deviceId
    - ipv4
    - ipv6
  customizeDeviceLookup:
    enabled: true
```

The above YAML configuration is used to change the device mapping.

Table 8-1 Device Mapping Fields

Field	Description
deviceMapping.lookupFields	This is an array field that can have only the values : name, id, deviceIdIdentifier, ipv4, ipv6. There are names of the fields in persisted data which will be used to search the device that is mentioned in the alarmedObject.id field. The name field is default. That means, the first part of the ':' of alarmedObject.id field by default get searched with name. The order of the array is followed. Therefore, if array is updated in id, deviceIdIdentifier, ipv4, ipv6, or name fields, the alarm consumer will take the first part of ':' of alarmedObject.id field and then search it in database with the corresponding id, since the array first element is id. Only the first three entries of the array are considered for searching. That means, for name, id, deviceIdIdentifier, ipv4, and ipv6 settings, it will search with the name first and if not found then id, if not found then deviceIdIdentifier. Once a device is found, no further matching will be performed. In case no device is found or multiple devices found, see "Fallout Events Resolution" for more information.
deviceMapping.customizeDeviceLookup.enabled	This is a Boolean value. If it is true, the alarm consumer enables extensibility to its user to provide groovy script, which should return a single value by processing either alarmedObject or alarm (TMF-642). This single value which is expected to be returned from the Groovy that is used to match in the database. The sample Groovy script is as follows:

```
import groovy.json.JsonSlurper

def getDeviceIds(alarmedObject,alarm){
    def jsonSlurper = new JsonSlurper()
    def alo = jsonSlurper.parseText(alarmedObject)
    def aloId = alo.id
    def device = aloId.split(":")[0].trim()
    /*
    * The return type must be type of String.
    * The string value will be used to search in database which expected to
    be matched with a device/ subdevice.
    */
    return device
}
```

This Groovy script must meet the following criteria:

- Groovy script is configured using **config-map** provided in the deployment.
- Groovy script is named as **DeviceMapping.groovy**.

 Note:

You cannot change the name.

- Groovy script has a method named as `getDeviceIds`.
- The `getDeviceIds` method has two arguments of type **String**.
- The **`getDeviceIds`** method returns a single value of the device name that is to be searched in the database.

Mounting Groovy Scripts To Alarm Consumer

To mount Groovy scripts to alarm consumer pod:

1. Edit the script in `$COMMON_CNTK/charts/ata-app/charts/ata/config/alarm-consumer/DeviceMapping.groovy` location.
2. Upgrade ATA instance as follows:

```
$COMMON_CNTK/scripts/upgrade-applications.sh -p project -i instance -
f $SPEC_PATH/project/instance/applications.yaml -a ata
```

Integrate ATA Service with Message Bus Service

To integrate ATA API service with Message Bus service:

1. In the file `$SPEC_PATH/sr/quick/applications.yaml`, uncomment the section **`messagingBusConfig`**.
2. Provide namespace and instance name on which the Messaging Bus service is deployed.
3. Security protocol is `SASL_PLAINTEXT` if authentication is enabled on Message bus service. If authentication is not enabled on the Message Bus service, the security protocol is `PLAINTEXT`.

A sample configuration when authentication is enabled and Messaging Bus is deployed on instance 'quick' and namespace 'sr' is as follows:

applications.yaml

```
authentication:
  enabled: true

messagingBusConfig:
  namespace: sr
  instance: quick
```

Integrating ATA with Authorization Service

If Authorization Service is installed, you can integrate ATA with Authorization service by updating `$SPEC_PATH/project/instance/applications.yaml` and uncommenting the following properties and provide appropriate values:

```
authorizationServiceConfig:
  namespace: <project> #namespace on which authorization service is deployed
```

```
instance: <instance> #instance name on which authorization service is
deployed
```

Creating an ATA Instance

To create an ATA instance in your environment using the scripts that are provided with the toolkit:

1. Run the following command to create an ATA instance:

```
$COMMON_CNTK/scripts/create-applications.sh -p sr -i quick -
f $SPEC_PATH/sr/quick/applications.yaml -a ata
```

The create-applications script uses the helm chart located in \$COMMON_CNTK/charts/ata-app to create and deploy a ata service.

2. If the scripts fail, see the Troubleshooting Issues section at the end of this topic, before you make additional attempts.

For more information on creating an ATA instance, see "[Creating an ATA Instance](#)"

Accessing ATA Instance

Proxy Settings

To set the proxy settings:

1. In the browser's network no-proxy settings include ***<hostSuffix>**. For example, *uim.org.
2. In /etc/hosts include **etc/hosts**

```
<k8s cluster ip or loadbalancerIP>
<instance>.<project>.topology.<hostSuffix>
```

```
for example: <k8s cluster ip or external loadbalancer ip>
quick.sr.topology.uim.org
```

Exercise ATA service endpoints

If TLS is enabled on ATA, exercise endpoints using Hostname <topology-instance>.<topology-project>.topology.uim.org.

ATA UI endpoint format: https://<topology-instance>.<topology-project>.topology.<hostSuffix>:<port>/apps/ata-ui

ATA API endpoint format: https://<topology-instance>.<topology-project>.topology.<hostSuffix>:<port>/topology/v2/vertex

- ATA UI endpoint: https://quick.sr.topology.uim.org:30443/apps/ata-ui
- ATA API endpoint: https://quick.sr.topology.uim.org:30443/topology/v2/vertex

If TLS is not enabled on ATA, exercise endpoints:

ATA UI endpoint format: http://<topology-instance>.<topology-project>.topology.<hostSuffix>:<port>/apps/ata-ui

ATA API endpoint format: `http://<topology-instance>.<topology-project>.topology.<hostSuffix>:<port>/topology/v2/vertex`

Validating the ATA Instance

To validate the ATA instance:

1. Run the following to check the status of ata instance deployed.

```
$COMMON_CNTK/scripts/application-status.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a ata
```

The application-status script returns the status of ATA service deployments and pods status.

2. Run the following endpoint to monitor health of ata:

```
https://quick.sr.topology.uim.org:<loadbalancerport>/health
```

3. Run the following ATA service endpoints to add entry in /etc/hosts <k8s cluster ip or external loadbalancer ip> quick.sr.topology.uim.org:

- ATA UI endpoint: `https://quick.sr.topology.uim.org:30443/apps/ata-ui`
- ATA API endpoint: `https://quick.sr.topology.uim.org:30443/topology/v2/vertex`

Deploying the Graph Server Instance

Graph Server or Pgx Server instance is needed for Path Analysis. By default, replicaCount of pgx(graph) server pods is set to '0'. For path analysis to function, set the replicaCount of pgx pods to '2' and upgrade instance. See "[Upgrading the ATA Instance](#)" for more information.

A **cron** job must be scheduled to periodically reload the active ata-pgx pod.

```
pgx:
  pgxName: "ata-pgx"
  replicaCount: 2
  java:
    user_mem_args: "-Xms8000m -Xmx8000m -XX:+HeapDumpOnOutOfMemoryError -XX:HeapDumpPath=/logMount/$(APP_PREFIX)/ata/ata-pgx/"
    gc_mem_args: "-XX:+UseG1GC"
    options:
  resources:
    limits:
      cpu: "4"
      memory: 16Gi
    requests:
      cpu: 3500m
      memory: 16Gi
```

Scheduling the Graph Server Restart CronJob

Once the instance is created successfully, cronjob needs to schedule for ata-pgx pod restarts. For a scheduled period of time, one of the ata-pgx pod is restarted and all incoming requests are routed to other unified-topology-pgx pod seamlessly.

Update the script `$COMMON_CNTK/samples/cronjob-scripts/pgx-restart.sh` to include required environment variables - `KUBECONFIG`, `pgx_ns`, `pgx_instance`. For a basic instance, `pgx_ns` is `sr` and `pgx_instance` is `quick`.

```
export KUBECONFIG=<kube config path>
export pgx_ns=<ata project name>
export pgx_instance=<ata instance name>
pgx_pods=`kubectl get pods -n $pgx_ns --sort-by=.status.startTime -o name |
awk -F "/" '{print $2}' | grep $pgx_instance-ata-pgx`
pgx_pod_arr=( $pgx_pods )
echo "Deleting pod - ${pgx_pod_arr[0]}"
kubectl delete pod ${pgx_pod_arr[0]} -n $pgx_ns --grace-period=0
```

The following crontab is scheduled for every day midnight. Scheduled time may vary depending on the volume of data.

Variable `$COMMON_CNTK` should be set in environment where cronjob runs or replace `$COMMON_CNTK` with complete path.

```
crontab -e 0 0 * * * $COMMON_CNTK/samples/cronjob-scripts/pgx-restart.sh
> $COMMON_CNTK/samples/cronjob-scripts/pgx-restart.log
```

Affinity on Graph Server

If multiple PGX pods are scheduled on the same worker node, the memory consumption by these PGX pods becomes very high. To address this, include the following affinity rule in **applications.yaml**, under the ata chart to avoid scheduling of multiple PGX pods on the same worker node.

The following **podantiaffinity** rule uses the **app= <topology-project>-<topology-instance>-ata-pgx** label. Update the label with the corresponding project and instance names for ATA service. For example: **sr-quick-ata-pgx**.

```
ata:
  affinity:
    podAntiAffinity:
      requiredDuringSchedulingIgnoredDuringExecution:
        - labelSelector:
            matchExpressions:
              - key: app
                operator: In
                values:
                  - <topology-project>-<topology-instance>-ata-pgx
          topologyKey: "kubernetes.io/hostname"
```

Upgrading the ATA Instance

Upgrading ATA is required when there are updates made to **applications.yaml** and **topology-static-config.yaml** and **topology-dynamic-config.yaml** configuration files.

Run the following command to upgrade ATA service.

```
$COMMON_CNTK/scripts/upgrade-applications.sh -p sr -i quick -f $COMMON_CNTK/samples/applications.yaml -a ata
```

After script execution is done, validate the ATA service by running application-status script.

Restarting the ATA Instance

To restart the ATA instance:

1. Run the following command to restart ATA service

```
$COMMON_CNTK/scripts/restart-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a ata -r all
```

2. After running the script, validate the ATA service by running application-status script.
3. To restart **ata-api/ata-ui/ata-pgx**, run the above command by passing **-r** with service name as follows:
4. To restart ATA API

```
$COMMON_CNTK/scripts/restart-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a ata -r ata-api
```

5. To restart ATA PGX

```
$COMMON_CNTK/scripts/restart-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a ata -r ata-pgx
```

6. To restart ATA UI:

```
$COMMON_CNTK/scripts/restart-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a ata -r ata-ui
```

7. To restart ATA Consumer:

```
$COMMON_CNTK/scripts/restart-applications.sh -p sr -i quick -f $SPEC_PATH/sr/quick/applications.yaml -a ata -r ata-consumer
```

8. To restart Alarm Consumer:

```
$COMMON_CNTK/scripts/restart-applications.sh -p sr -i quick -f $COMMON_CNTK/samples/applications.yaml -a ata -r alarm-consumer
```

9. To restart SmartSearch Consumer:

```
$COMMON_CNTK/scripts/restart-applications.sh -p sr -i quick -  
f $COMMON_CNTK/samples/applications.yaml -a ata -r smartsearch-consumer
```

Deleting and Recreating a ATA Instance

- Run the following command to delete the ATA service:

```
$COMMON_CNTK/scripts/delete-applications.sh -p sr -i quick -f $COMMON_CNTK/  
samples/applications.yaml -a ata
```

- Run the following command to delete the ATA schema:

```
$COMMON_CNTK/scripts/install-database.sh -p sr -i quick -f $COMMON_CNTK/  
samples/database.yaml -a ata -c 2
```

- Run the following command to create the ATA schema:

```
$COMMON_CNTK/scripts/install-database.sh -p sr -i quick -f $COMMON_CNTK/  
samples/database.yaml -a ata -c 1
```

- Run the following command to create the ATA service:

```
$COMMON_CNTK/scripts/create-applications.sh -p sr -i quick -f $COMMON_CNTK/  
samples/applications.yaml -a ata
```

Alternate Configuration Options for ATA

You can configure ATA using the following alternate options.

Setting up Secure Communication using TLS

When ATA service is involved in secure communication with other systems, either as the server or as the client, you should additionally configure SSL/TLS. The procedures for setting up TLS use self-signed certificates for demonstration purposes. However, replace the steps as necessary to use signed certificates. To generate common self-signed certificates, see "[SSL Certificates](#)".

To setup secure communication using TLS:

1. Edit the **\$SPEC_PATH/sr/quick/applications.yaml** and set **tls enabled** to **true**.

```
tls:  
  enabled: true
```

2. Create the **ingressTLS** secret to pass the generated certificate and key pem files.

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p sr -i quick -  
f $COMMON_CNTK/samples/applications.yaml -a ata create ingressTLS
```

3. The script prompts for the following detail:

- a. Ingress TLS Certificate Path (PEM file): <path_to_commoncert.pem>
- b. Ingress TLS Key file Path (PEM file): <path_to_commonkey.pem>
4. Verify that the following secrets are created successfully.


```
sr-quick-ata-ingress-tls-cert-secret
```
5. Create ATA instance as usual. Access ATA endpoints using hostname <topology-instance>.<topology-instance>.topology.uim.org
6. Add entry in /etc/hosts <k8s cluster ip or external loadbalancer ip>
quick.sr.topology.uim.org
7. ATA UI endpoint: https://quick.sr.topology.uim.org:30443/apps/ata-ui
8. ATA API endpoint: https://quick.sr.topology.uim.org:30443/topology/v2/vertex

Supporting the Wildcard Certificate

Smartsearch supports wildcard certificates. You can generate the **wildCard** certificates with the **hostSuffix** value provided in **applications.yaml**. The default is **uim.org**.

You must change the **subDomainNameSeparator** value from period(.) to hyphen(-) so that the incoming hostnames match the wild card DNS pattern.

Make the following updates to the **\$SPEC_PATH/project/instance/applications.yaml** file.

```
#Uncomment and provide the value of subDomainNameSeparator, default is "."
#Value can be changed as "-" to match wild-card pattern of ssl certificates.
#Example hostnames for "-" quick-sr-topology.uim.org
subDomainNameSeparator: "-"
```

Using Annoation-Based Generic Ingress Controller

ATA supports standard Kubernetes ingress API and has samples for integration. In the following configuration, the required annotations for ATA for NGINX, are provided.

Any Ingress Controller, which conforms to the standard Kubernetes ingress API and supports annotations required by ATA should work, although Oracle does not certify individual Ingress controllers to confirm this **generic** compatibility.

To use annotation-based generic ingress controller:

1. Update applications.yaml to provide the following annotations that enable stickiness through cookies:

```
# Valid values are TRAEFIK, GENERIC
ingressController: "GENERIC"

ingress:
  className: nginx ##provide ingressClassName value, default value for
nginx ingressController is nginx.
  # This annotation is required for nginx ingress controller.
  annotations:
    nginx.ingress.kubernetes.io/affinity: "cookie"
    nginx.ingress.kubernetes.io/affinity-mode: "persistent"
    nginx.ingress.kubernetes.io/session-cookie-name: "nginxingresscookie"
    nginx.ingress.kubernetes.io/proxy-body-size: "50m"
```

```
smartSearch:
  #uncomment and provide applications specific annotations if required,
  these will get added to list of annotations specified in common section.
  ingress:
    className: nginx-prod ##provide ingressClassName value, default
    value for nginx ingressController is nginx.
    annotations:
      nginx.ingress.kubernetes.io/rewrite-target: /$2
```

Enabling Authentication for ATA

This section provides you with information on enabling authentication for ATA.

The samples, for using IDCS as Identity Provider, are packaged with ATA. To use any Identity Provider of your choice, you must follow the corresponding configuration instructions.

Registering ATA in Identity Provider

You can register ATA as a Confidential application in Identity Provider. To do so:

1. Access the IDCS console and log in as administrator.
2. Navigate to the **Domains** and select the domain (*Default domain*) to add Helidon application as Confidential application.
3. Click **Add application** to register Helidon application as Confidential application.
 - a. Choose **Confidential Application** and click **Launch workflow**.
 - b. Enter the name as **ATA Application** and description as **ATA Application**.
 - c. Select **Enforce grants as authorization** checkbox under **Authentication and authorization** section.
 - d. Click **Next** at the bottom of the page.
 - e. Choose **Configure this application as a resource server now** radio button under **Resource server configuration**.
 - f. Enter **Primary Audience** as `https://<topology-hostname>:<loadbalancer-port>/`.
 - g. Select **Add secondary audience** and enter IDCS URL as **Secondary audience**.
 - h. Select **Add scopes** and add **ataScope** as **allowed scope**.
 - i. Select **Configure this application as a client now** radio button under the **Client configuration** section.
 - j. Select **Resource owner**, **Client credentials**, and **Authorization code** check boxes.
 - k. Select **Allow HTTP URLs** check box only if your ATA application is not SSL enabled.
 - l. Enter the following **Redirect URLs**:
 - `https://<ata-hostname>:<loadbalancer-port>/topology`
 - `https://<ata-hostname>:<loadbalancer-port>/redirect/ata-ui/`
 - `https://<ata-hostname>:<loadbalancer-port>/sia`
 - m. Enter **Post-logout redirect URL** as `https://<ata-hostname>:<loadbalancer-port>/apps/ata-ui` (provide your Helidon application's home page URL).

- n. Enter **Logout URL** as **https://<ata-hostname>:<loadbalancer-port>/oidc/logout** (provide your Helidon application's logout URL).
 - o. (Optional) Select **Bypass consent** button for skipping the consent page after IDCS login.
 - p. Select **Anywhere** radio button for **Client IP address**.
 - q. Click **Next** and click **Finish**.
4. Click **Activate** to create application (ATA Application).
5. Click **Activate application** from the pop-up window.
6. Click **Users** on the left side pane to assign users.
 - a. Click **Assign users** to add domain users to the registered application.
 - b. Choose the desired users from the pop-up window and click **Assign**.
7. (Optional) Click **Groups** on the left-side pane to assign groups.
 - a. Click **Assign groups** to add domain groups to the registered application.
 - b. Choose the desired groups from the pop-up window and click **Assign**.

Common Secret and Properties

You create a secret and config map with OAuth client details, which will be required for Message Bus and ATA.

Getting Client Credentials

You can get client credential details by navigating to your OAuth client on IDP. In case of IDCS, you can follow these steps to get the details.

Access the IDCS console and log in as Administrator. To get client credentials:

1. Navigate to **Domains** and select the domain (*Default domain*) to add Helidon application as Confidential application.
2. Click on the **ATA Application** name from the table.
3. Scroll to view the **Client secret** under the **General Information** section.
4. Click **Show secret** link to open a pop-up window showing the client secret.
5. Copy the link and store it to use in the Helidon application configuration.

Creating the OAuth Secrets and ConfigMap

To create **OAuthConfig** secret with OIDC, see "[Adding Common OAuth Secret and ConfigMap](#)".

The sample for IDCS is as follows:

```
Identity Provider Uri: https://idcs-  
df3063xxxxxxxxx.identity.pint.oc9qadev.com:443  
Client Scope: https://quick.sr.topology.uim.org:30443/first_scope  
Client Audience: https://quick.sr.topology.uim.org:30443/  
Token Endpoint Uri: https://idcs-  
df3063xxxxxxxxx.identity.pint.oc9qadev.com:443/oauth2/v1/token  
Valid Issue Uri: https://identity.oraclecloud.com/  
Introspection Endpoint Uri: https://idcs-
```

```
df3063xxxxxxx.identity.pint.oc9qadev.com:443/oauth2/v1/introspect
JWKS Endpoint Uri: https://idcs-
df3063xxxxxxxxxxx.identity.pint.oc9qadev.com:443/admin/v1/SigningCert/jwk
Cookie Name: OIDCS_SESSION
Cookie Encryption Password: lpmaster
Provide Truststore details ...
Certificate File Path (ex. oamcert.pem): ./identity-pint-oc9qadev-com.pem
Truststore File Path (ex. truststore.jks): ./truststore.jks
Truststore Password: xxxxx #provide Truststore password
```

**Note:**

For more details on IDCS, see "[Common Configuration Options For all Services](#)".

Choosing Worker Nodes for ATA Service

By default, ATA has its pods scheduled on all worker nodes in the Kubernetes cluster in which it is installed. However, in some situations, you may want to choose a subset of nodes where pods are scheduled.

For example:

Limitation on the deployment of ATA on specific worker nodes per each team for reasons such as capacity management, chargeback, budgetary reasons, and so on.

To choose a subset of nodes where pods are scheduled, you can use the configuration in the **applications.yaml** file.

Sample node affinity configuration(requiredDuringSchedulingIgnoredDuringExecution) for ATA service:

applications.yaml

```
ata:
  affinity:
    nodeAffinity:
      requiredDuringSchedulingIgnoredDuringExecution:
        nodeSelectorTerms:
          - matchExpressions:
              - key: name
                operator: In
                values:
                  - south_zone
```

Kubernetes pod is scheduled on the node with label name as *south_zone*. If node with label name: *south_zone* is not available, pod will not be scheduled.

Sample node affinity configuration (preferredDuringSchedulingIgnoredDuringExecution:) for ATA service:

applications.yaml

```
ata:
  affinity:
```

```

nodeAffinity:
  preferredDuringSchedulingIgnoredDuringExecution:
  - weight: 1
    preference:
      matchExpressions:
      - key: name
        operator: In
        values:
        - south_zone

```

Kubernetes pod is scheduled on the node with label name as *south_zone*. If node with label name: *south_zone* is not available, pod will still be scheduled on another node.

Setting up Persistent Storage

Follow the instructions mentioned in *UIM Cloud Native Deployment guide* for configuring Kubernetes persistent volumes.

To create persistent storage:

1. Update **applications.yaml** to enable storage volume for ATA service and provide the persistent volume name.

```

storageVolume:
  enabled: true
  pvc: sr-nfs-pvc #Specify the storage-volume name

```

2. Update **database.yaml** to enable storage volume for ATA dbinstaller and provide the persistent volume name.

```

storageVolume:
  enabled: true
  type: pvc
  pvc: sr-nfs-pvc #Specify the storage-volume name

```

After the instance is created, you must see the directories **ata** and **ata-dbinstaller** in your PV mount point, if you have enabled logs.

Managing ATA Logs

To customize and enable logging, update the logging configuration files for the application.

1. Customize ata-api service logs:
 - For service level logs update file `$COMMON_CNTK/charts/ata-app/charts/ata/config/ata-api/logging-config.xml`
 - For Helidon-specific logs update file `$COMMON_CNTK/charts/ata-app/charts/ata/config/ata-api/logging.properties`. By default console handler is used, you can provide filehandler as well uncomment below lines and provide <project> and <instance> names for location to save logs

```

handlers=io.helidon.common.HelidonConsoleHandler,java.util.logging.FileH
andler
java.util.logging.FileHandler.formatter=java.util.logging.SimpleFormatte
r

```

```
java.util.logging.FileHandler.pattern=/logMount/sr-quick/ata/ata-api/
logs/TopologyJULMS-%g-%u.log
```

2. Customize ata-pgx service logs:
Update file `$COMMON_CNTK/charts/ata-app/charts/ata/config/pgx/logging-config.xml`
3. Customize ata-ui service logs:
Update file `$COMMON_CNTK/charts/ata-app/charts/ata/config/ata-ui/logging.properties`
4. Update the logging configuration files and upgrade the ata m-s application:

```
$COMMON_CNTK/scripts/upgrade-applications.sh -p sr -i quick -f $SPEC_PATH/
applications.yaml -a ata
```

5. Customize the **ata-alarm-consumer** service log as follows:

- For service-level logs update file:

```
$COMMON_CNTK/charts/ata-app/charts/ata/config/alarm-consumer/logging-
config.xml
```

- For Helidon-specific logs update file:

```
$COMMON_CNTK/charts/ata-app/charts/ata/config/alarm-consumer/
logging.properties.
```

6. Customize SmartSearch Consumer service log:
 - For service level logs update the **`$COMMON_CNTK/charts/ata-app/charts/ata/config/smartsearch-consumer/logging-config.xml`** file.
 - For Helidon-specific logs update the **`$COMMON_CNTK/charts/ata-app/charts/ata/config/smartsearch-consumer/logging.properties`** file.

Viewing Logs using OpenSearch

You can view and analyze the Application logs using OpenSearch.

The logs are generated as follows:

1. Fluentd collects the application logs that are generated during cloud native deployments and sends them to OpenSearch.
2. OpenSearch collects all types of logs and converts them into a common format so that OpenSearch Dashboard can read and display the data.
3. OpenSearch Dashboard reads the data and presents it in a simplified view.

See "[Deleting the OpenSearch and OpenSearch Dashboard Service](#)" for more information.

Managing ATA Metrics

Run the following endpoint to monitor metrics of ATA:

```
https://instance.project.topology.<hostSuffix>:<loadbalancerport>/metrics
```

Prometheus and Grafana setup

See "Setting Up Prometheus and Grafana" for more information.

Adding scrape Job in Prometheus

Add the following Scrape job in Prometheus Server. This can be added by editing the **config** map used by the Prometheus server:

```

- job_name: 'topologyApiSecuredMetrics'
  oauth2:
    client_id: <client-id>
    client_secret: <client-secret>
    scopes:
      - <Scope>
    token_url: <OAUTH-TOKEN-URL>
    tls_config:
      insecure_skip_verify: true
  kubernetes_sd_configs:
  - role: pod
  relabel_configs:
  - source_labels: [__meta_kubernetes_pod_annotation_prometheus_io_scrape]
    action: keep
    regex: true
  - source_labels: [__meta_kubernetes_pod_label_app]
    action: keep
    regex: (<project>-<instance>-ata-api)
  - source_labels: [__meta_kubernetes_pod_container_port_number]
    action: keep
    regex: (8080)
  - source_labels: [__meta_kubernetes_pod_annotation_prometheus_io_path]
    action: replace
    target_label: __metrics_path__
    regex: (.+)
  - source_labels: [__address__,
__meta_kubernetes_pod_annotation_prometheus_io_port]
    action: replace
    regex: ([^:]+)(?::\d+)?;(\d+)
    replacement: $1:$2
    target_label: __address__
  - action: labelmap
    regex: __meta_kubernetes_pod_label_(.+)
  - source_labels: [__meta_kubernetes_namespace]
    action: replace
    target_label: kubernetes_namespace
  - source_labels: [__meta_kubernetes_pod_name]
    action: replace
    target_label: kubernetes_pod_name

```



Note:

If Authentication is not enabled on ATA, remove **oauth** section from above mentioned job.

Allocating Resources for ATA Service Pods

To increase performance of the service, **applications.yaml** has configuration to provide JVM memory settings and pod resources for ATA Service.

There are separate configurations provided for ata-api, topology-consumer, alarm-consumer, smartsearch-consumer, pgx, and ata-ui services. Provide required values under the service name under ata application.

```
ata:
  topologyApi:
    apiName: "ata-api"
    replicaCount: 3
  java:
    user_mem_args: "-Xms2000m -Xmx2000m -XX:+HeapDumpOnOutOfMemoryError -
XX:HeapDumpPath=/logMount/${APP_PREFIX}/ata/ata-api/"
    gc_mem_args: "-XX:+UseG1GC"
    options:
  resources:
    limits:
      cpu: "2"
      memory: 3Gi
    requests:
      cpu: 2000m
      memory: 3Gi
```

Scaling Up or Scaling Down the ATA Service

Provide replica count in **applications.yaml** to scale up or scale down the ATA pods. Replica count can be configured for ata-api, topology-consumer, alarm consumer, pgx, and ata-ui pods individually by updating **applications.yaml**.

Update **applications.yaml** to increase replica count to 3 for ata-api deployment.

```
ata:
  topologyApi:
    replicaCount: 3
```

Apply the change in replica count to the running Helm release by running the upgrade-applications script.

```
$COMMON_CNTRK/scripts/upgrade-applications.sh -p sr -i quick -f $SPEC_PATH/sr/
quick/applications.yaml -a ata
```

Enabling GC Logs for ATA

By default, GC logs are disabled, you can enable them and view the logs at the corresponding folders inside location **/logMount/sr-quick/ata**.

To Enable GC logs, update **\$SPEC_PATH/sr/quick/applications.yaml** file as follows:

1. Under gcLogs make enabled as true you can uncomment gcLogs options under ata to override the common values.

- To configure the maximum size of each file and limit for number of files you need to set `fileSize` and `noOfFiles` inside `gcLogs` as follows:

```
gcLogs:
  enabled: true
  fileSize: 10M
  noOfFiles: 10
```

Debugging and Troubleshooting

Common Problems and Solutions

- ATA DBInstaller pod is not able to pull the dbinstaller image.

NAME	READY	STATUS
RESTARTS AGE		
project-instance-unifed-topology-dbinstaller	0/1	ErrImagePull
0 5s		

OR

NAME	READY	STATUS
RESTARTS AGE		
project-instance-unifed-topology-dbinstaller	0/1	ImagePullBackOff
0 45s		

To resolve this issue

- Verify that the image name and the tag provided in `database.yaml` for `ata-dbinstaller` and that it is accessible from the repository by the pod.
 - Verify that the image is copied to all worker nodes.
 - If pulling image from a repository, verify the image pull policy and image pull secret in `database.yaml` for `ata-dbinstaller`.
- ATA API, PGX and UI pod is not able to pull the images.

To resolve this issue

- Verify that the image names and the tags are provided in **`applications.yaml`** for `ata` and that it is accessible from the repository by the pod.
 - Verify that the image is copied to all worker nodes
 - If pulling image from a repository, verify the image pull policy and image pull secret in **`applications.yaml`** for `ATA` service.
- ATA pods are in `crashloopbackoff` state.

To resolve this issue, describe the Kubernetes pod and find the cause for the issue. It could be because of missing secrets.

- ATA API pod did not come up.

NAME	READY	STATUS
RESTARTS AGE		
project-instance-ata-api 0/1 Running 0		5s

To resolve this issue, verify that the Message Bus bootstrap server provided in topology-static-config.yaml is a valid one.

Test Connection to PGX server

To troubleshoot PGX service, connect to pgx service using graph client by running the following command.

Connect to pgx service endpoint `http://<LoadbalancerIP>:<LoadbalancerPort>/<topology-project>/<topology-instance>/pgx` by providing pgx client user credentials.

```
C:\TopologyService\oracle-graph-client-22.1.0\oracle-graph-
client-22.1.0\bin>opg4j -b http://<hostIP>:30305/sr/quick/pgx -u
<PGX_CLIENT_USER>
```

```
password:<PGX_CLIENT_PASSWORD>
For an introduction type: /help intro
Oracle Graph Server Shell 22.1.0
Variables instance, session, and analyst ready to use.
```

Fallout Events Resolution

The fallout events resolution process starts from analyzing the events (or messages) from the **TOPOLOGY_FALLOUT_EVENTS** table. The main intent of this fallout events resolution is to make the message consumer client (such as topology) data in synchronization with the producer client (such as UIM) data by correcting the fallout events which are failed in processing by the consumer clients. Correcting the failed events means rebuilding, resubmitting, editing or ignoring.

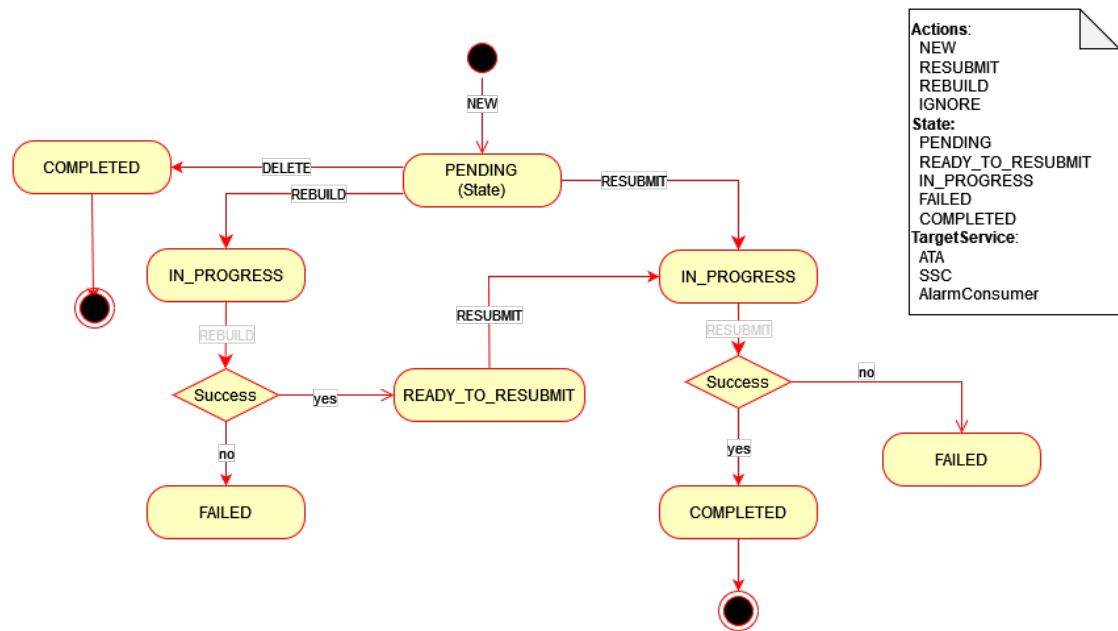


Note:

This resolution is a manual administrative task that should be performed periodically.

At first, these events (or messages) are collected in the **TOPOLOGY_FALLOUT_EVENTS** table. The message consumer services subscribe and consume the events from the message bus on a specific topic (such as **ora-uim-topology**) and process them accordingly. Process means getting the event type from the message and create, update, or delete the entity from the corresponding downstream services for each event. For any failures occurred, the system retries for the configured number of times. If there are any failures that are still being processed, the corresponding messages are produced to the consumer service-specific **dead-letter**-topic (such as **ora-dlt-topology**). From this **dead-letter** topic, the events (or messages) are added to the **TOPOLOGY_FALLOUT_EVENTS** table by another subscriber.

The general fallout events resolution process flow is illustrated in the following image. Some of process steps are applicable only to specific message consumer services. For example, the REBUILD setup is applicable only to the topology consumer service.



The following actions can be performed on fallout events. The actions can be performed using the REST APIs provided as part of ATA-API.

Table 8-2 Fallout Events Actions

Action	Description
NEW	The event is added to the TOPOLOGY_FALLOUT_EVENTS table if the action is NEW .
REBUILD	This action corrects the missing dependencies. Note: This action is applicable only to the topology consumer.
RESUBMIT	The resubmit action resubmits the event or message into the retry topic (such as ora-retry-topology) of the specific target service for reprocessing.
DELETE	Clears the event or messages from the fallout tables.
EDIT	Edits the specific event or message from the fallout table.

The following are various states that an event can be based on the corresponding actions.

Table 8-3 Fallout Events States

State	Description
PENDING	The fallout event is in pending state for the newly arrived fallouts.
IN_PROGRESS	The fallout event is in progress for either RESUBMIT or REBUILD actions.
READY_TO_RESUBMIT	The fallout event is processed by the REBUILD action and is ready for RESUBMIT.

Table 8-3 (Cont.) Fallout Events States

State	Description
FAILED	The fallout event processing is failed for either RESUBMIT or REBUILD.
COMPLETED	The fallout event processing is completed for RESUBMIT.

You can use the fallout REST APIs for resolving these failures. See *REST API for ATA* for full list of REST APIs.

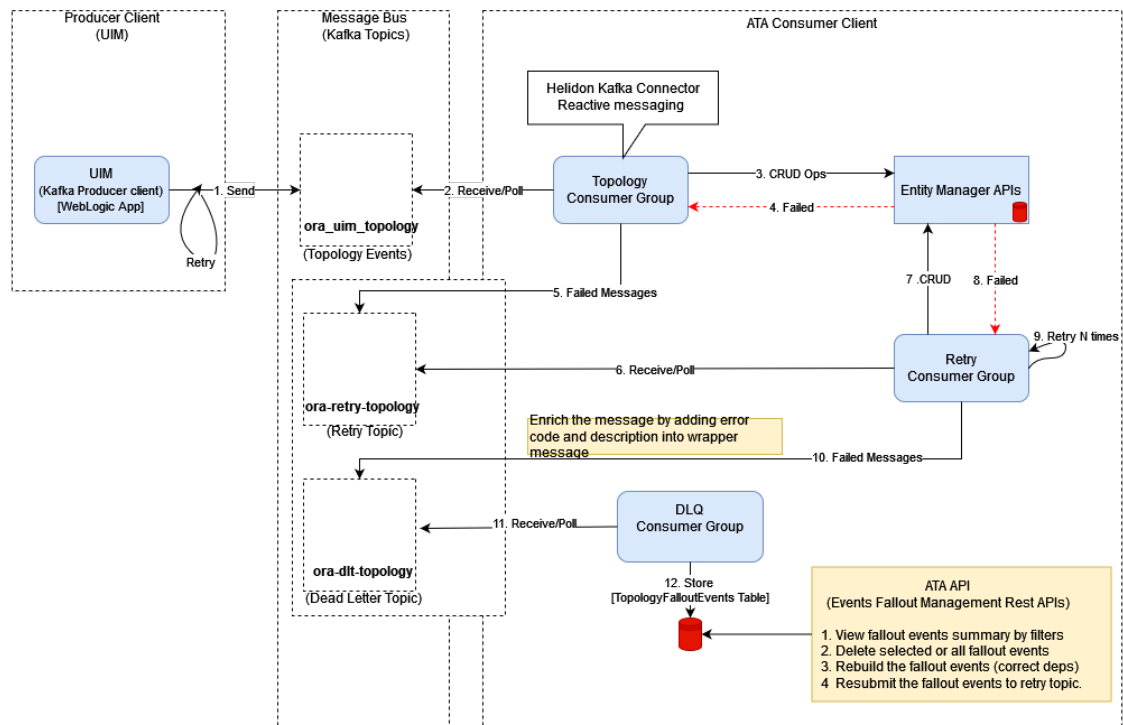
Table 8-4 REST APIs and the Corresponding Resolutions

REST API	Resolution
/topology/v2/fallout/events/summary	Get a brief summary of the fallout events with status.
/topology/v2/fallout/events/rebuild/jobs	Rebuild to correct the missing dependencies.
/topology/v2/fallout/events/resubmit	Resubmit to retry the topic to re-process the event or message.
/topology/v2/fallout/events /topology/v2/fallout/events/eid/{eid}	Clear or delete the event or message from the fallout table.
/topology/v2/fallout/events/eid/{eid}	To edit the event or message in the fallout table and resubmit again.

Fallout Events Resolution for Topology Consumer

The following figure illustrates the fallout events resolution process flow for topology consumer.

Figure 8-2 Process Flow of Fallout Events Resolution for Topology Consumer



These failed events in the TOPOLOGY_FALLOUT_EVENTS table can be rebuilt and resubmitted for the specific target service identifier. The target service value used for the topology consumer is **ATA**. When a fallout event comes into the table, it is in **PENDING** state. These events can be Rebuilt or Resubmitted as follows:

- **REBUILD**: This action processes the Fallout Event and gets any out of sync data from UIM into ATA through the Database Link.
- **RESUBMIT**: This action takes the events from the TOPOLOGY_FALLOUT_EVENTS table in **PENDING** or **READY_TO_RESUBMIT** states and moves them back into the **ora_retry_topology** topic for re-processing.

Prerequisites for REBUILD

- Before Rebuild is performed, the ATA Schema user should have the following privileges:
 - CREATE JOB
 - ALTER SYSTEM
 - CREATE DATABASE LINK
- Ensure a Database Link exists from ATA schema to UIM schema with the name **REM_SCHEMA**. That is, ATA schema user should be able to access the objects from UIM schema. For more information, see <https://docs.oracle.com/en/database/oracle/oracle-database/19/sqlrf/CREATE-DATABASE-LINK.html#GUID-D966642A-B19E-449D-9968-1121AF06D793>

Performing REBUILD Action

You can perform the Rebuild action in the following ways:

- **DBMS Job Scheduling:** In this approach the REBUILD action on the Fallout Events in “PENDING” state is scheduled to run for every 6 hours. The frequency at which the job runs automatically can be configured by changing the **repeat_interval**.

```
BEGIN
  DBMS_SCHEDULER.create_job (
    job_name          => 'FALLOUT_DATA_REBUILD',
    job_type          => 'PLSQL_BLOCK',
    job_action        => 'BEGIN
PKG_FALLOUT_CORRECTION.SCHEDULE_FALLOUT_JOBS(commitSize => 1000, cpusJobs
=> 4, waitTime => 2); END;',
    start_date        => SYSTIMESTAMP,
    repeat_interval   => 'FREQ=HOURLY; INTERVAL=6',
    enabled            => TRUE
  );
END;
/
```

- **On-Demand REST API Call:** In this approach, the REBUILD action on the Fallout Events in **PENDING** state are invoked through REST API before invoking the Rebuild API:
 - POST - fallout/events/rebuild – To rebuild the Fallout Events on demand as and whenever required.
 - DELETE - fallout/events/scheduledJobs – To drop any running or previously scheduled jobs.

Performing RESUBMIT Action

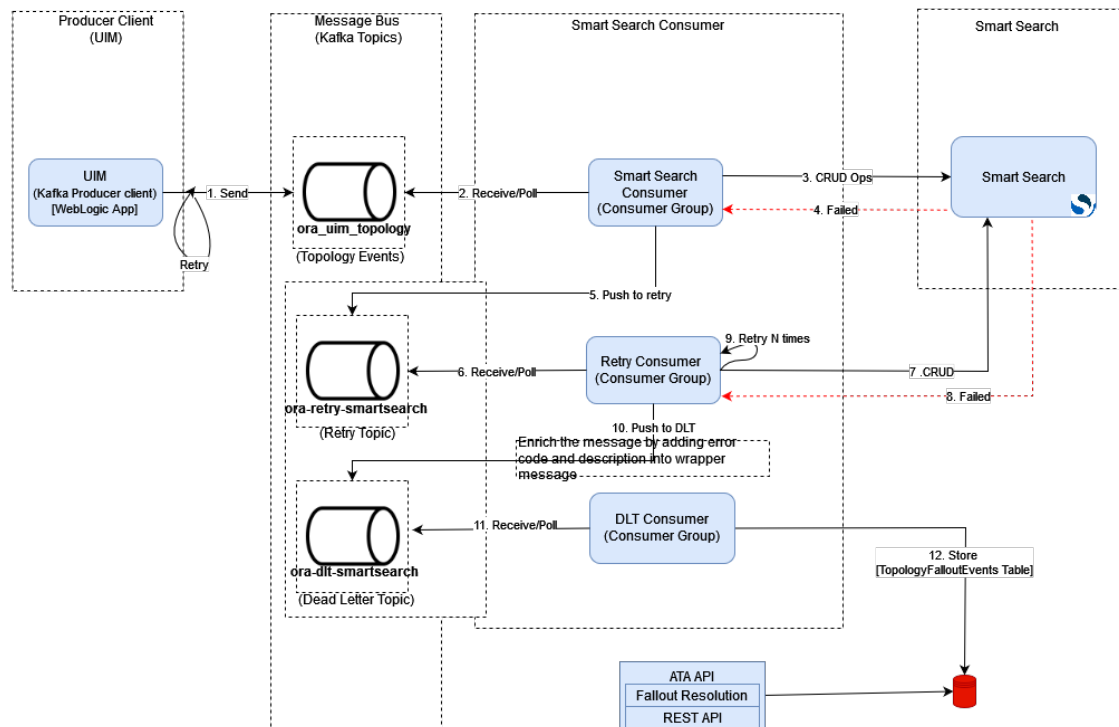
Resubmit Action is performed through a REST call and it takes the fallout events in “READY_TO_RESUBMIT” (post Rebuild) and **PENDING** states based on the query parameters and pushed the events into the “ora_retry_topology” topic:

POST - fallout/events/resubmit?targetService=ATA – To resubmit the Fallout Events on demand for topology consumer.

For more information on APIs available, see *ATA REST API Guide*.

Fallout Events Resolution for SmartSearch Consumer

The events will be stored into topology fallout event table when the SmartSearch consumer service is not able to process successfully due to some possible technical and data validation issues.



The fallout resolution for a SmartSearch consumer is as follows:

1. The message producer sends event and message to the topic (**ora_uim_topology**).
2. The SmartSearch consumer receives the event and message from the topic (**ora_uim_topology**).
3. It invokes the SmartSearch bulk API to persist the event or message in Open Search.
4. If the SmartSearch bulk API not able to process the even or message, or SmartSearch consumer is not able to process then the SmartSearch consumer sends a message to retry the topic (**ora-retry-smartsearch**).
5. The SmartSearch consumer retries again to process. If still not processed, then the SmartSearch consumer sends an event message to the Dead Letter topic (**ora-dlt-smartsearch**).
6. The DLT process of SmartSearch consumer gets event or message from the Dead Letter topics that persist in the **TOPOLOGY_FALLOUT_EVENTS** table.

The fallout resolution starts analyzing from the topology fallout events for the specific target service. The target service value used for SmartSearch consumer is **SSC**. The resolution can be performed with the help of fallout resolution REST APIs.

Table 8-5 Fallout Events REST APIs

REST API	Resolution
/topology/v2/fallout/events/events/summary?targetService=SSC	Get the fallout events summary for the SmartSearch consumer.

Table 8-5 (Cont.) Fallout Events REST APIs

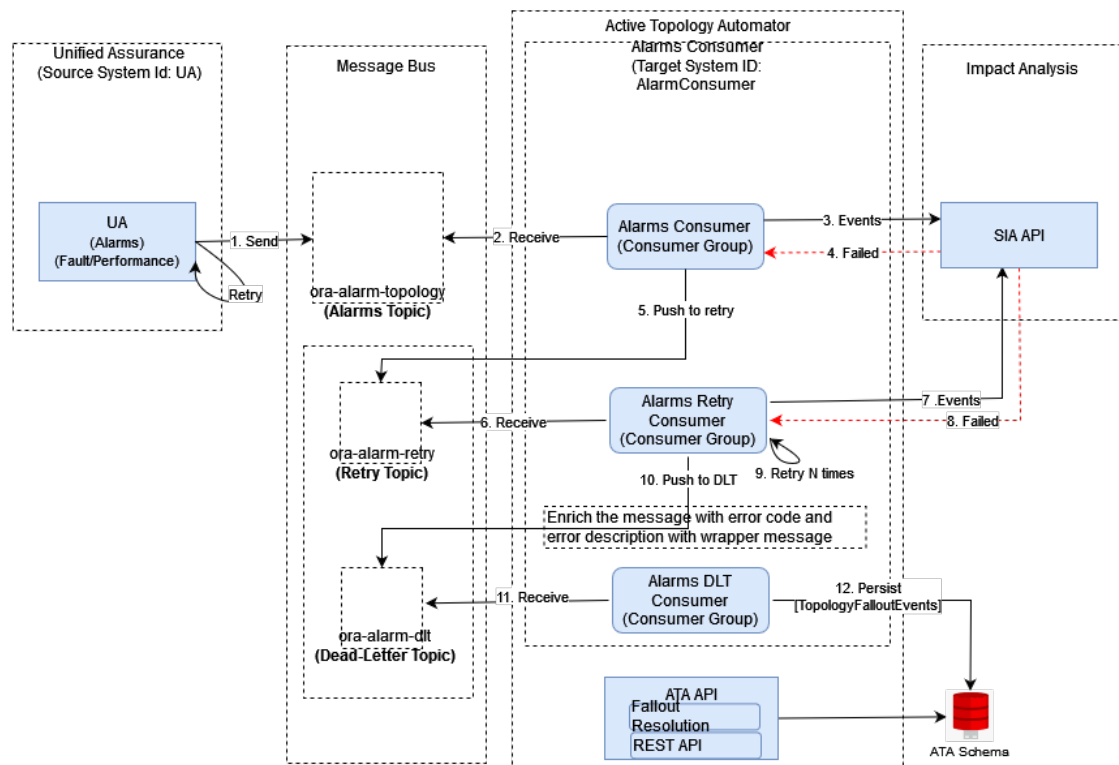
REST API	Resolution
/topology/v2/fallout/events/events? targetService=SSC	Get all events by matching the state and action for the SmartSearch consumer. Query Parameters: • state: PENDING/FAILED • action: NEW/RESUBMIT • targetService: SSC
/topology/v2/fallout/events/resubmit	Re-submit the matched events of SmartSearch consumer for re-processing Query Parameters: • state: PENDING/FAILED • action: NEW/RESUBMIT • targetService: SSC
/topology/v2/fallout/events/eid/{ENTITY_ID}	Update a specific fallout.
/topology/v2/fallout/events /topology/v2/fallout/events/eid/{ENTITY_ID}	To delete matching the fallout events for SmartSearch consumer. The parameter values are as follows: • state: PENDING/FAILED • action: NEW/RESUBMIT • targetService: SSC

For full list of REST APIs, see *REST API for ATA for Inventory and Automation*.

Fallout Events Resolution for Alarm Consumer

The following image illustrates an alarm event (or message) processing flow in alarm consumer.

Figure 8-3 Fallout Events Resolution for Alarm Consumer



Troubleshooting the Alarm Fallouts

Alarm fallouts are the alarms that could not be processed in alarm consumer because of the exceptions or errors occurred during processing of the alarm. Following are the major fallout scenarios identified:

- Incoming alarm has an invalid JSON structure or invalid TMF-642 structure.
- No device is found to which the incoming alarm can be mapped.
- Multiple devices are found for the incoming alarm.
- Processed alarm could not be forwarded to SIA API.

In the mentioned fallout scenarios, alarm-consumer is configured to retry the processing of the same alarm. This helps to address the possible intermittent issues such as connectivity and temporary data unavailability. In case the retry processing of the alarm is a fallout scenario, the details of the fallout information along with the alarm information will be stored into database. The persisted fallout alarms can be reviewed manually. In the process of review of the fallout alarm, the reviewer can add modification or correction to the alarm data and send the fallout alarm for reprocessing.

Note:

All fallout alarms are persisted. The alarms that have invalid JSON structure or invalid TMF-642 structure will not be persisted. This non-persisted fallout alarms are dropped from the alarm-consumer and alarm details cannot be verified later.

The **TARGETSYSTEMID** for all alarm fallouts for the alarm consumer will be **AlarmConsumer**. Therefore, while running a fallout resolution, the target service value will be used as **AlarmConsumer**.

The alarm consumer fallout alarms can be used for reprocessing, using the fallout resolution APIs:

- To list all alarm consumer fallout alarms:
 - **Method** - GET
 - **URI** - /topology/v2/fallout/events?targetService=AlarmConsumer
- To find a specific fallout alarm:
 - **Method** - GET, **URI** - /topology/v2/fallout/events/eid/<eid value>
- Update fallout alarm data:
 - **Method** - PUT
 - **URI** - /topology/v2/fallout/events/eid/<eid value>
 - **Request Body** - Includes the fallout event details found using the above mentioned APIs.
- To send for reprocessing:
 - **Method** - PUT
 - **URI** - /topology/v2/fallout/events/resubmit?state=PENDING&action=NEW&targetService=AlarmConsumer

ATA Support for Offline Maps

ATA support for map visualization is provided by the third-party service providers such as Open Street Maps (OSM), MapBox, Carto, Esri, and Web Map Service (WMS).

ATA integrates with these service providers and they provide the required components and computing resources, so that you can avoid setting up and maintaining a local tile server.

Oracle offers the following options to support offline maps:

- Allowlisting map URLs
- Setting up a local tile server

Allowlisting Map URLs

In highly secured installations, you may not provide internet access to the location. In such situations, Oracle recommends using an allowlist solution so the base maps can include the streets, cities, buildings, and so on.

For the map tiles to render, allowlist the following URLs:

- Tile 1:
 - <http://a.tile.openstreetmap.org/11/472/824.png>
 - <http://b.tile.openstreetmap.org/11/472/825.png>
 - <http://c.tile.openstreetmap.org/11/472/825.png>
- Tile 2:

- http://a.tiles.mapbox.com/v4/mapbox.satellite/10/236/412@2x.png?access_token=pk.eyJ1IjoidzhylwiYSI6ImNpeGhwaXF1ejAwMHQydG8yZ3pyanZ5aTkiZjQ.QNScWNGnLRHIXeAsGMvyw
- http://b.tiles.mapbox.com/v4/mapbox.satellite/10/235/411@2x.png?access_token=pk.eyJ1IjoidzhylwiYSI6ImNpeGhwaXF1ejAwMHQydG8yZ3pyanZ5aTkiZjQ.QNScWNGnLRHIXeAsGMvyw
- http://c.tiles.mapbox.com/v4/mapbox.satellite/10/236/411@2x.png?access_token=pk.eyJ1IjoidzhylwiYSI6ImNpeGhwaXF1ejAwMHQydG8yZ3pyanZ5aTkiZjQ.QNScWNGnLRHIXeAsGMvyw
- Tile 3:
 - http://a.basemaps.cartocdn.com/light_all/10/235/412@2x.png
 - http://b.basemaps.cartocdn.com/light_all/10/235/412@2x.png
 - http://c.basemaps.cartocdn.com/light_all/10/235/412@2x.png
- Tile 4:
 - http://a.basemaps.cartocdn.com/dark_all/10/236/413@2x.png
 - http://b.basemaps.cartocdn.com/dark_all/10/236/413@2x.png
 - http://c.basemaps.cartocdn.com/dark_all/10/236/413@2x.png
- Tile 5: http://server.arcgisonline.com/ArcGIS/rest/services/World_Street_Map/MapServer/tile/10/412/235
- Tile 6: http://server.arcgisonline.com/ArcGIS/rest/services/World_Imagery/MapServer/tile/10/412/236

Setting Up a Local Tile Server

To set up a local tile server, you must deploy the prepared tile files on a local server. Every file must have its direct link: **<http://tileservers.com/{z}/{y}/{x}>**. This format allows getting the required response for the request **<http://tileservers.com/{z}/{x}/{y}.png>**.

Contact your system administrator to install, deploy, and run your own tile server. The configuration process is dependent on the tile server you choose to implement. The tile server requires high computing power and requires operations support and maintenance.

The tile server is responsible for caching the tiles, sharing the load, and processing the request queue at regular intervals.

You can consider some options available in the market such as MapTiler, QGIS, Switch2OSM, ArcGis Enterprise, and so on.

After you set up the tile server and a successful deployment, you can access the map tiles through APIs in the format: **<http://{hostname}:{port}/{baseUrl}/{z}/{x}/{y}.png>**.

Manual Changes for Setting Up a Local Tile Server

The following manual changes are required to set up a local tile server:

- Update **visualization-start-page.js** as per your requirement.
- Open **ata-ui.jar** and navigate to **ata-ui/flows/visualization/pages/visualization-start-page.js**.
- In the **loadGeoMaps** method of **visualization-start-page.js**, update the **mapurl** variable of the custom map API URL.

After you redeploy the updated jar file and run the application, you can see the map tiles served from your local server.

9

Upgrading ATA

This chapter describes how to upgrade the ATA application.

Prerequisites for Upgrading ATA

The prerequisites for upgrading ATA are:

- ATA Schema should have a database link to the UIM schema with the name `rem_schema`. This is mandatory if only ATA is used with UIM. However, the database link is not required if ATA is used with some external system. The `rem_schema` database link is created during the first time of complete migration. If the database link is not present, the database link can be created as follows:

```
ACCEPT schema CHAR PROMPT "Enter username for remote schema: "
ACCEPT passwd CHAR PROMPT "Enter password for remote schema: " HIDE
ACCEPT host CHAR PROMPT "Enter pingable hostname/ipaddress for remote
schema database host : "
ACCEPT port CHAR PROMPT "Enter port number for remote schema database : "
ACCEPT service_name CHAR PROMPT "Enter SQL*Net / service for remote schema
database: "
ACCEPT commitSize CHAR PROMPT "Enter Batch/Commit size for a single
parallel process(Optional): "
ACCEPT threads CHAR PROMPT "Enter Maximum no.of total parallel process at
any given time(Optional): "
ACCEPT waitTime CHAR PROMPT "Enter Waiting interval after which the
listener checks for the availabilty of jobs in Seconds(Optional): "
```

```
PROMPT
```

```
alter system set global_names=FALSE scope=both;
```

```
CREATE DATABASE LINK rem_schema CONNECT TO &schema IDENTIFIED BY &passwd
USING '(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp) (HOST=&host) (PORT=&port))
(CONNECT_DATA=(SERVICE_NAME=&service_name)))';
```

- For ATA 1.0.0.1.0 or later versions, the installer will create an **ApplicationInfo** table and will update the **VERSION** after every upgrade. If you have ATA 1.0.0.0.0 installed, you will not be having **ApplicationInfo** table. Therefore, create **ApplicationInfo** table before running an upgrade as follows:

```
CREATE TABLE APPLICATIONINFO ( ENTITYID NUMBER(19,0) NOT NULL ENABLE,
    ENTITYCLASS VARCHAR2(255 BYTE),
    BUILDDATE TIMESTAMP (6) WITH LOCAL TIME ZONE,
    CREATEDDATE TIMESTAMP (6) WITH LOCAL TIME ZONE,
    CREATEDUSER VARCHAR2(255 BYTE),
    ENDDATE TIMESTAMP (6) WITH LOCAL TIME ZONE,
    ENTITYVERSION NUMBER(10,0),
    FILENAME VARCHAR2(255 BYTE),
    LASTMODIFIEDDATE TIMESTAMP (6) WITH LOCAL TIME ZONE,
```

```

LASTMODIFIEDUSER VARCHAR2(255 BYTE),
NAME VARCHAR2(255 BYTE),
STARTDATE TIMESTAMP (6) WITH LOCAL TIME ZONE,
STATUS VARCHAR2(255 BYTE),
TYPE VARCHAR2(255 BYTE),
VERSION VARCHAR2(255 BYTE),
PRIMARY KEY (ENTITYID));

INSERT INTO APPLICATIONINFO VALUES (ENTITYID_SEQ.NEXTVAL,
'ApplicationInformationDAO', SYSDATE, SYSDATE, NULL, SYSDATE, 1, NULL,
SYSDATE, NULL, 'Active Topology Automator', SYSDATE, 'SUCCESS', 'Topology',
'1.0.0.0.0');

```

Upgrading the ATA Application

To upgrade the ATA application:

1. Download the latest ATA Builder Tool Kit and Common Cloud Native Tool Kit into the workspace directory.
2. Export the unzipped path to the **WORKSPACEDIR** environment variable.

```
export WORKSPACEDIR=$(pwd)/workspace
```

3. Set the **COMMON_CNTK** variable to the path of the common-cntk directory in the workspace.

```
export COMMON_CNTK=$WORKSPACEDIR/common-cntk
```

4. Set **SPEC_PATH** variable to the location where applications.yaml and database.yaml files are copied :

```
$ export SPEC_PATH=$WORKSPACEDIR/ata_spec_dir
```

5. Create ATA images using the latest ATA Builder Tool Kit. See "[Prerequisites and Configuration for Creating ATA Images](#)" for more information.
6. Upgrade the ATA schema. See "[Upgrading the ATA Schema](#)" for more information.
7. Upgrade the ATA instance. See "[Upgrading the ATA Instance](#)" for more information.

Upgrading the ATA Schema

To upgrade the ATA schema:

1. Upgrade PDB by starting \$UIM_CNTK/scripts/install-database.sh.
2. To only update the model of ATA and skip the data migration:

```
$COMMON_CNTK/scripts/install-database.sh -p sr -i quick -f $SPEC_PATH/sr/
quick/database.yaml -a ata -c 4
```

3. To update the model of ATA and also populate the data from the UIM schema:

```
$COMMON_CNTK/scripts/install-database.sh -p sr -i quick -f $SPEC_PATH/sr/  
quick/database.yaml -a ata -c 40
```

Upgrading the ATA Instance

To upgrade the ATA instance:

1. Update \$COMMON_CNTK/samples/applications.yaml with the latest ATA API, ATA PGX, and ATA UI image names and the corresponding tags.
2. Run \$COMMON_CNTK/scripts/upgrade-applications.sh to upgrade the ATA instance:

```
$COMMON_CNTK/scripts/upgrade-applications.sh -p sr -i quick -  
f $SPEC_PATH/sr/quick/applications.yaml -a ata
```

ATA Localization

This chapter provides information on localizing the Active Topology Automator (ATA) user interface (UI). The localization is a process of translating a UI from the original language in which it was written into a different language for use in a specific country or region.

The supported languages for ATA localization are: **fr-ca**, **fr**, **es**, **en**.

The localization process works as follows:

- If a regional variant of one of the above languages is selected but is not available, the system rolls back to its appropriate parent language (for example: es-ar → es, en-in → en). A message appears as follows:

```
The page is displayed in <parentLanguage> because <parentLanguage-
regionalVariant> is not supported.
```

- If a different language is selected that is not one of the above mentioned languages and has no parent language included among them, the system rolls back to English (en). A message appears as follows:

```
The page is displayed in English because <selected-language> is not
supported.
```

Localizing ATA involves modifying a specific set of files that ATA uses to display text in the UI. It requires the following files:

- The **ATA app** bundle
- The properties files in ATA API
- The **UIM app** bundle

About App Bundles in ATA

The **Ata app** bundles are a set of **.js** files that contain text strings that can be localized, that define labels and messages in ATA UI. You can find the app bundles at the following location within **ata-ui.jar**: **\$BUILDER_HOME/staging/downloads/ata-ui/ataAppBundle/nls**. The **/root/appBundle-strings.js** is the default app bundle and it contains the strings in English language.

Localizing the ATA App Bundles

To localize the ATA app bundles:

1. Add a folder at **\$BUILDER_HOME/staging/downloads/ata-ui/ataAppBundle/nls/** with locale code as the name of the folder.
2. Copy **\$BUILDER_HOME/staging/downloads/ata-ui/ataAppBundle/nls/root/appBundle-strings.js** to the newly created folder.
3. The **appBundle-strings.js** contains the key-value pairs, where value is the label or message displayed in the UI.

4. Edit the values in the copied **appBundle-strings.js** file with the required localized strings.
5. In **\$BUILDER_HOME/staging/downloads/ata-ui/ataAppBundle/nls/appBundle-strings.js**, add the locale code as label and **true** as the value. You can use the following sample:

```
define({
  "root": true,
  "it": true,
  "fr": true,
  "sv": true
});
```

The sample app bundles for default root bundle (en) and the fr bundle are as follows:

- **root/appBundle-strings.js**

```
define({
  "outofText" : "out of",
  "@outofText": {
    "description": ""
  },
  "uploaded": "uploaded",
  "@uploaded": {
    "description": ""
  },
  "all": "All",
  "@all": {
    "description": ""
  }
});
```

- **fr/appBundle-strings.js**

```
define({
  "outofText": "hors de",
  "@outofText": {
    "description": ""
  },
  "uploaded": "téléchargé",
  "@uploaded": {
    "description": ""
  },
  "all": "All",
  "@all": {
    "description": ""
  }
});
```

 Note:

Modify the labels (key) values as shown in the samples and not in the **appBundle-strings.js**.

About Properties in ATA API

ATA API generates messages in the API response that are displayed in ATA UI in certain flows. These messages are a part of the properties files and located at **\$BUILDER_HOME/staging/downloads/ata-api/logging/resources/ui.properties**. The format for **ui.properties** file is as follows:

```
ui.{key}.id={id}
ui.{key}={value or message to be displayed}
```

Localizing Properties in ATA API

To localize the properties in ATA API:

1. Create a file using the following naming convention at **\$BUILDER_HOME/staging/downloads/ata-api/logging/resources/**:

```
ui_{locale_code}.properties
# example: ui_fr.properties for french
```

2. Copy the contents of **ui.properties** to **ui_<locale>.properties**.
3. Modify the values in **ui_<locale>.properties** to the required locale (For example: **fr**).
4. Build the ATA API application and run to update the application with the locale changes.

The sample **ui.properties** and **ui_fr.properties** properties are as follows:

- **ui.properties**

```
ui.invalidSearch.id=5000
ui.invalidSearch=A valid auto suggest search term is required : {0}

ui.query.id=5001
ui.query=Following query is prepared to run : {0}

ui.invalidSearchName.id=5002
ui.invalidSearchName=Search Name is required.
```

- **ui_fr.properties**

```
ui.invalidSearch.id=5000
ui.invalidSearch=Un terme de recherche de suggestion automatique valide
est requis : {0}

ui.query.id=5001
ui.query=La requête suivante est prête à être exécutée : {0}

ui.invalidSearchName.id=5002
ui.invalidSearchName=Le nom de recherche est obligatoire.
```



Note:

Modify the values as shown in the samples and not in the id or keys.

About UIM App Bundle in ATA

You can localize the specification names in ATA UI by exporting the specification bundle from UIM and building the image with customization.

Before you localize the specification name, make sure that the specification display names are provided in Design Studio and deployed to UIM.

Localizing Specification Names in ATA UI

To localize the specification names in ATA UI:

1. Export the **UIM App** bundle:
 - a. In the UIM left navigation pane, go to **Execute Rule** under the **Administration** section.
 - b. Select **EXPORT_SPECIFICATION_DISPLAY_NAMES_AS_JSON** from the dropdown, ignore the file upload option, and click **Process**.



Note:

For this option to appear, the **ora_uim_baserulesets** should be deployed.

- c. Download **uimAppBundle.tar.gz**.
2. Add the builder for image building by adding **uimAppBundle.tar.gz** in **\$BUILDER_HOME/staging/downloads/ata-ui/uimAppBundle/**.
3. Customize and build the image.

Data Migration and Dynamic Attribute Mapping between UIM and ATA

This chapter describes how to perform the data migration and Dynamic Attribute mapping between UIM and ATA.

Planning the Topology Migration

In preparation for implementing ATA, you must set up the topology migration and the UIM to topology configuration. The UIM to topology migration extracts and loads necessary information from UIM into the topology graph model consisting of vertices and edges. Following the Database per Service Micro service Design Pattern, the topology graph resides in a Pluggable Database (PDB) container separated from the UIM database.

The migration consists of the following:

- Index Rebuilding: The index rebuilding consists of re-creating indexes on tables with migrated data, dropping the temporary tables created during migration and renaming the tables with migrated data to actual topology tables.



Note:

If the UIM Entities are in 'UNAVAILABLE' state prior to migration, such entities will not be migrated.

Data Migration Approaches

You can follow the following approaches for data migration:

- Data Migration through Database Link: Database Link (DBLink) is created from ATA schema to UIM schema.
- Data Migration through Read Access on UIM schema: ATA schema is set up within the same PDB as that of the UIM schema. ATA schema user is granted with **SELECT** (read access) along with the tables owned by UIM schema user. Data dump files are created for the migrated topology data. These dump files are then imported in the target PDB where the ATA schema will be placed.

The prerequisites are:

- Add DATAFILE to increase the TABLESPACE available (SYSTEM by default) for the ATA schema user. Preferably one-fourth the size of UIM schema.
- Data Migration to custom tablespace can be achieved by making the custom tablespace as the default tablespace for the ATA schema user.

The Migration Steps are as follows:

1. Build Characteristics tables for the following topology enabled entities such as Equipment, Logical Device, Network, Network Edge, Physical Device, Pipe and Place. These

<ENTITY>_CHAR_MIG tables are used to store all characteristics on each entity which are used during Dynamic Attribute Migration and Customizing Topology JSON files. Build <ENTITY>_CHAR_MIG tables:

- Open a command line window and login to SQL*Plus for the UIM database.
- Run the following SQL scripts providing the full path of the files. For example, use the @scriptFileName command where scriptFileName is the full path and name of the file.
 - \$WORKSPACEDIR/ata-builder/migration_scripts/Char_Mig_tables/CREATE_CHAR_MIG_TABLE.sql
 - \$WORKSPACEDIR/ata-builder/migration_scripts/Char_Mig_tables/MIGRATION_CHAR1.sql
 - \$WORKSPACEDIR/ata-builder/migration_scripts/Char_Mig_tables/MIGRATION_CHAR2.sql
 - \$WORKSPACEDIR/ata-builder/migration_scripts/Char_Mig_tables/MIGRATION_CHAR3.sql
- To verify if the scripts ran successfully, you can verify that the UIM schema includes the following tables:
 - EQUIPMENT_CHAR_MIG
 - LOGICALDEVICE_CHAR_MIG
 - NETWORK_CHAR_MIG
 - NETWORKEDGE_CHAR_MIG
 - PHYSICALDEVICE_CHAR_MIG
 - PIPE_CHAR_MIG
 - PLACE_CHAR_MIG
 - CHARACTERISTICS_TABLE_MAPPING_MIG

 Note:

You can perform this step for any of the data migration approaches.

2. The Topology schema user account must have the following privileges:
 - CREATE JOB
 - CREATE SESSION
 - ALTER SYSTEM
 - CREATE DATABASE LINK
 - CREATE PROCEDURE
 - CREATE SEQUENCE
 - CREATE TABLE
 - CREATE TYPE
 - UNLIMITED TABLESPACE
 - CREATE JOB

These above privileges are sufficient for Approach 1, however for Approach 2:

- Create **SYNONYM**.
- Grant **SELECT** permission to all the tables owned by UIM schema user and ATA schema user.

```
CREATE PROCEDURE grant_select(
    username VARCHAR2,
    grantee VARCHAR2)
AS
BEGIN
    FOR r IN (
        SELECT owner, table_name
        FROM all_tables
        WHERE owner = username
    )
    LOOP
        EXECUTE IMMEDIATE
            'GRANT SELECT ON '||r.owner||'.'||r.table_name||' to ' ||
grantee;
    END LOOP;
END;
"username" - UIM Schema User
"grantee" - ATA Schema User within the same PDB.
```

3. Static Attribute Migration:

- Open a command line window and login to SQL*Plus for the Topology database.
- **Approach 1:**
 - Migrate the static attributes data by running \$WORKSPACEDIR/ata-builder/migration_scripts/data_migration_script_using_dblink.sql
 - The following input arguments are expected:
 - * UIM schema username
 - * UIM schema password
 - * Database Hostname
 - * Database port number
 - * Database Service name
 - * Commit Size(Optional – 50000(Default))
 - * Maximum number of parallel processes(Optional – 5(Default))
 - * Wait Time(Optional – 2(Default in seconds))
- **Approach 2:**
 - Migrate the static attributes data by running \$WORKSPACEDIR/ata-builder/migration_scripts/data_migration_script_using_localCopy.sql
 - The expects the following input arguments:
 - * UIM schema username with in the PDB
 - * Commit Size(Optional – 50000(Default))
 - * Maximum number of parallel processes(Optional – 5(Default))
 - * Wait Time(Optional – 2(Default in seconds))

 Note:

Commit Size: The number of records handled by a single process, Maximum number of parallel processes – Depends on number of CPU's available, Wait Time – Waiting interval after which the listener checks for the availability of jobs.

4. Modify the topology JSON files in **\$WORKSPACEDIR/ata-builder/migration_scripts/scriptGenerator/scriptGenerator_Executable/topologyjsonfiles/** and run the following commands:
Approach 1: **java -jar scriptgenerator_dblink-1.0-jar-with-dependencies.jar**
Approach 2: **java -jar scriptgenerator_localCopy-1.0-jar-with-dependencies.jar**
5. Dynamic Attribute Migration: Once the **scriptgenerator_<Approach>-1.0-jar-with-dependencies.jar** is run, the SQLs required for Dynamic attribute migration are generated in **\$WORKSPACEDIR/ata-builder/migration_scripts/scriptGenerator/scriptGenerator_Executable/scriptOutFiles/dynamicAtt.sql**. Run the SQL queries sequentially.
6. Verify the migrated data by going through tables with **%_FINAL** or **%_NEW** name.
7. Index Rebuild: The tables with names as **%_FINAL** and **%_NEW** contain the actual migrated data and indexes and constraints have to be added to these tables, these are generated in **\$WORKSPACEDIR/ata-builder/migration_scripts/scriptGenerator/scriptGenerator_Executable/scriptOutFiles/indexRebuild.sql**. Run the SQL queries sequentially.
8. In case of performing data migration using Approach 2, export the migrated Topology Data and import the migrated Topology Data into the target PDB where the ATA schema is expected to be.
9. Oracle Optimizer determines the cost of each execution plan based on database, schema, table and other statistics. The changes inside database result in stale statistics. To gather new statistics, run the following command:

```
EXEC DBMS_STATS.gather_schema_stats( '<TopologySchema_Name>' );
```

 Note:

PG_PROFILE tables which store the Service Topology Data are not supported in existing migration. If you want service topology profile data in the topology schema you can create a new service configuration and approve it. In 7.5.1.0.0, Profile Data is created for every service configuration in Approved State.

Customizing Topology JSON files for Migration

The **\$WORKSPACEDIR/ata-builder/migration_scripts/scriptGenerator/scriptGenerator_Executable/topologyjsonfiles/** contains three topology JSON files:

- topologyAttributeMapping.json
- topologyRoleMapping.json
- topologySpecificationMapping.json

Customize topologyAttributeMapping.json

```
[
  {
    "name": "LogicalDeviceDAO",
    "properties": [
      {
        "name": "NativeEMSName",
        "property": "NativeEMSName",
        "vertex": "",
        "columnName": ""
      }
    ]
  }
]
```

TopologyAttributeMapping (TAM) is an array defining how attributes of different DAO's can map to Topology Schema. Each TAM object consists of key-value pairs of **name** and **properties**.

- **name** – Maps to different entity classes and entity specification classes. For example: “LogicalDeviceDAO”, “EquipmentSpecificationDAO”, “PlaceSpecificationDAO”, “PropertyLocationDAO” and so on.
- **properties** – This is an array defining how individual attributes of an entity are supposed to be stored in Topology schema. Each JSON object of the **properties** has:
 - name – Name of the Attribute.
 - property – Name of the key used to store the value retrieved from Attribute.
 - vertex – Build the relationship with the Vertices, from Topology Schema.
 - columnName – Column from Topology Schema used to store the Attribute values.



Note:

In “properties” array objects, “name” is a mandatory field to be provided which maps to either “property” or “vertex” or “columnName”.

An example of TAM is:

Assume, the topologyAttributeMapping.json contains the following:

```
[
  {
    "name": "LogicalDeviceSpecificationDAO",
    "properties": [
      {
        "name": "vendorName",
        "property": "",
        "vertex": "vendor",
        "columnName": ""
      },
      {
        "name": "modelnumber",
        "property": "Model",

```



```

        "vertex": "",
        "columnName": ""
    }
    ],
    },
    {
        "name": "EquipmentDAO",
        "properties": [
            {
                "name": "NativeEMSName",
                "property": "",
                "vertex": "",
                "columnName": "DEVICEIDENTIFIER"
            }
        ]
    }
    ]
}

```

In the above example:

- LogicalDeviceSpecification table from UIM schema is expected to have “vendorName” and “modelName” columns which are used to do the following:
 - All LogicalDeviceSpecification’s which have a vendorName as some non-null value is moved to PG_VENDOR table and containment edges between the devices of LogicalDevice type and their respective vendors are created in PG_DEVICE_TO_VENDOR table.
Example: Assume there are 2 Logical Devices (“LDSampleDevice1” and “LDSampleDevice2”) of specification “LDSampleSpec”, and “LDSampleVendor” is the “vendorName”. Then, vertex/record for “LDSampleVendor” is created in PG_VENDOR table and the logical devices have their respective containment edges to the “LDSampleVendor” in PG_DEVICE_TO_VENDOR table.
 - All LogicalDeviceSpecification’s which have a “modelName” as some non-null value is stored in “PROPERTIES” column of PG_DEVICE table. For example: “LDSampleSpec” has “APTS-123” as “modelName”, then it’s stored as:

```

{
    "Model": "APTS-123"
}

```

- Equipments which have non-null value in “NativeEMSName” are stored in “DEVICEIDENTIFIER” column of PG_DEVICE table.

Customizing “topologyRoleMapping.json”

```

[
    {
        "name": "ADM",
        "entityClass": [
            "LogicalDeviceDAO",
            "PhysicalDeviceDAO",
            "EquipmentDAO"
        ],
        "property": "",
        "vertex": "domain",
        "columnName": ""
    }
]

```

```
    }
  ]
}
```

TopologyRoleMapping (TRM) is an array defining how entities which are role-enabled are stored in Topology schema. Each TRM object contains key-values pairs of “name”, “entityClass”, “property”, “vertex” and “columnName”.

- name – Name of the Role.
- entityClass – Entities which are enabled by the role and want data migrated for.
- property – Name of the key used to store the Role.
- vertex – Build the relationship with the Vertices, from Topology Schema
- columnName – Column from Topology Schema used to store the Role.



Note:

In each TRM object “name” is a mandatory field with role information which can be mapped to either “property” or “vertex” or “columnName”. If “entityClass” is empty ([]) that is same as role information to be checked in Logical Device, Equipment, Physical Device, Place, Pipe and Network.

An example of TRM is:

Assume, the topologyRoleMapping.json contains the following:

```
[
  {
    "name": "ADM",
    "entityClass": [
      "LogicalDeviceDAO",
      "PhysicalDeviceDAO",
      "EquipmentDAO"
    ],
    "property": "",
    "vertex": "domain",
    "columnName": ""
  },
  {
    "name": "EIGRP",
    "entityClass": [
      "LogicalDeviceDAO"
    ],
    "property": "routingProtocol",
    "vertex": "",
    "columnName": ""
  },
  {
    "name": "Router",
    "entityClass": [
      "EquipmentDAO"
    ],
    "property": "",
```

```

        "vertex": "",
        "columnName": "nodeCategory"
    }
]

```

In the above example,

- A record for **ADM** is created in PG_DOMAIN table and all logical devices, equipments, and physical devices that are enabled by the **ADM** role, have the corresponding records in the PG_DEVICE_TO_DOMAIN table.
- All logical devices enabled by the **EIGRP** role have the **PROPERTIES** column populated with

```

{
    "routingProtocol": "EIGRP"
}

```

- All equipments enabled by the **Router** role have **Router** stored in the **NODECATEGORY** column of PG_DEVICE table.

Customizing “topologySpecificationMapping.json”

```

[
    {
        "name": "EthernetDevice",
        "entityType": "LogicalDeviceSpecificationDAO",
        "relatedVertices": [
            {
                "vertex": "domain",
                "value": "Ethernet"
            }
        ],
        "characteristics": [
            {
                "name": "zoneID",
                "property": "",
                "vertex": "",
                "columnName": "ZONEID"
            }
        ]
    }
]

```

TopologySpecificationMapping (TSM) is an array defining how characteristics of a specification are mapped Topology schema and how all entities of a specification can have containment edge to other entities. Each TSM object contains key-values pairs of “name”, “entityType”, “relatedVertices” and “characteristics”.

- name – Name of the Specification.
- entityType – The type of entity does the specification represent.
- relatedVertices – Create containment edges for all entities of the given specification with the vertex and value. This contains an array of objects which have:
 - vertex – To which vertex the containment edges must be created to.

- Value – The value of the vertex.
- characteristics – Array of characteristics provided by the specification and how they are stored in Topology schema.
 - name – Name of the characteristic(case-sensitive)
 - property- Name of the key used to store the characteristic.
 - vertex – Build the relationship with vertices in Topology schema.
 - columnName – Column from Topology schema in which the characteristic is stored.



Note:

In each TSM object “name” and “entityType” are mandatory fields with specification and type of specification information. “relatedVertices” is used to create direct containment edges for all entities of the specification in question. “characteristics” is an array of objects where “name” is mandatory and talks about the characteristics provided by specification and can be mapped to either “property” or “vertex” or “columnName”.

An example of TSM is:

Assume, the topologySpecificationMapping.json contains the following:

```
[
  {
    "name": "cableModem",
    "entityType": "PhysicalDeviceSpecificationDAO",
    "characteristics": [
      {
        "name": "deviceType",
        "property": "deviceType",
        "vertex": "",
        "columnName": ""
      }
    ]
  },
  {
    "name": "EthernetDevice",
    "entityType": "LogicalDeviceSpecificationDAO",
    "relatedVertices": [
      {
        "vertex": "domain",
        "value": "Ethernet"
      }
    ],
    "characteristics": [
      {
        "name": "Tech",
        "property": "",
        "vertex": "Technology",
        "columnName": ""
      }
    ]
  }
]
```

```

    },
    {
      "name": "Generic_Address",
      "entityType": "PlaceSpecificationDAO",
      "characteristics": [
        {
          "name": "CityName",
          "property": "",
          "vertex": "",
          "columnName": "city"
        },
        {
          "name": "StateName",
          "property": "",
          "vertex": "",
          "columnName": "state"
        },
        {
          "name": "PostalCode",
          "property": "",
          "vertex": "",
          "columnName": "postalCode"
        }
      ]
    }
  ]
}

```

In the above example,

- “cableModem” is a PhysicalDeviceSpecification which has a characteristic “deviceType”. This characteristic is stored in “PROPERTIES” column of PG_DEVICE table.

```

{
  "DeviceType": "deviceType"
}

```

- A record for “Ethernet” is added to PG_DOMAIN table. All devices of “EthernetDevice” specification have containment edges to “Ethernet” in PG_Device_To_Domain table.
- “EthernetDevice” has a characteristic called “Tech”, so all unique values of “Tech” characteristic are added to PG_Technology. And for each “EthernetDevice” depending on its “Tech” characteristic respective containment edges are built.
- “Generic_Address” is a Place which has “CityName”, “StateName” and “PostalCode” characteristics which are mapped to “CITY”, “STATE” and “POSTALCODE” columns of PG_LOCATION table.

Customizing Topology JSON Files

To customize the topology JSON files:

1. When migrating Attribute or Role or Characteristic data to “PROPERTIES” column of respective entity, make sure the key used doesn’t include any empty space or special characters:

```

{
  "name": "Vendor Name",

```

```

    "property": "",
    "vertex": "vendor",
    "columnName": ""
  }

```

The above example “Vendor Name” contains empty space. Instead use “VendorName” or “Vendor_Name”.

2. In topologySpecificationMapping.json if the characteristic being migrated has length greater than 30 characters or contains special characters, the <ENTITY>_CHAR_MIG, do not have the characteristic as is. Instead, it has been casted to coded value, which can be derived from “CHARACTERISTICS_TABLE_MAPPING_MIG” in UIM schema.

For example: “Inter-rack_Power_Distribution” (CHAR_NAME) is the name of the characteristic which has been casted to “C46575002” (COLUMN_NAME).

```

{
  "name": "Inter-rack_Power_Distribution",
  "property": "",
  "vertex": "",
  "columnName": "nodeCategory"
}

```

The above example would result in a column not found error, instead characteristic must be migrated as follows:

```

{
  "name": "C46575002",
  "property": "",
  "vertex": "",
  "columnName": "nodeCategory"
}

```

Dynamic Data Mapping from UIM

The dynamic data mapping takes advantage of UIM characteristics and provides maximum flexibility for mapping fields from UIM to the topology model.

The dynamic data mapping:

- Does not require any additions, updates, migrations, or deployments of your existing specifications.
- Guarantees the value is set correctly and does not require a user to select the correct value.
- Allows ATA to support data extensions to the topology model without an upgrade.
- Vertex and Edge Labels or Properties in ATA may require different names than Characteristics, or Attributes or Roles in the implemented UIM model.
- These items are supported through dynamic data mapping.

The examples are:

- UIM has a 'Vendor' attribute on the Logical Device and Equipment Specifications but some users have added 'manufacturer' to their Physical Device Specifications.

- Some vertices are not identified specifically in UIM such as Domain and Service Type. These values are implied based on the '5G' cartridge or the 'FTTx' cartridge but are not specifically identified on the entity.

Prerequisites for Dynamic Data Mapping from UIM

The prerequisites are as follows:

- The following configuration files are required:
 - topologyAttributeMapping.json
 - topologyRoleMapping.json
 - topologySpecificationMapping.json.
- These files must exist in the <domain>/UIM/config/topologyMappings directory.
- Files with these names plus the extension .sample are provided.
- Prior to migration, the correct configurations must be provided. Else, the data will not be mapped correctly to ATA.
- If the file does not exist an error occurs during UIM entity creation.
- If you want to skip this process, you can remove the **.sample** extension and proceed with the default settings.

Mapping the Dynamic Data from UIM

To map the dynamic data from UIM, the following definitions are required:

- vertex: A node in the Topology Model, examples are Vendor, Domain, Technology, Network Type, Device, Location
- property: A column on every vertex and edge in the Topology model.
 - It supports JSON allowing for unlimited additional attributes.
 - Property is the name of the key used to store the value retrieved from the UIM attribute.
- properties: Is an array defining how individual attributes of an entity are to be stored in Topology schema.
- columnName: An existing column on a physical table in the Topology Model used to store the attribute.
- name: Maps to different entity classes and entity specification classes. For example: "LogicalDeviceDAO", "EquipmentSpecificationDAO", "PlaceSpecificationDAO", "PropertyLocationDAO" and so on.

The following POST operation creates a logical device, you can see the relationships and properties with which the dynamic properties are supported.

POST: http://localhost:8080/vertex

Body:

```
{ "entityId":<entityID>,"entityVersion":<entityVersion>,"businessObjectClass": "
LogicalDeviceDAO","id":<ID>,"name":<name>,"specName":<specificationName>
","latitude":0.0,"longitude":0.0,"inventoryStatus":"INSTALLED","referenceId":<r
eferenceID>,"relationships":{"vendor":<vendor>},"properties":
{"deviceIdentifier":<deviceIdentifier>"} }
```

 Note:

- In this example, the TopologyAttributesMapping.json file provides the instructions to ATA and the file is available in the UIM/config/topologyMappings directory.
- The topologyAttributesMapping file is used to address hard coded attributes from UIM tables.
- See topologyAttributesMapping.json for more information.

The POST operation tells the topology:

- Map LogicalDevice.deviceIdentifier to the property deviceIdentifier.
- Map LogicalDeviceSpecification.vendorName to the vertex = vendor
- This is based on the UIM ClassName, it works with any Class or specification that is topology-enabled.

You can add a role to the Logical Device from the list of roles that are configured in the TopologyRoleMapping.json file.

You can see that GET that the Logical Device tracks the **deviceIdentifier** in the **properties** column using:

GET: `http://localhost:8080/vertex/typeid/1/referenceid/<refID>`

```
{ "businessObjectClass": "LogicalDeviceDAO", "entityId": "<entityID>", "entityVersion": "<entityVersion>", "id": "<versionID>", "inventoryStatus": "INSTALLED", "latitude": 0.0, "longitude": 0.0, "name": "<name>", "properties": { "deviceIdentifier": "<deviceID>", "referenceId": "<referenceID>", "specName": "<specificationName>" }
```

PUT: `http://localhost:8080/vertex`

```
{ "businessObjectClass": "LogicalDeviceDAO", "entityId": "<entityID>", "entityVersion": 3, "id": "<ID>", "inventoryStatus": "INSTALLED", "latitude": 0.0, "longitude": 0.0, "name": "<name>", "properties": { "deviceIdentifier": "<ID>", "transmission": "Optical_Transmission", "referenceId": "<referenceID>", "specName": "<specificationName>" }
```

In the body:

- The role “Optical_Transmission” is mapped to the property field with name = “transmission”.
- The role was given a name = “transmission” which was provided by the UIM admin.
- Add, update and delete are supported. This works for Equipment and Physical Device (any topology-enabled entity that supports roles).
- Roles can be mapped to properties, vertices or columns.

The rules to perform this are:

- The Vertex must exist: The mapping can be performed to multiple vertices and can have multiple values.

- **Property:** There can be multiple properties. The UIM integrator is responsible for not having similar or misspelled values.
- **ColumnName:** A column can only have 1 value. The user is currently responsible for assuring this value is unique. It can be overlaid. This should be used for a queried attributes where an index is needed.
- The possible values of "columnName" are the following:
 - PG_DEVICE - [NODECATEGORY, MACADDRESS, IPV4, IPV4SUBNET, IPV6, IPV6SUBNET, ZONEID, DEVICEIDENTIFIER, NETWORKSTATUS, NODETYPE]
 - PG_LOCATION - [DISTRICT, PROVINCE, OPERATOR, CITY, STATE, POSTALCODE, COUNTRY, AREA, CIRCLE]
 - PG_COMMICATION - [FROMNODEDATA, TONODEDATA, RATECODE, TECHNOLOGY]
 - PG_NETWORK - [CATEGORY, SUBCATEGORY, TOPOLOGYTYPE, SUBTYPE]

 Note:

UIM currently supports city, state, country and postalcode attributes from the PropertyLocationDAO and PropertyAddressDAO. The street address or subunit (apartment number, room number) are not supported.

The supported UIM classes are:

LogicalDeviceDAO, GeographicPlaceDAO, PhysicalDeviceDAO, NetworkDAO, NetworkEdgeDAO, EquipmentDAO, GeographicSiteDAO, PropertyLocationDAO

 Note:

This includes the corresponding supported specification classes.

The last configuration is **TopologySpecificationMapping.json**.

- The **related vertices** field automatically adds a relationship edge between any instance of the specification to the vertex with the provided name and value.
- A characteristic does not need to be added and set on the specification to be tracked in topology.
- This allows our current RI cartridges to be used without any modifications.
- The **characteristics** column works the same as roles.
- It automatically adds a relationship to a vertex, sets properties or sets a column value.
- Any current characteristics can be used. No changes are needed.

PUT: <http://localhost:8080/vertex>

```
{ "entityId":<entityID>,"entityVersion":<entityVersion>,"businessObjectType":
1,"businessObjectClass":"LogicalDeviceDAO","id":<ID>,"name":<name>,"specName":
"router","latitude":<latitude>,"longitude":<longitude>,"inventoryStatus":
"INSTALLED","isTopLevelNode":true,"nodeAvailable":true,"placeNode":false,"refer
```

```
enceId":<referenceID>,"createdUser":"test","lastModifiedUser":"test","relation  
ships":{"vendor":"<vendor>","domain":"Ethernet"},"properties":  
{"deviceIdentifier":"<deviceID>"}}
```

Data Migration and Dynamic Attribute Mapping between UIM and SmartSearch

This chapter describes how to perform data migration and Dynamic Attribute mapping from UIM to SmartSearch or OpenSearch NoSQL Database. This migration helps you to seamlessly integrate data between UIM and SmartSearch or OpenSearch while designing networks.

Prerequisites

Before you perform SmartSearch data migration, ensure the following are performed:

- Cancel or complete all BIs that are associated with devices, connectivities, and pipes.
- Upgrade UIM.
 - For UIM Cloud Native, see UIM Cloud Native Upgrade Procedures
 - For Traditional UIM, see Upgrading Unified Inventory Management
- Ensure that SmartSearch and OpenSearch are deployed and are running with **Authentication disabled**. For more information, see ["Deploying OpenSearch and OpenSearch Dashboard"](#) and ["Deploying SmartSearch"](#).
- Add **lang_pipeline** in OpenSearch. For more information, see ["Creating Ingest Pipeline for OpenSearch"](#).
- Create all required indexes or metadata in OpenSearch. For more information, see ["Installing OpenSearch"](#) and ["Creating SmartSearch Schema"](#).
- Update the **hostAliases** section according to your SmartSearch and OpenSearch service setup. Add the target machine details in the **/etc/host** file as follows:

```
<IP ADDRESS> <instance>.<project>.<hostSuffix>
t3.<instance>.<project>.<hostSuffix>
admin.<instance>.<project>.<hostSuffix>
<instance>.<project>.topology.<hostSuffix>
```

- Verify your access to the service URL and database connection as follows:
 1. Open a command line window and login to SQL*Plus for the UIM database.
 2. Verify if UIM schema connection is successful using SQL*Plus.
 3. Ensure that you have admin or system access for UIM schema.
 4. Open a web browser and verify if you can access the SmartSearch API URL: **https://<instance>.<project>.topology.<hostSuffix>:<PORT>/<API-VERSION>/index/smartsearch-location**.
 5. Verify if **JAVA_HOME** and **PATH** are set.
 6. If SmartSearch is SSL enabled, use the **Import SSL** certificate in JAVA to secure connection.

7. Download the corresponding **.pem** file from target machine and run the following command in terminal to import certificate:

```
keytool -import -alias common-cert -file commoncert.pem -storetype JKS -  
keystore $JAVA_HOME/jre/lib/security/cacerts
```

Running the SmartSearch Migration Script

When you perform ATA migration along with SmartSearch migration, and if you perform data migration from UIM to ATA, you can ignore running the SQL files from migration SQL script as MIG tables are already present in your UIM schema.

If ATA migration is done before you start SmartSearch migration, you must drop all the tables before running the scripts.

If you perform data migration from UIM to SmartSearch, run the migration script as follows:

1. Go to **\$WORKSPACEDIR/ata-builder/migration_scripts/Char_Mig_tables** directory. You can see the following SQL files:
 - a. CREATE_CHAR_MIG_TABLE.sql
 - b. MIGRATION_CHAR1.sql
 - c. MIGRATION_CHAR2.sql
 - d. MIGRATION_CHAR3.sql
2. Run the SQL scripts in UIM schema in the above order.
3. Make a new directory:

```
mkdir $WORKSPACEDIR/<directory_name>
```

4. Copy **\$WORKSPACEDIR/uim-image-builder/staging/cnsdk/uim-db/staging/uim-db-installer/ora_uim_dbtools.jar** into the newly created directory.
5. Extract the jar file as follows:

```
jar -xvf ora_uim_dbtools.jar
```

6. Modify **smartSearchMappings.json** for dynamic attribute mapping and save it.

Note:

Dynamic attribute mappings support mapping of vendor-specific characteristic for Physical Device. You can map only one characteristic from the Physical Device entity to the **vendor** field in the OpenSearch index, using the mappings. The equivalent vendor characteristic mappings must be present in **topologySpecificationMapping.json**.

7. Modify the required parameters in the **smartSearchMigration.sh** file. For more information, see "[Post-migration Check](#)".

- Grant the **execute** permissions to the **smartSearchMigration.sh** file. If you do not have modify permissions, update the required parameters and save the file as follows:

```
chmod +x smartSearchMigration.sh
```

- Run the migration command using:

```
./smartSearchMigration.sh UIMToSmartSearch
```

 Note:

You must wait until the migration script is complete. Or, if you want more options, run `./smartSearchMigration.sh help`.

If the migration script fails, and you want to perform the migration again, delete the **temp** tables as follows:

```
./smartSearchMigration.sh deleteTable force
```

After a table is deleted, run the following command to restart the migration:

```
./smartSearchMigration.sh UIMToSmartSearch
```

Post-migration Check

Perform the following after a successful data migration to SmartSearch:

- Verify or search the following information in the console log:

```
**** After Json Data Processed Completed ****
      Total Batch Size: 8
      Total Completed Batch Size: 8
      Total Pending And Failed Batch Size: 0
**** Data Migration from UIM to Open Search Successfully Completed!
*****
```

 Note:

The **Total Pending and Failed Batch Size** value is Zero if the data migration is successful.

- Contact your administrator to enable Authentication for SmartSearch API and OpenSearch database.
- After enabling Authentication, open NPD to verify the search functionality for the corresponding entities such as logical device, physical device, equipment, and so on.

The sample file is as follows:

```
[
  {
    "name": "Ciena 3928 PD",
    "entityType": "PhysicalDeviceSpecificationDAO",
    "characteristics": [
      {
        "name": "vendor",
        "smartSearchName": "vendor"
      }
    ]
  },
  {
    "name": "Nokia 1800 PD",
    "entityType": "PhysicalDeviceSpecificationDAO",
    "characteristics": [
      {
        "name": "vendor",
        "smartSearchName": "vendor"
      }
    ]
  },
  {
    "name": "Ciena 3928 PD",
    "entityType": "PhysicalDeviceSpecificationDAO",
    "relatedVertices": [
      {
        "vertex": "vendor",
        "value": "Ciena",
        "smartSearchName": "vendor"
      }
    ],
    "characteristics": []
  }
]
```

The **relatedVertices** and **characteristics** sections in the mapping are mutually exclusive. Meaning, you should use only one of them, not both. If both sections are provided, the **characteristics** section overrides the **relatedVertices** section.

The **relatedVertices** section specifies a default value for a characteristic in the mapping, than searching for it from the database. For example, in the above sample, physical devices with the specification **Ciena 3928 PD** always have **Ciena** as the value in the vendor field in the index. This ensures that all physical devices with the **Ciena 3928 PD** specification have **Ciena** as their vendor in the NPD search.

Table 12-1 Dynamic Attributes

Dynamic Attribute	Description
name	Name of the entity specification on which the characteristic to be mapped exists. This is a mandatory attribute.
entityType	Entity specification DAO. This is a mandatory attribute. The only valid value is PhysicalDeviceSpecificationDAO .

Table 12-1 (Cont.) Dynamic Attributes

Dynamic Attribute	Description
characteristics.name	Name of the characteristic that you plan to map with the index attribute.
characteristics.smartSearchName	Attribute name of the index where dynamic attribute value is stored in OpenSearch index
relatedVertices.vertex	The relatedVertices.vertex value from the ATA mappings. The only supported value is vendor .
relatedVertices.value	Manually-entered value for characteristics that will persist in attribute of the index.
relatedVertices.smartSearchName	Attribute name of index where dynamic attribute value is stored in OpenSearch index

Open the **smartSearchMigration.sh** file in terminal or in a text editor, modify the required attributes values, and save the file. The sample file is as follows:

```
export SMART_SEARCH_BASE_URL=""; #BASE URL format like http or https://
<host>:<port>/<api_version>
  export LANG=""; # for example en
  export TENANT_ID=""; # for example tenant1
  export LIMIT=""; #for example 10000
  export BATCH_SIZE_LIMIT=""; # for example 10
  export BULK_LOAD_TIMEOUT="20"; # Maximum processing time per batch
operation (seconds)
  export INITIAL_DELAY="1"; # Initial waiting time between batch
operations (seconds)
  export BACK_OFF_FACTOR="2.0"; # Multiplier to increase retry delay time
  export MAX_DELAY="180"; # Maximum Delay allowed between retries
of one batch (seconds)
  export JAVA_HOME="";
  export DB_HOSTNAME="";
  export DB_PORT="";
  export DB_SERVICE_NAME="";
  export DB_USER_NAME=""; # user details left as blank for production
environment once prompt then you can provide
  export DB_PASSWD=""; # password details left as blank for production
environment once prompt then you can provide
```

13

Disaster Recovery Support

A minimum of two pods is required for a service to be highly available. They should be on different worker nodes (Kubernetes can schedule the pods on different nodes using pod anti-affinity). If one node goes down, it takes out the corresponding pod, leaving the other pod(s) to handle the requests until the downed pod can be rescheduled. When a worker node goes down, the PODs running on that worker node will be rescheduled on other available worker nodes.

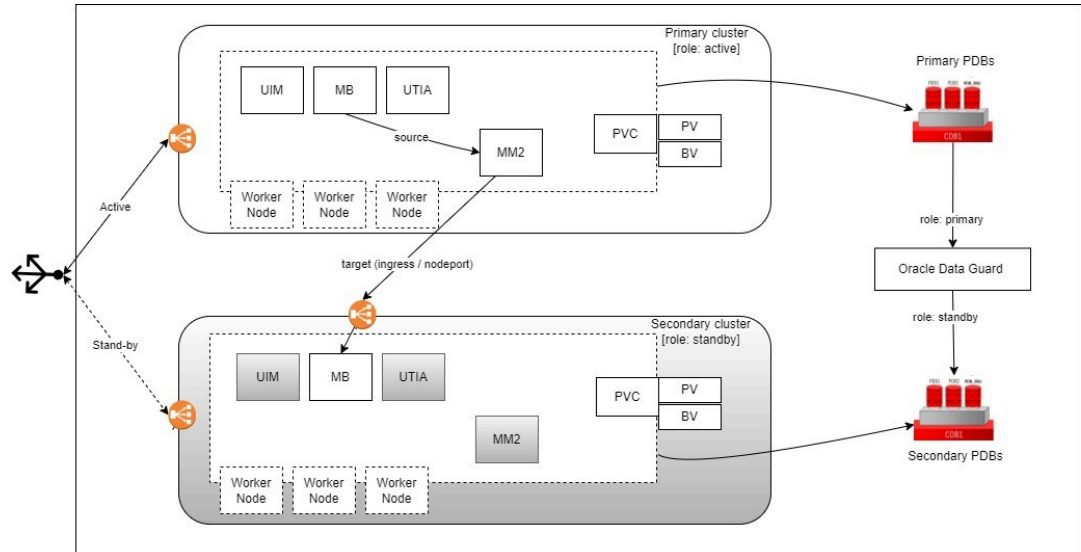
For DB High Availability we can use the Oracle Real Application Clusters (RAC) to run a single Oracle Database across multiple servers in order to maximize availability and enable horizontal scalability.

Disaster Recovery across Data Centers

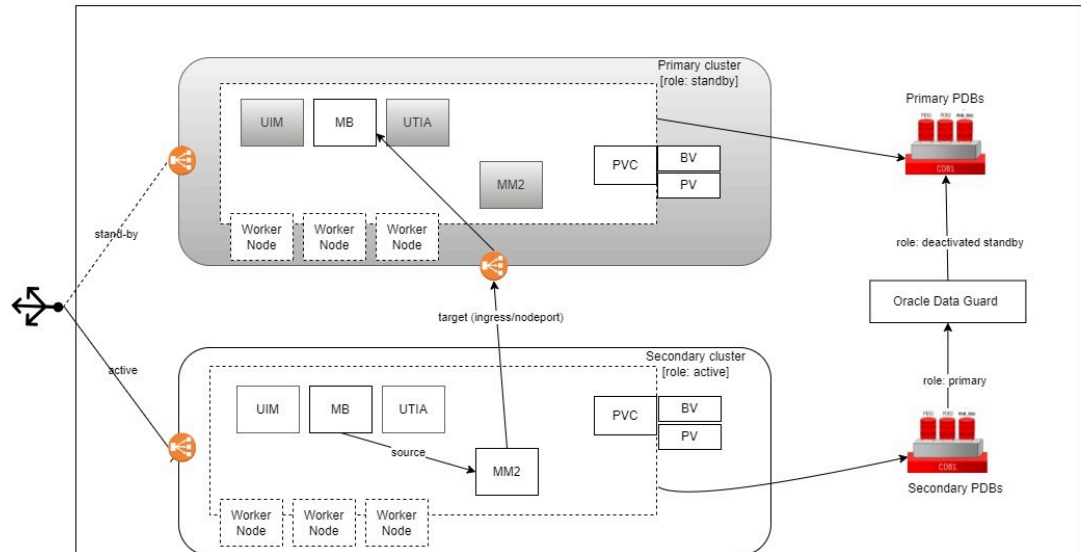
The disaster recovery when the data center completely goes down is maintained with another passive data center.

[Figure 13-1](#) documents the disaster recovery plan for the data center. A parallel passive data center is maintained, where the runtime data is periodically replicated from the active data center to the passive data center. In the event of any catastrophic failures in the primary (or active) data center, the load must be switched to secondary (or passive) data center. Before switching the load to secondary data center, you should shutdown all the services in the primary data center and start all the services in the secondary data center.

Figure 13-1 Disaster Recovery Plan for Data Center



After failover, the instances are brought up in the secondary cluster. The primary site is shut down and primary DB goes into 'Deactivated Standby' role."



UIM: Unified Inventory Management
MB: Message Bus
UTIA: Unified Topology for Inventory and Automation
PVC: Persistent Volume Claims
PV: Persistent Volumes

About Switchover and Failover

The purpose of a geographically redundant deployment is to provide resiliency in the event of a complete loss of service in the primary site, due to a natural disaster or other unrecoverable failure in the primary UIM site. This resiliency is achieved by creating one or more passive standby sites that can take the load when the primary site becomes unavailable. The role reversal from the standby site to the primary site can be accomplished in any of the following ways:

- **Switchover**, in which the operator performs a controlled shutdown of the primary site before activating the standby site. This is primarily intended for planned service interruptions in the primary UIM site. Following a switchover, the former primary site

becomes the standby site. The site roles of primary site and standby site can be restored by performing a second switchover operation, which is switchback.

- **Failover**, in which the primary site becomes unavailable due to unanticipated reasons and cannot be recovered. The operator then transitions the standby site to the primary role. The primary site that is down cannot act as a standby site and will require reconstruction of the database as a standby database before restoring the site roles.

About Kafka Mirror Maker

Kafka's Mirror Maker functionality makes it possible to maintain a replica of an existing Kafka cluster (which is used in Message Bus service). This mirrors a source Kafka cluster into a target (mirror) Kafka cluster. To use this mirror, it is a requirement that the source and target Kafka clusters (that is, Message Bus service) are up and running. If the target Kafka cluster is down or offline, we cannot mirror into the target cluster.

Oracle Data Guard

Oracle Data Guard is responsible for replicating transactions from the Active DB to the Standby DB. It is included as a part of every Oracle DB Enterprise Edition installation.



Note:

When using multi-tenant databases involving CDBs and PDBs with Data Guard, the replication happens at the CDB level. This means all the PDBs from the active CDB will be replicated over to the standby CDB and also, the commands to enable Data Guard must be run at the CDB level.

Installation and Configuration

If ATA is disabled in UIM Cloud Native then it is not required to deploy Message Bus, ATA and Mirror Maker Services in the clusters. These commands are intended to be used as samples. For detailed documentation on deploying UIM, see "Overview of the UIM Cloud Native Deployment" in *UIM Cloud Native Deployment Guide*.

Setting up the Primary (active) Instance

To set up the primary (active) instance:

1. Provision Databases one for the primary site and another for the secondary site.
2. Set up Data Guard between primary site and secondary site. Primary site should be in **ACTIVE** role. Secondary site should be in **STANDBY** role. Refer to [Oracle 19c Documentation](#).
3. Deploy UIM Cloud Native.
 - a. Create image pull secrets (if required).
 - b. Create UIM secrets for WLS admin, OPSS, WLS RTE, RCU DB and UIM DB.

 Note:

`uimprimary` here refers to the Kubernetes namespace where the primary instance will be deployed. Replace this with the desired namespace.

```
$UIM_CNTK/scripts/manage-instance-credentials.sh -p uimprimary -i dr
create wlsadmin,opssWP,wlsRTE,rcudb,uimdb
```

c. Create Weblogic encrypted password.

```
$UIM_CNTK/scripts/install-uimdb.sh -p uimprimary -i dr -s $SPEC_PATH -c
8
```

d. Create UIM users secrets.

```
$UIM_CNTK/samples/credentials/manage-uim-credentials.sh -p uimprimary -
i dr -c create -f "/home/spec_dir/users.txt"
```

e. Create DB schemas.

```
$UIM_CNTK/scripts/install-uimdb.sh -p uimprimary -i dr -s $SPEC_PATH -c
1
$UIM_CNTK/scripts/install-uimdb.sh -p uimprimary -i dr -s $SPEC_PATH -c
2
```

f. Create UIM instance.

```
$UIM_CNTK/scripts/create-ingress.sh -p uimprimary -i dr -s $SPEC_PATH
$UIM_CNTK/scripts/create-instance.sh -p uimprimary -i dr -s $SPEC_PATH
```

g. Add UIM user roles.

```
$UIM_CNTK/samples/credentials/assign-role.sh -p uimprimary -i dr -f uim-
users-roles.txt
```

4. Deploy Message Bus.

```
$COMMON_CNTK/scripts/create-applications.sh -p uimprimary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a messaging-bus
```

5. Deploy ATA:

a. Create Topology DB secrets:

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p uimprimary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a ata create
database
```

b. Create Topology UIM secrets:

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p uimprimary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a ata create uim
```

c. Create DB schemas:

```
$COMMON_CNTK/scripts/install-database.sh -p uimprimary -i dr -
f $SPEC_PATH/<proejct>/<instance>/database.yaml -a ata -c 1
```

d. Deploy Topology:

```
$COMMON_CNTK/scripts/create-applications.sh -p uimprimary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a ata
```

See "Deploying Unified Operations Message Bus" for deploying Message Bus, "Deploying the Active Topology Automator Service" for deploying ATA.

See "Overview of the UIM Cloud Native Deployment" in *UIM Cloud Native Deployment Guide* for deploying UIM.

Setting up the Secondary (standby) Instance

To set up the secondary (standby) instance:

1. Perform switchover operation on active (primary site) DB. Now secondary site DB should be in **ACTIVE** role and primary site DB should be in **PASSIVE** role. Refer to [Oracle 19c Documentation](#).
2. Deploy UIM Cloud Native:
 - a. Export OPSS wallet file secret from primary instance and recreate in secondary instance.

 Note:

Where, `uimsecondary` refers to the Kubernetes namespace where the secondary instance will be deployed. Replace this with the desired namespace.

```
kubectl -n uimprimary get configmap uimprimary-dr-weblogic-domain-
introspect-cm -o jsonpath='{.data.ewallet\.p12}' > ./primary_ewallet.p12
$UIM_CNTK/scripts/manage-instance-credentials.sh -p uimsecondary -i dr
create opssWF
```

- b. (Optional) Create image pull secrets.
- c. Create UIM secrets for WLS admin, OPSS, WLS RTE, RCU DB and UIM DB:

```
$UIM_CNTK/scripts/manage-instance-credentials.sh -p uimsecondary -i
quick create wlsadmin,opssWP,wlsRTE,rcudb,uimdb
```

d. Create Weblogic encrypted password:

```
$UIM_CNTK/scripts/install-uimdb.sh -p uimsecondary -i dr -s $SPEC_PATH -
c 8
```

e. Create UIM users secrets:

```
$UIM_CNTK/samples/credentials/manage-uim-credentials.sh -p uimsecondary
-i dr -c create -f "/home/spec_dir/users.txt"
```

f. Create UIM instance:

```
$UIM_CNTK/scripts/create-ingress.sh -p uimsecondary -i dr -s $SPEC_PATH
$UIM_CNTK/scripts/create-instance.sh -p uimsecondary -i dr -s $SPEC_PATH
```

g. Add UIM user roles:

```
$UIM_CNTK/samples/credentials/assign-role.sh -p uimsecondary -i dr -f
uim-users-roles.txt
```

3. Deploy message bus:

```
$COMMON_CNTK/scripts/create-applications.sh -p uimsecondary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a messaging-bus
```

4. Deploy ATA:**a. Create Topology DB secrets:**

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p uimsecondary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a ata create
database
```

b. Create Topology UIM secrets:

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p uimsecondary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a ata create uim
```

c. Deploy Topology:

```
$COMMON_CNTK/scripts/create-applications.sh -p uimsecondary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a ata
```

5. Deploy Mirror Maker. See "[Installing and Configuring Mirror Maker 2.0](#)" for more information.**6. After the secondary instance has been setup, switchover back to the primary (active) site.**

Switchover Sequence

To perform a switchover between site A (active) and site B (standby):

1. Bring down instances in site A. These include UIM and ATA. Message Bus must be enabled to perform the replication using Mirror Maker.

```
#Disable topology
$COMMON_CNTK/scripts/delete-applications.sh -p uimprimary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a ata
#Disable UIM
$UIM_CNTK/scripts/delete-instance.sh -p uimprimary -i dr -s $SPEC_PATH
```

2. Perform switchover on DB. Site B DB will now become Primary. Site B DB will assume Standby role. Refer to [Oracle 19c Documentation](#).
3. Bring up instances in site B. This includes UIM and ATA. Message Bus should already be active:

```
#EnableUIM
$UIM_CNTK/scripts/create-instance.sh -p uimsecondary -i dr -s $SPEC_PATH
#Enable topology
$COMMON_CNTK/scripts/create-applications.sh -p uimsecondary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a ata
```

4. Perform DNS switching to route all traffic to site B.

Failover Sequence

In case of any irrecoverable failure in the primary site, perform a failover operation on the standby site. To do so:

1. Perform failover on DB. Standby (secondary) DB will now become Primary. Primary site DB will assume Deactivated Standby role. Refer to [Oracle 19c Documentation](#).
2. Bring up instances in standby. This includes UIM and Topology. Message Bus should already be active:

```
#EnableUIM
$UIM_CNTK/scripts/create-instance.sh -p uimsecondary -i dr -s $SPEC_PATH
#Enable topology
$COMMON_CNTK/scripts/create-applications.sh -p uimsecondary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a ata
```

3. Perform DNS switching to route all traffic to secondary instances.

Once the primary site is restored, establish a synchronization between secondary and primary site. To do so:

1. Bring up Message Bus and DB in primary site:

```
#Enable message bus
$COMMON_CNTK/scripts/create-applications.sh -p uimprimary -i dr -
f $SPEC_PATH/<project>/<instance>/applications.yaml -a messaging-bus
```

2. Setup Kafka Mirror Maker with secondary Message Bus as source and primary Message Bus as target. See "[About Kafka Mirror Maker](#)" for more information.
3. Switch primary DB role from **Deactivated Standby** → **Standby**. See "[Deploying Unified Operations Message Bus](#)" for more information.

As the synchronization between secondary and primary site is established, perform a switchover to the primary site. To do so:

1. Bring up UIM in primary site:

```
$UIM_CNTK/scripts/create-instance.sh -p uimprimary -i dr -s $SPEC_PATH
```

2. Bring up Topology in primary site:

```
$COMMON_CNTK/scripts/create-applications.sh -p uimprimary-i dr -  
f $SPEC_PATH/<project>/<instance>/applications.yaml -a ata
```

3. Perform DNS switching to route all traffic to primary instances.
4. Bring down instances in secondary site. This includes UIM and Topology. Message Bus should remain active for Kafka Mirror Maker synchronization:

```
#Disable topology  
$COMMON_CNTK/scripts/delete-applications.sh -p uimsecondary-i dr -  
f $SPEC_PATH/<project>/<instance>/applications.yaml -a ata  
#Disable UIM  
$UIM_CNTK/scripts/delete-instance.sh -p uimsecondary -i dr -s $SPEC_PATH
```

Checklists for Integration of Services

This chapter provides a checklist of integrating the services.

The checklists include the following variables:

- `<topology-project>`: Refers to the Kubernetes namespace on which the ATA service is running.
- `<topology-instance>`: Refers to the instance name of the ATA service running on `<topology-project>` namespace.
- `<messaging-project>`: Refers to the Kubernetes namespace on which Message Bus service is running.
- `<messaging-instance>`: Refers to the instance name of Message Bus running on `<messaging-project>` namespace.
- `<loadbalancerport>`: Refers to the port of loadbalancer configured. If you use Oracle Cloud Infrastructure LBaaS, or any other external load balancer, if TLS is enabled set `loadbalancerport` to 443. Otherwise, set `loadbalancerport` to 80. If there is no external loadbalancer configured for the instance, change the value of `loadbalancerport` to the default Traefik NodePort. If TLS is enabled on ATA Traefik NodePort is 30443 and if TLS is disabled, is 30305.
- `<loadbalancerhost>`: Refers to the host of loadbalancer configured. If you use Oracle Cloud Infrastructure LBaaS, or any other external load balancer, update the value for `loadbalancerhost` appropriately. If there is no external loadbalancer configured for the instance change the value of `loadbalancerhost` to the worker node IP/ Kubernetes cluster IP.
- `<hostSuffix>` : Refers to the host suffix configured using `applications.yaml` file. The default is: `uim.org`.
- `<oauth-token-endpoint-uri>`: Get the OAuth token endpoint URI from your IdP. Usually, you can find it on `.well-known/openid-configuration` endpoint of your IdP. In case of OAM, it is `https://<instance>.<project>.ohs.<hostSuffix>:<loadbalancerport>/oauth2/rest/token`
- `<oauth-scope>`: Provide the configured scope to your OAuth client. If not configured, keep it empty.
- `<oauth-audience>`: Provide the configured audience to your OAuth client. If not configured, keep it empty.
- `<oauth-client-id>`: Provide the Client ID of of your OAUTH 2.0 client.
- `<oauth-client-secret>`: Provide the Client Secret of your OATUH 2.0 client.
- `<oauth-token-endpoint-uri>`: Provide the token endpoint URI of your IDP client. You can find the `well-known/openid-configurations` site of your identity provider for details.
- `<smartsearch-instance>`: Refers to the instance name of the Smart Search service on `<smartsearch-project>` namespace.

**Note:**

It is mandatory to deploy all applications with the same instance and project names with Message Bus as an exception as it can be in a different instance or project.

Use the following checklist for integrating UIM cloud native instance, Message Bus, and ATA:

Table 14-1 Checklist for UIM cloud native instance, Message Bus, ATA, Smart Search, and Authorization Service

Source Application	Target	Application Properties	Configuration Reference
UIM CN	ATA	ATA API disableTopology=false microServiceEnabled=true microServiceUrl=http://<topology-project>-<topology-instance>-ata-api.<topology-project>.svc.cluster.local:8080/topology/v2/ ATA UI uim.rest.filter.CORSAllowedOrigin=https://<topology-instance>.<topology-project>.topology.<hostSuffix>:<loadbalancerport> topology.ui.host=https://<topology-instance>.<topology-project>.topology.<hostSuffix> topology.ui.port=<loadbalancerport> topology.ui.path=/apps/ata-ui	Rename custom-config.properties.samples file and update the properties. mv \$UIM_CNTK/charts/uim/custom-config.properties.samples \$UIM_CNTK/charts/uim/custom-config.properties

Table 14-1 (Cont.) Checklist for UIM cloud native instance, Message Bus, ATA, Smart Search, and Authorization Service

Source Application	Target	Application Properties	Configuration Reference
	Message Bus	bootstrap.server.url=<messaging-project>-<messaging-instance>-messaging-kafka-bootstrap.<messaging-project>.svc.cluster.local:9092	
	Smart Search	#Uncomment the following properties only if UIM CN and Smart Search are not in the same namespace. smartSearch.ui.host=http://<smartsearch-project>-<smartsearch-instance>-smartsearch.<smartsearch-project>.svc.cluster.local smartSearch.ui.port=8080	
	IDP OAUTH CLIENT	oauth.enabled=true oauth.token.endpoint.uri=<oauth-token-endpoint-uri> oauth.client.id=<oauth-client-id> oauth.client.secret=<oauth-client-secret> oauth.scope=<oauth-scope> oauth.audience=<oauth-audience>	
	IDP SAML 2.0		See Enabling SAML Based Authentication Provider in Cloud Native Deployment Guide.

Table 14-1 (Cont.) Checklist for UIM cloud native instance, Message Bus, ATA, Smart Search, and Authorization Service

Source Application	Target	Application Properties	Configuration Reference
	SSL	Enable ssl flag in instance.yaml ssl: enabled: true	See Setting Up UIM Cloud Native for Incoming Access in Cloud Native Deployment Guide.
ATA	UIM		See Creating Secrets for UIM Credentials
	Message Bus	messagingBusConfig: namespace: <messaging-bus-namespace> instance: <messaging-bus-instance>	\$SPEC_PATH/project/instance/applications.yaml
	Authorization Service	authorizationServiceConfig: namespace: <authorization-service-namespace> instance: <authorization-service-instance>	\$SPEC_PATH/project/instance/applications.yaml
	SSL	Enable tls flag in applications.yaml tls: enabled: true	See Setting up Secure Communication using TLS section.
ATA MB Smart Search Authorization Service	IDP OATUH CLIENT	Enable authentication flag in applications.yaml authentication: enabled: true	See Adding Common OAuth Secret and ConfigMap in ATA Deployment Guide See Common Configuration Options For all Services in ATA Deployment Guide

Use the following checklist for integrating traditional UIM, Message Bus, and ATA:

Checklist for entries in **/etc/hosts** for integration:

- Authentication service

- If OAM is deployed as IdP:

`<loadbalancerIP> <oam-instance>.<oam-project>.ohs.<oam-host-suffix>`

- If any IdP is used other than OAM, for accessing UIM:

`<instance>.<project>.<hostSuffix>`

- **Message service**

`<loadbalancerIP> <messaging-instance>.<messaging-project>.messaging.bootstrap.<hostSuffix>`

`<loadbalancerIP> <messaging-instance>.<messaging-project>.messaging.broker0.<hostSuffix>`

`<loadbalancerIP> <messaging-instance>.<messaging-project>.messaging.broker1.<hostSuffix>`

- **ATA service**

`<loadbalancerIP> <topology-instance>.<topology-project>.topology.<hostSuffix>`

Table 14-2 Checklist for UIM, Message Bus, and ATA

Source Application	Target	Application Properties	Configuration Reference
UIM	ATA	ATA API disableTopology=false microServiceEnabled=true microServiceUrl=https:// <topology-instance>.<topology-project>.topology.<hostSuffix>:<loadbalancerport>/topology/v2/ ATA UI uim.rest.filter.CORSAllowedOrigin=https:// <topology-instance>.<topology-project>.topology.<hostSuffix>:<loadbalancerport> topology.ui.host=https:// <topology-instance>.<topology-project>.topology.<hostSuffix> topology.ui.port=<loadbalancerport> topology.ui.path=/apps/ata-ui	Update system-config.properties file.

Table 14-2 (Cont.) Checklist for UIM, Message Bus, and ATA

Source Application	Target	Application Properties	Configuration Reference
	Message Bus	<pre>bootstrap.server .url=<messaging- instance>.<messa ging- project>.messagi ng.bootstrap.<ho stSuffix>:<loadb alancerport> kafka.client.isT Ls=true</pre>	
	IDP OATUH CLIENT	<pre>oauth.enabled=tr ue oauth.token.endp oint.uri=<oauth- token-endpoint- uri> oauth.client.id= <oauth-client- id> oauth.client.sec ret=<oauth- client-secret> oauth.scope=<oua th-scope> oauth.audience=< oauth-audience></pre>	
	IDP SAML 2.0		For enabling SSO authentication on UIM On Premise instance, see Setting Up Unified Inventory Management for Single Sign-On Authentication section in UIM Installation Guide.

Table 14-2 (Cont.) Checklist for UIM, Message Bus, and ATA

Source Application	Target	Application Properties	Configuration Reference
	SSL	You have to add MB, ATA, and IDP SSL certificates to the trust of UIM Managed Servers: <pre>keytool -import -alias common- cert -keystore \$JAVA_HOME/jre/lib/security/ cacerts - file \$COMMON_CNT K/certs/ commoncert.pem keytool -import -alias idp-cert - keystore \$JAVA_H OME/jre/lib/ security/cacerts - file \$COMMON_CNT K/certs/ idpcertificate.p em</pre>	See Configuring the SSL Policy/Certificate section in System Administrator Guide. See Enabling WebLogic SSL Port section in UIM Installation Guide.
Message Bus	SSL	Update applications.yaml <pre>tls: enabled: true</pre>	See Message Bus Ingress Listener in "Configuring Message Bus Listeners"
ATA	UIM	Provide proxy server uri as UIM URL to the secret. In applications.yaml, set Replica count of impact-analysis-api and alarm consumer to 0.	See Creating Secrets for UIM Credentials section. See Configuring the applications.yaml File section.

Table 14-2 (Cont.) Checklist for UIM, Message Bus, and ATA

Source Application	Target	Application Properties	Configuration Reference
	Message Bus	Update applications.yaml messagingBusConfig: namespace: <messagingbus-project> instance: <messagingbus-instance>	See Integrate ATA Service with Message Bus Service section.
	SSL	Make Sure you add UIM and IDP certificate to the truststore of oauthConfig secret.	See Setting up Secure Communication using TLS section.
ATA Message Bus	IDP OAUTH CLIENT	Enable authentication flag in applications.yaml authentication: enabled: true	See Adding Common OAuth Secret and ConfigMap in ATA Deployment Guide See Common Configuration Options For all Services in ATA Deployment Guide

Integrating UIM with ATA and Message Bus

This section provides you with instructions to integrate UIM (traditional and cloud native) with ATA and Message Bus. The samples for IDCS Idp are packaged along with ATA.

Integrating UIM CN with Message Bus and ATA

To integrate UIM CN with Message Bus and ATA:

1. Update **\$UIM_CNTK/charts/uim/custom-config.properties** file with the following details:

- UIM CN to Message Bus service settings:

```
bootstrap.server.url=<messaging-project>-<messaging-instance>-messaging-
kafka-bootstrap.<messaging-project>.svc.cluster.local:9092
#Set below properties to pass Authentication service details
kafka.client.isOAuth=true
kafka.client.oauth.token.endpoint.uri=<oauth-token-endpoint-uri> (Ex.
https://idcs-df3*****f64b21.identity.pint.oc9qadev.com:443/
oauth2/v1/token)
kafka.client.oauth.client.id=<oauth-client-id> (Ex.
e6e0b2cxxxxxxxxxxxxxxxx)
kafka.client.oauth.client.secret=<oauth-client-secret> (Ex. xxxx-xxxx-
xxxx-xxxx)
```



```
kafka.client.oauth.client.scope=<oauth-client-scope> (Ex. https://
quick.sr.topology.uim.org:30443/ataScope)
kafka.client.oauth.client.audience=<oauth-client-audience> (Ex. https://
quick.sr.topology.uim.org:30443/)
#Internal communications between kubernetes services is non-ssl. Set
kafka.client.isTls to false.
kafka.client.isTls=false
```

- UIM CN to ATA API settings:

```
disableTopology=false
microServiceEnabled=true
microServiceUrl=http://<topology-project>-<topology-instance>-ata-
api:8080/topology/v2/
```

- UIM CN to ATA UI settings:

```
uim.rest.filter.CORSAllowedOrigin=https://<topology-instance>.<topology-
project>.topology.<hostSuffix>:<loadbalancerport>
topology.ui.host=https://<topology-instance>.<topology-
project>.topology.<hostSuffix>
topology.ui.port=<loadbalancerport>
topology.ui.path=/apps/ata-ui
```

2. Create or restart the UIM CN instance as usual, after the above configurations.

Integrating Traditional UIM with Message Bus and ATA

To integrate traditional UIM with Message Bus and ATA:

1. Update the **system-config.properties** file with the following details:

- UIM to Message Bus service settings:

```
Provide ingress bootstrap server details as UIM traditional instance is
outside of kubernetes cluster.
bootstrap.server.url=<messaging-instance>.<messaging-
project>.messaging.bootstrap.uim.org:<loadbalancerport>
#Set below properties to pass Authentication service details
kafka.client.isOAuth=true
kafka.client.oauth.token.endpoint.uri=<oauth-token-endpoint-uri> (Ex.
https://idcs-df3*****f64b21.identity.pint.oc9qadev.com:443/
oauth2/v1/token)
kafka.client.oauth.client.id= <oauth-client-id> (Ex.
e6e0b2cxxxxxxxxxxxxxxxxxx)
kafka.client.oauth.client.secret= <oauth-client-secret> (Ex. xxxx-xxxx-
xxxx-xxxx)
kafka.client.oauth.client.scope=<oauth-client-scope> (Ex. https://
quick.sr.topology.uim.org:30443/ataScope)
kafka.client.oauth.client.audience=<oauth-client-audience> (Ex. https://
quick.sr.topology.uim.org:30443/)
# External access is TLS enabled
kafka.client.isTls=true
```

- UIM to ATA API settings:

```
disableTopology=false
microServiceEnabled=true
microServiceUrl=https://<topology-instance>.<topology-
project>.topology.<hostSuffix>/topology/v2/
```

- UIM to ATA UI settings:

```
uim.rest.filter.CORSAllowedOrigin=https://<topology-instance>.<topology-
project>.topology.<hostSuffix>:<loadbalancerport>
topology.ui.host=https://<topology-instance>.<topology-
project>.topology.<hostSuffix>
topology.ui.port=<loadbalancerport>
topology.ui.path=/apps/ata-ui
```

2. Add the Identity Providers certificate to **JAVA_HOME** as follows:

```
keytool -import -alias idp-cert -keystore $JAVA_HOME/jre/lib/security/
cacerts -file <idp-certificate-file>
```

3. Add the ATA certificate to **JAVA_HOME** as follows:

```
keytool -import -alias ata-cert -keystore $JAVA_HOME/jre/lib/security/
cacerts -file <ata-certiricate>
```

4. Add the common certificate to **JAVA_HOME** as follows:

```
keytool -import -alias common-cert -keystore $JAVA_HOME/jre/lib/security/
cacerts -file $COMMON_CNTHK/certs/commoncert.pem
```

Note:

Make sure that ATA and Message bus are configured with **commoncert.pem**.

A

Deploying the OAM Service

This chapter describes how to optionally deploy and manage the Oracle Access Manager (OAM) service.

Required Software

The following software can be optional if you use an Identity Provider other than OAM:

- Oracle Access Manager (OAM), included with Oracle Identity and Access Management 12c (12.2.1.4.0)
- Oracle WebLogic Server 12c (12.2.1.4.0)
- Oracle HTTP Server (OHS) 12c (12.2.1.4.0)
- Oracle HTTP Server 12c WebGate for OAM

Install the following required software only if you use OAM or OHS for traditional UIM.



Note:

You can skip installing the following software if your Identity Provider supports SAML2.0.

To install the required software, do the following:

1. Install Oracle WebLogic Server 12c and create the Oracle Middleware Home directory (*MW_Home*). This is the directory in which the Oracle Fusion Middleware products are installed.

For more information, see *Oracle Fusion Middleware Installation Guide for Oracle WebLogic Server 12c*.
2. Install Oracle Access Manager (OAM) in the same Oracle Middleware Home directory that you created when you installed Oracle WebLogic Server 12c.

For more information, see *Oracle Fusion Middleware Installation Guide for Oracle Identity and Access Management*.
3. Install and configure Oracle HTTP Server, which is a Web server that acts as the front end to the Oracle WebLogic Server.

For more information, see *Oracle Fusion Middleware Installing and Configuring Oracle HTTP Server*.
4. Install and configure Oracle HTTP Server WebGate for OAM.

A WebGate is a web-server plug-in for Oracle Access Manager (OAM) that intercepts HTTP requests and forwards them to the Access Server for authentication and authorization. For more information, see *Oracle Fusion Middleware Installing WebGates for Oracle Access Manager*.
5. Install an external LDAP server. For example, Oracle Internet Directory (OID). Oracle recommends Oracle Internet Directory as an external LDAP store.

For information on installing and configuring Oracle Internet Directory, see *Oracle Fusion Middleware Installation Guide for Oracle Identity Management*.

6. Configure the external LDAP as the user identity store in OAM.

For more information, see *Oracle Fusion Middleware Administrator's Guide for Oracle Access Management*.

7. Register the Oracle HTTP Server WebGate instance with OAM by using the Oracle Access Manager Administration Console.

For more information, see the chapter on "Registering Partners (Agents and Applications) by Using the Console" in *Oracle Fusion Middleware Administrator's Guide for Oracle Access Manager with Oracle Security Token Service*.

8. Continue with the steps in "Configuring UIM to Enable SSO Authentication" in *UIM Installation Guide*.

 Note:

OAM, OHS, and WebGate are optional when you use UIM with ATA, and if you use any other identity provider.

Building the OHS Image

To build OHS image:

1. Go to **WORKSPACEDIR** that is created in "[Unified Inventory and Topology Toolkit](#)".
2. Download **V983369-01.zip: Oracle Fusion Middleware 12c (12.2.1.4.0) HTTP Server for Linux x86-64, 1.9 GB** file from Oracle E-Delivery by searching for the file from **Oracle HTTP Server 12.2.1.4.0 for (Linux x86-64)** and copy them to the **\$WORKSPACEDIR/ohs-builder/staging/downloads/** folder.
3. Modify `ohsBaseImage.package.path` in **\$WORKSPACEDIR/ohs-builder/bin/ohs_manifest.yaml** with the filename of the downloaded OHS archive file.
4. Download `jdk-<version>_linux-x64_bin.tar.gz` and copy to the **\$WORKSPACEDIR/ohs-builder/staging/downloads/java** folder.

 Note:

See *UIM Compatibility Matrix* for the latest versions of software.

5. Modify the `ohsBaseImage.jdk.path` in **\$WORKSPACEDIR/ohs-builder/bin/ohs_manifest.yaml** file with the name of the downloaded JDK file.
6. Run `build-all-images.sh` in **bin** directory to build all images on OHS.

Deploying OAM along with OHS for Authentication Service

Before deploying OAM using the COMMON CNTK scripts, ensure the following:

- WebLogic Operator is deployed and configured as per UIM_CNTK. See "Setting Up Oracle WebLogic Server Kubernetes Operator" in *UIM Cloud Native Deployment Guide* for more information.

- Namespace is registered with WebLogic Operator using the UIM_CNTK script. See "Registering the Namespace" in *UIM Cloud Native Deployment Guide* for more information.
- Traefik (ingress-based) load balancer is installed as per UIM_CNTK script. See "Installing the Traefik Container Image" in *UIM Cloud Native Deployment Guide* for more information.
- Pull the Oracle Access Manager Image or latest cpu image from Oracle Container Registry as follows:
 1. Launch a browser and access the "[Oracle Container Registry](#)".
 2. Click **Sign In** and enter your username and password.
 3. In the **Search** field, enter **Oracle Access Manager** and press **Enter**.
 4. Click **oam_cpu** for the latest CPU patch image of Oracle Access Manager.
 5. In the **Terms and Conditions** box, select the language as **English**.
 6. Click **Continue** and accept **Terms and Restrictions**.
 7. On your Podman environment, log in to the Oracle Container Registry and enter your Oracle SSO username and password when prompted:

```
$ podman login container-registry.oracle.com
Username: <username>
Password: <password>
$ podman pull <oam-cpu-image-name>
```

8. Pull the Oracle Access Manager Image or latest CPU image from Oracle Container Registry as follows.
For example: Use the following command to pull OAM CPU image from Oracle Container Registry:

```
docker pull container-registry.oracle.com/middleware/oam_cpu:12.2.1.4-jdk8-ol7-221014
```

- Download **Oracle Communications Unified Inventory Management Common Toolkit** from Oracle Software Delivery Cloud.

Deploying OAM Using Common Cloud Native Toolkit Scripts

To deploy OAM using COMMON_CNTK scripts:

1. Go to the **\$WORKSPACEDIR/common_cntk** folder created in Unified Inventory and Topology Toolkit and export the path to a variable COMMON_CNTK. See "[Unified Inventory and Topology Toolkit](#)" for more information.
2. Modify the parameters in the `$SPEC_PATH/sr/quick/applications.yaml` file as follows:
 - **inventory.host**: Provide the inventory host IP or address where UIM traditional application is installed. This is a mandatory parameter. For UIM cloud native instance, the value is: `<uimproject>-<uiminstance>-cluster-uimcluster.<uimproject>.svc.cluster.local`
 - **inventory.port**: Provide the inventory host port where the UIM on-perm is installed. This is a mandatory parameter. For UIM cloud native instance, the value is 8502.
 - **inventory.isSSL**: If traditional UIM has the SSL port used, change the value to **true**, for Cloud Native Inventory always false.

- **imagePullSecret:** Provide the Kubernetes secret name containing the Docker secrets to pull images. This is a mandatory parameter. This secret should be accessible, which means that it must be created in the same namespace as OAM.
- **persistentVolumeClaimName:** Provide the existing pvc name for storage of OAM domain. This is a mandatory parameter.
- **hostSuffix:** By default it is .uim.org.
- **loadBalancerPort:** The load balancer port exposed by Traefik or external load balancer. Enter the Secure/SSL port.
- **gcLogs:** To enable GC logs for OAM, set **enabled** to **true** and configure the number of files and size of each file. You can uncomment values inside **oam-server** to override common values for **gcLogs**.
For example:

```
gcLogs:
  enabled: true
  fileSize: 10M
  noOfFiles: 10
```

- **tls.enabled:** Flag to enable tls or ssl. By default, it is true. If **true**, create the certificate and the key mentioned in next step. Oracle recommends not to disable SSL in production environment.
3. If SSL is enabled that is, `tls.enabled` is **true**, create the certificate as follows:
 - a. Create `certs` folder in `$COMMON_CNTK`.
 - b. Copy your signed certificate and key into `certs` folder by renaming the certificate name as `commoncert.pem` and renaming the key file name as `commonkey.pem`.

Note:

OAM supports wild card certificates. Your certificate can be updated with the `*.<hostSuffix>`. By default, the `hostSuffix` value is `uim.org` from **applications.yaml**. See ["Using Wild Card Certificates"](#) for more information.

- c. (Optional) Run the following command to create Single Certificate and Key for OAM, messaging-bus, UIM, and ATA:

```
openssl req -x509 -nodes -days 365 -newkey rsa:2048 -
keyout $COMMON_CNTK/certs/commonkey.pem -out $COMMON_CNTK/certs/
commoncert.pem -subj "/CN=<instance>.<project>.admin.uim.org" -
extensions san -config <(echo '[req]'; echo 'distinguished_name=req';
echo '[san]';echo 'subjectAltName=@alt_names'; \echo '[alt_names]'; \
echo 'DNS.1=<instance>.<project>.admin.uim.org'; \
echo 'DNS.2=<instance>.<project>.oam.uim.org'; \
echo 'DNS.3=<instance>.<project>.ohs.uim.org'; \
echo 'DNS.4=uim.org'; \
echo 'DNS.5=<instance>.<project>.topology.uim.org'; \
echo 'DNS.6=localhost'; \
echo 'DNS.7=svc.cluster.local'; \
echo 'DNS.8=<instance>.<project>.uim.org'; \
echo 'DNS.9=admin.<instance>.<project>.uim.org'; \
```

```
echo 'DNS.10=t3.<instance>.<project>.uim.org'; \
)
```

An example for **project:sr** and **instance: quick**:

```
openssl req -x509 -nodes -days 365 -newkey rsa:2048 -
keyout $COMMON_CNTK/certs/commonkey.pem -out $COMMON_CNTK/certs/
commoncert.pem -subj "/CN=quick.sr.admin.uim.org" -extensions san -
config <(echo '[req]'; echo 'distinguished_name=req'; echo '[san]';echo
'subjectAltName=@alt_names'; \echo '[alt_names]'; \
echo 'DNS.1=quick.sr.admin.uim.org'; \
echo 'DNS.2=quick.sr.oam.uim.org'; \
echo 'DNS.3=quick.sr.ohs.uim.org'; \
echo 'DNS.4=uim.org'; \
echo 'DNS.5=quick.sr.topology.uim.org'; \
echo 'DNS.6=localhost'; \
echo 'DNS.7=svc.cluster.local'; \
echo 'DNS.8=quick.sr.uim.org'; \
echo 'DNS.9=admin.quick.sr.uim.org'; \
echo 'DNS.10=t3.quick.sr.uim.org'; \
)
```

 Note:

Ensure that **commoncert.pem** and **commonkey.pem** files are present in the **\$COMMON_CNTK/certs** folder.

OAM, UIM, ATA, and Message Bus support wildcard certificates. See "[Using Wild Card Certificates](#)" for more information.

- d. (Optional) To generate your own self-signed certificates, see "[SSL Certificates](#)".
4. Create the secrets for OAM as follows:
 - a. Create the mandatory secrets according to the system prompts as follows:

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p sr -i quick -
f $SPEC_PATH/sr/quick/applications.yaml -a oam create
database,wlsadmin,ingressTLS
Applications specified - oam
```

```
====create database,wlsadmin,ingressTLS secret for oam Application====
Provide Database credentials for 'sr-quick-oam' ...
```

```
OAM DB Admin(sys) Username: <PDB-ADMIN-USER>
OAM DB Admin(sys) Password: <PDB-ADMIN-PWD>
OAM Schema Username: <OAM_SCHEMA_USER>
OAM Schema Password: <OAM_SCHEMA_PWD>
OAM DB Host: <DB_HOSTNAME>
OAM DB Port: <DB_PORT>
OAM DB Service Name: <SERVICE-NAME>
```

```
Provide Weblogic Admin credentials for 'sr-quick-oam' ...
```

```
Weblogic Admin Username: <WL_ADMIN_USER>
Weblogic Admin Password: <WL_ADMIN_PWD>
```

```
Provide Ingress TLS Credentials for OAM application 'sr-quick-oam' ...
Ingress TLS Certificate Path (PEM file): $COMMON_CNTK/certs/
commoncert.pem
Ingress TLS Key file Path (PEM file): $COMMON_CNTK/certs/commonkey.pem

secret/sr-quick-oam-rcu-credentials created
secret/sr-quick-oam-wls-credentials created
secret/sr-quick-oam-ingress-tls-cert-secret created
Execution status of secrets for command - create:
OAM MICROSERVICE.....Ok
```

 Note:

The RCU Schema password guideline specifies that a valid password must be specified. The password should be alpha numeric only and can contain the following special characters: # , _ . The password should not start with a number or a special character.

<OAM_SCHEMA_USER> should be less 12 characters and
<OAM_SCHEMA_PWD> is the RCU Schema password.

- b. Ensure the following secrets are created:
 - **Database secret** : Contains the details of OAM database schema. For example, `sr-quick-oam-rcu-credentials`.
 - **wlsadmin secret**: Contains the credentials for WebLogic and **oamconsole**. For example, `sr-quick-oam-wls-credentials`.
 - **ingressTLS**: Contains certificate and key for OAM. For example, `sr-quick-oam-ingress-tls-cert-secret`.
- c. For traditional UIM, if SSL port is used, you must create additional **configmap** to pass the inventory certificate.

```
$COMMON_CNTK/scripts/manage-app-credentials.sh -p sr -i quick -
f $SPEC_PATH/sr/quick/applications.yaml -a oam create inventorySSL
Provide Inventory SSL Credentials for OAM application 'sr-quick-oam' ...
On-prem Inventory SSL Certificate Path (PEM file): <provide inventory
certificate>
```

5. Configure Ingress and Ingress Controller for OAM. See "[Configuring Ingress and Ingress Controller for OAM](#)" for more information.
6. Create schema by running the following commands to install OAM DB and ensure that database secret and image name for database.yaml are correct:

```
$COMMON_CNTK/scripts/install-database.sh -p sr -i quick -f $SPEC_PATH/sr/
quick/database.yaml -a oam -c 1
```


7. Create OAM by running the following command to install OAM and ensure that you updated applications.yaml file:

```
$COMMON_CNTRK/scripts/create-applications.sh -p sr -i quick -
f $SPEC_PATH/sr/quick/applications.yaml -a oam
```

Using Wild Card Certificates

OAM, UIM, ATA and Message Bus supports wildcard certificates. You can generate wildCard Certificates with the hostSuffix value provided in applications.yaml. The default is **uim.org**.

To use wild card certificates:

1. To create a self-signed wild card certificate, use the following command:

```
openssl req -x509 -nodes -days 365 -newkey rsa:2048 -keyout $COMMON_CNTRK/
certs/wildcardkey.pem -out $COMMON_CNTRK/certs/wildcardcert.pem -subj "/
CN=*.uim.org" -extensions san -config <(echo '[req]'; echo
'distinguished_name=req';
echo '[san]';echo 'subjectAltName=@alt_names'; \echo '[alt_names]'; \
echo 'DNS.1=*.uim.org'; \
)
```

2. Change the **subDomainNameSeperator** value from period (.) to hyphen (-) so that the incoming hostnames match the wild card DNS pattern.
Update the \$SPEC_PATH/project/instance/applications.yaml file as follows:

```
#Uncooment and provide the value of subDomainNameSeparator, default is "."
#Value can be changed as "-" to match wild-card pattern of ssl
certificates.
#Example hostnames for "-" quick-sr-topology.uim.org
subDomainNameSeparator: "-"
```

3. If you have configured the above settings, the following are the hostnames to access OAM application for **project:sr**, **instance:quick**, and **hostSuffix: uim.org**:

```
oam-admin hostname: quick-sr-admin.uim.org
oam-ohs hostname: quick-sr-ohs.uim.org
oam hostname: quick-sr-oam.uim.org
oam-policy hostname: quick-sr-policy.uim.org
```

Configuring Ingress and Ingress Controller for OAM

OAM supports standard Kubernetes ingress API and provides samples for integration. The following configuration provides the OAM required annotations for NGINX.

Any Ingress Controller that conforms to the standard Kubernetes Ingress API and supports annotations needed by OAM should work. Oracle does not certify any individual Ingress controllers to confirm this **generic** compatibility.

The annotations for OAM are:

- To use Annoation Base Generic Ingress Controller, update **applications.yaml** from **\$SPEC_PATH/project/instance** as follows:

```
# Valid values are TRAEFIK, GENERIC
ingressController: "GENERIC"

ingress:
  className: nginx ##provide ingressClassName value, default value for
nginx ingressController is nginx.
  annotations:
    nginx.ingress.kubernetes.io/affinity: "cookie"
    nginx.ingress.kubernetes.io/affinity-mode: "persistent"
    nginx.ingress.kubernetes.io/session-cookie-name: "nginxingresscookie"
    nginx.ingress.kubernetes.io/proxy-body-size: "50m"
    nginx.ingress.kubernetes.io/proxy-buffer-size: 64k
```

- To enable SSL, provide the following annotations in **applications.yaml** under **oam-server** tag:

```
oam-server:
  ingress:
    annotations:
      nginx.ingress.kubernetes.io/configuration-snippet: |
        more_clear_input_headers "WL-Proxy-Client-IP" "WL-Proxy-SSL" "X-
Custom-Request-Header" ;
        more_set_input_headers "X-Forwarded-Proto: https";
        more_set_input_headers "WL-Proxy-SSL: true";
        more_set_input_headers "IS_SSL: ssl";
```

- To use TRAEFIK Ingress Controller, update **applications.yaml** from **\$SPEC_PATH/project/instance** as following:

```
# Valid values are TRAEFIK, GENERIC
ingressController: "TRAEFIK"
```

Upgrading OAM

To upgrade OAM, you can use following command:

```
$COMMON_CNTK/scripts/upgrade-applications.sh -p sr -i quick -f $SPEC_PATH/sr/
quick/applications.yaml -a oam
```



Note:

This upgrade command will restart OAM and OHS deployments. If you want to update ingressTLS, inventorySSL secrets or want to make any changes in **applications.yaml** for OAM, you can perform this operation.

This command will not make any changes to OAM domain. To update domain, you need to uninstall OAM and recreate.

Uninstalling OAM

To uninstall OAM:

1. Delete OAM as follows:

```
$COMMON_CNTK/scripts/delete-applications.sh -p sr -i quick -
f $SPEC_PATH/sr/quick/applications.yaml -a oam
```

2. Delete OAM db schema as follows:

```
$COMMON_CNTK/scripts/install-database.sh -p sr -i quick -f $SPEC_PATH/sr/
quick/database.yaml -a oam -c 2
```

3. Run the file `$COMMON_CNTK/scripts/uninstall.sh`.

Note:

Ensure the domain folder and its contents on the **PV_SHARED_PATH** or **Path sharedDomainPath** on NFS are deleted after the uninstallation. That is, delete `<project>-<instance>-oam` and `<project>-<instance>-oam-ohs` folders.

Specifying the Proxy Settings

Enter the following proxy settings:

- In the browser, go to **network no-proxy settings** and include the `*<hostSuffix>` value from `$SPEC_PATH/sr/quick/applications.yaml`. By default, it is `.uim.org` that is, `*.uim.org`.
- In `/etc/hosts` the following may be changed based on the `<instance>`, `<project>`, and `hostSuffix` values in `$SPEC_PATH/sr/quick/applications.yaml`.

etc/hosts:

```
<k8s cluster ip> <instance>.<project>.oam.<hostSuffix>
<instance>.<project>.admin.<hostSuffix>
<instance>.<project>.policy.<hostSuffix> <instance>.<project>.ohs.<hostSuffix>
for example:
<k8s cluster ip> quick.sr.oam.uim.org quick.sr.admin.uim.org
quick.sr.policy.uim.org traefik.uim.org quick.sr.ohs.uim.org
```

Accessing the WebLogic Server Administration Console and the OAM Console

You need to complete the proxy settings for accessing the WebLogic Server Administration console and the OAM console. The credentials for accessing WebLogic console or OAM console are stored in the **wlsadmin** secret.

WebLogic Console:

```
https://<instance>.<project>.admin.<hostSuffix>:<loadBalancerPort>/console
```

For example:

```
https://quick.sr.admin.uim.org:30443/console
```

OAM Console:

```
https://<instance>.<project>.admin.<hostSuffix>:<loadBalancerPort>/oamconsole
```

For example:

```
https://quick.sr.admin.uim.org:30443/console
```

Configuring OAM

To configure OAM before using it for SSO authentication:

1. Log in to Oracle Access Management (OAM) Console:

```
https://<instance>.<project>.admin.<hostSuffix>:<loadBalancerPort>/  
oamconsole
```

2. Click **Configuration** at the top right corner of the Console to show Configuration Launch Pad.
3. Click on **Available Services** and then click **Enable Service** for **OAuth and OpenIDConnect Service**.
4. From Configuration Launch Pad, select **Access Manager** from the **View** menu in the **Settings** section:
 - a. Under **Load Balancing** and **WebGate Traffic Load Balancer**, modify OAM Server Host with <instance>.<project>.ohs.<hostSuffix>. The hostSuffix value is taken from \$SPEC_PATH/sr/quick/applications.yaml. By default, it is .uim.org.
 - b. Modify OAM Server Protocol to https.
 - c. Modify OAM Server Port to <loadBalancerPort>. This value is from \$SPEC_PATH/sr/quick/applications.yaml.
 - d. Secure the load balancer port.
 - e. Click **Apply** to save.

Figure A-1 Access Manager Settings

Launch Pad Access Manager Settings x

Configuration >

Access Manager Settings

The following settings apply to the Access Manager service.

Apply Revert

Load Balancing

- * OAM Server Host: quick.sr.ohs.uim.org
- * OAM Server Port: 30443
- * OAM Server Protocol: https
- * Server Error Mode: Secure
- SSL Terminated: ☐

WebGate Traffic Load Balancer

- * OAM Server Host: quick.sr.ohs.uim.org
- * OAM Server Port: 30443
- * OAM Server Protocol: https

SSO

- IP Validation: ☒
- SSO Token Version: 5

Access Protocol

Simple Mode Configuration

Global Passphrase:

Cert Mode Configuration

PEM KeyStore Alias:

PEM KeyStore Alias Password:

Policy

Resource Matching Cache

* Maximum Size: 100000

5. From Configuration Launch Pad, select **User Identity Stores** to create an ID store for using the embedded LDAP of UIM:
 - a. Click **Create** under the **IDS Profiles** section for creating an IDS profile.
 - b. Specify **Name** as `UIMEmbeddedLDAP`.
 - c. (Optional) Provide **Description**.
 - d. Configure the Repository properties under **Repository**:
 - i. Choose **Repository Options** by selecting **Create New**.
 - ii. Provide **Directory Type** as `Weblogic Server Embedded LDAP`.
 - iii. Provide **Host Name** as `<Inventory's AdminHost>` and **Port** as `<Inventory's AdminPort>` under **Hosts**.

Note:

In case of UIM Cloud Native Environment, provide AdminServer service name and port for `<Inventory's AdminHost>:<Inventory's AdminPort>` as `<uim-project>-<uim-instance>-admin:8501` (sample: `sr-quick-admin:8501`).

- iv. If UIM onPrem admin server is SSL enabled, select **SSL Enabled**, for UIM Cloud Native environment not required.
- v. Provide the **Bind DN** as `cn=Admin`.
- vi. Specify **Bind Password** provided for the embedded LDAP in the WebLogic admin console. Ensure that the following steps are performed in WebLogic console where UIM is deployed. In the WebLogic Server admin console, change the credential for the embedded LDAP server as follows:

 Note:

In case of UIM Cloud Native environment, enter your WebLogic password in the **Password** field.

- Expand **Domain > Security > Embedded LDAP**.
- In the **Credential** field, enter the new credential.
- In the **Confirm Credential** field, enter the new credential again.
- Click **Save**.
- Reboot the WebLogic server.

vii. Provide **Base DN** as follows:

```
ou=myrealm,dc=<inventory application domain name>
```

 Note:

In case of UIM Cloud Native Environment, provide <inventory application domain name> as domain. On UIM CN, WebLogic domain name is set to `domain` by default.

- e. Configure the user properties to configure the LDAP user object under **User** section:
 - i. Provide **Base DN** as `ou=people,ou=myrealm,dc=<inventory application domain name>`.
 - ii. Provide **Login ID Attribute** as `uid`.
- f. Configure the Group properties to configure the LDAP group object under **Group** section:
- g. Provide **Base DN** as `ou=groups,ou=myrealm,dc=<inventory application domain name>`.
- h. Click **Test Connection** on the top-right corner to ensure the connection to embedded LDAP is successful.
- i. Click **OK** to close the **Connection Status** dialog box.
- j. Click **Create** to create IDS profile.
Entries with the profile name are displayed in the IDS Profiles and IDS Repositories table.
- k. Click **Sync IDS Profiles** button on right side of **OAM ID Stores** section to see the *IDSPROFILE-UIMEmbeddedLDAP* entry displayed under OAM ID Stores table.
6. Click **Application Security** at the top right corner of the Console to show the Application Security Launch Pad.
7. Click **Agents** and then **Search** to show the **UnifiedWebgate** in the table.
8. Select **UnifiedWebgate** from the table and click **Edit** to modify the Webgate settings:

- a. Modify **Logout Redirect URL** as:

`https://<instance>.<project>.ohs.<hostSuffix>:<loadBalancerPort>/oam/server/logout`
 - b. Modify the **Access Server** and **Host Name** under **Primary Server List** as **Other** and `<domainUID> -oam-server1` ' where `domainUID` is the `<project>-<instance>-oam`. By default, it is `sr-quick-oam-oam-server1`.
 - c. Click **Apply** to save.
9. From the Application Security Launch Pad, select **Authentication Modules** from **Plug-ins** to create 'UIM Embedded LDAP Module' authentication module.
 - a. Click **Create LDAP Authentication Module** in the **Create** dropdown, under **Search Results** section.
 - b. Provide **Name** as **UIM Embedded LDAP Module**.
 - c. Choose **User Identity Store** as **IDSPROFILE-UIMEmbeddedLDAP** that is created above.
 - d. Click **Apply** to save.
 10. From the Application Security Launch Pad, select **Authentication schemas** from **Access Manager** to create 'UIM Embedded LDAP Schema' authentication schema.
 - a. Click **Create** under **Search Results** section.
 - b. Provide **Name** as **UIM Embedded LDAP Schema**.
 - c. Provide **Description** as **UIM Embedded LDAP Schema**.
 - d. Modify the **Authentication Level** as **2**.
 - e. Provide **Challenge Method** as **FORM**.
 - f. Provide **Challenge Redirect URL** as `/oam/server/`.
 - g. Choose **Authentication Module** as **UIM Embedded LDAP Module**.
 - h. Provide **Challenge URL** as `/login.jsp`.
 - i. Choose **Context Type** as **customwar**.
 - j. Provide **Context Value** as `/customConsent`.
 - k. Click **Apply** to save.
 11. From the Application Security Launch Pad, select **Application Domains** from **Access Manager** to edit **UnifiedWebgate** application domain.
 - a. Click **Search** to show the **UnifiedWebgate** in the table.
 - b. Select **UnifiedWebgate** from the table and click **Edit** to modify the Application Domain settings.
 - c. Select **Authentication Policies** tab and select the **Protected Resource Policy** table item.
 - d. Click **Edit** button to open **Protected Resource Policy** authentication policy settings.
 - e. Choose **Authentication Schema** as **UIM Embedded LDAP Schema** from the drop down.
 - f. Click **Apply** to save.

Configuring OAuth Service Settings

Complete the proxy settings as mentioned in the above section.

Ensure environment variable **NO_PROXY** is set with <hostSuffix>.

Run the following commands from the machine on which the proxy settings are done:

```
export CREDs=`echo -n "<OAM_Domain_Username>:<password>" | base64 -w 0`
export OAMHOST=<instance>.<project>.admin.<hostSuffix> (example,
quick.sr.admin.uim.org)
export OAMPORT=<loadBalancerPort> (the value provided in $SPEC_PATH/sr/quick/
applications.yaml)
```

Creating an OAuth Identity Domain

Run the following curl statement to create the UnifiedIdDomain identity domain with custom-consent enabled and using IDSPROFILE-UIMEmbeddedLDAP as the identity provider:

```
curl -i -H "Content-Type: application/json" -H "Authorization:Basic ${CREDs}"
--cacert $COMMON_CNTK/certs/commoncert.pem --noproxy $NO_PROXY --request POST
https://${OAMHOST}:${OAMPORT}/oam/services/rest/ssa/api/v1/oauthpolicyadmin/
oauthidentitydomain -d '{"consentPageURL":"/customConsent/
customConsent.jsp","issueTLSClientCertificateBoundAccessTokens":false,"tokenSe
ttings":
[{"tokenType":"ACCESS_TOKEN","tokenExpiry":3600,"lifeCycleEnabled":false,"refr
eshTokenEnabled":true,"refreshTokenExpiry":86400,"refreshTokenLifeCycleEnabled
":false},
{"tokenType":"AUTHZ_CODE","tokenExpiry":3600,"lifeCycleEnabled":false,"refresh
TokenEnabled":true,"refreshTokenExpiry":86400,"refreshTokenLifeCycleEnabled":f
alse},
{"tokenType":"SSO_LINK_TOKEN","tokenExpiry":3600,"lifeCycleEnabled":false,"ref
reshTokenEnabled":true,"refreshTokenExpiry":86400,"refreshTokenLifeCycleEnable
d":false}], "customAttrs":{"allowedCustomPlugins":"OAuthCustomClaimsPlugin\
"},"name":"UnifiedIdDomain","description":"Unified Identity
Domain","identityProvider":"IDSPROFILE-UIMEmbeddedLDAP","errorPageURL":"/oam/
pages/servererror.jsp","keyPairRolloverDurationInHours":48}'
```

Creating a Resource

Run the following curl statement to create UnifiedRserver resource with default scope as Info:

```
curl -i -H "Content-Type: application/json" -H "Authorization:Basic ${CREDs}"
--cacert $COMMON_CNTK/certs/commoncert.pem --noproxy $NO_PROXY --request POST
https://${OAMHOST}:${OAMPORT}/oam/services/rest/ssa/api/v1/oauthpolicyadmin/
application -d '{"tokenAttributes":
[], "resServerType":"CUSTOM_RESOURCE_SERVER","resourceServerNameSpacePrefix":"U
nifiedRserver","name":"UnifiedRserver","description":"Unified Resource
Server","audienceClaim":null,"scopes":
[{"scopeName":"Info","description":"null"}],
```



```
{"scopeName":"DefaultScope","description":"DefaultScope"}], "idDomain":"UnifiedIdDomain", "resourceServerId":"1f50f6f4-06a9-4d1b-8347-bc5672a12e56"}
```

Creating a Client

Run the curl statement to create topologyClient client.

The following is an example for creating a client with **<project>** as *sr* and **<instance>** as *quick*:

```
curl -i -H "Content-Type: application/json" -H "Authorization:Basic ${CREDS}"
--cacert $COMMON_CNTK/certs/commoncert.pem --noproxy $NO_PROXY --request POST
https://${OAMHOST}:${OAMPORT}/oam/services/rest/ssa/api/v1/oauthpolicyadmin/
client -d
'{"clientType":"CONFIDENTIAL_CLIENT","issueTLSClientCertificateBoundAccessTokes":false,"name":"topologyClient","grantTypes":
["PASSWORD","CLIENT_CREDENTIALS","JWT_BEARER","REFRESH_TOKEN","AUTHORIZATION_CODE"],"description":"null","attributes":
[{"attrName":"customeAttr1","attrValue":"CustomValue","attrType":"STATIC"}],"id":"topologyClient","secret":"<secret>","scopes":
["UnifiedRserver.Info"],"defaultScope":"UnifiedRserver.Info","redirectURIs":
[{"url":"https://quick.sr.topology.uim.org:30443/topology","isHttps":true},
{"url":"https://quick.sr.topology.uim.org:30443/redirect/ata-
ui","isHttps":true}], "idDomain":"UnifiedIdDomain"}
```

Add topology service specific redirect URLs under **redirectURIs** attribute in json data and update **<secret>**:

- For ATA-API:

```
redirect-uri: "https://<instance>.<project>.topology.<hostSuffix>:<port>/
topology"
```

- For ATA-UI:

```
redirect-uri: https://<instance>.<project>.topology.<hostSuffix>:<port>/
redirect/ata-ui
```

Note:

If an external load balancer is used with a default port of **80** or **443**, you do not mention ports in redirect URIs. In that case, redirect URIs will be as follows:

```
"redirectURIs":[{"url":"https://quick.sr.topology.uim.org/
topology","isHttps":true},
{"url":"https://quick.sr.topology.uim.org/redirect/ata-
ui","isHttps":true}]
```

Debugging and Troubleshooting

The following are some common issues.

Unable to create Domain or Admin Server is not coming up

To troubleshoot the issue:

1. Check if a folder with the domain name already exists at the **persistentVolumeClaim** location.

If there is a **Domain Exists** error, the following message appears:

```
The domain will be created using the script /u01/weblogic/create-domain-script.sh
ERROR: The create domain job will not overwrite an existing domain. The domain folder /u01/oracle/user_projects/domains/accessdomain already exists
```

2. Ensure RCU schema creation is successful.

```
kubectl -n <NAMESPACE> get pods
```

3. Check the logs of `<project>-<instance>-oam-dbschema (kubectl -n <NAMESPACE>)`, which ends with `Repository Creation Utility - Create : Operation Completed line`.
4. Check the logs of `<project>-<instance>-oam-create-infra-domain-job-<podsuffix>`.

To resolve the issue:

1. If a folder with the same domain name already exists, delete the domain folders (`<project>-<instance>-oam` and `<project>-<instance>-oam-ohs`) and its contents.
2. Uninstall OAM. See [Uninstalling OAM](#) for more information.
3. If RCU Schema creation is not successful, then check the `rcuDatabaseURL` and `rcuSchemaPrefix` values provided.

Note:

Same `rcuSchemaPrefix` value cannot be used for different domains with in the same database.

4. Resolve the database issues and run the scripts again.
5. Resolve the errors appeared in the logs of `<project>-<instance>-oam-create-infra-domain-job-<podsuffix>`:
 - a. If you see `mkdir: cannot create directory ... : Permission denied` error, then ensure the **PVC/sharedDomainPath** has permissions. For example: `chmod 777 /scratch/shared`.
 - b. If there are no errors or exceptions in logs, ensure the `<NAMESPACE>` is registered with the WebLogic operator as mentioned in prerequisites for running scripts.
6. Before running the scripts again, remove the Helm releases that are partially installed as follows to get the helm releases in the namespace:

```
helm ls -n <NAMESPACE> -
```

Unable to Access OAM Console

Unable to access OAM Console using: `https://admin.<DOMAIN_NAME><hostSuffix>:<loadBalancerPort>/oamconsole`

To troubleshoot the issue:

- Ensure the OHS service is up and running the following commands:

```
kubectl -n <NAMESPACE> logs <project>-<instance>-oam-ohs-<podSuffix>
```

- Ensure the `loadBalancerPort` is correct and provide secure port if SSL is enabled.
- Ensure proxy settings are done.

To resolve the issue, identify and uninstall the failed pod as follows:

1. Check if there are any pods that are failed or in the **Error** state using:

```
kubectl -n <NAMESPACE> get pods
```

2. Check the release of the pods using the following Helm command:

```
helm ls -n <NAMESPACE>
```

3. If RCU Schema creation has failed, uninstall `<project>-<instance>-oam-dbschema` release using:

```
helm -n <NAMESPACE> uninstall <project>-<instance>-oam-dbschema
```

4. If OAM domain creation has failed, uninstall `<project>-<instance>-oam-createdomain` release using:

```
helm -n <NAMESPACE> uninstall <project>-<instance>-oam-createdomain
```

5. Run `$COMMON_CNTK/scripts/delete_applications.sh -p <project> -i <instance> -f $SPEC_PATH/sr/quick/applications.yaml -a oam` then ensure the `<DOMAIN_NAME>` folder and `<DOMAIN_NAME>-ohs` folder (if exists) from the `PVC/sharedDomainPath` is deleted.

Inventory UI is not appearing after successful login

To troubleshoot the issue, check if you have the credentials to view UIM and check the logs of ATA-UI service.

The following error appears if you have recreated UIM.

Failure of Web Server bridge:

No back-end server available for connection: timed out after 10 seconds or idempotent set to OFF or method not idempotent.

To resolve the issue:

1. Restart the OHS pod.

2. Get the OHS pod name using `kubectl -n <namespace> get pods` command where the name of the pod is `<project>-<instance>-oam-ohs-<podsuffix>`.

 Note:

The pod name starts with Pod name starts with `<project>-<instance>-oam-ohs-<number>`.

3. Open the OHS pod using: `kubectl -n oamns exec -it <OHS_POD_NAME> -- bash`.
4. Run the command:

```
echo '<DOMAIN_USER_PWD>' | /u01/oracle/ohssa/user_projects/domains/
<project>-<instance>-oam-ohs/bin/restartComponent.sh ohs1
```

5. Exit from the pod using `exit`.

Alternatively, you can restart OHS by rolling out restart from deployments as follows:

```
kubectl -n <namespace> get deployments
      kubectl -n <namespace> rollout restart deployment <project>-
<instance>-oam-ohs
```

UIM UI Not Accessible on Using SSL Port of Traditional UIM Instance

Check the OHS logs and if you observe SSL Handshake error message in logs. For example, `wl_ssl_open : SSL Handshake failed onerror : Success, error : 29024, status : 2`, perform the following resolution steps:

1. Identify the Inventory certificate file (**.pem**) and copy it into OHS pod.

```
kubectl -n <NAMESPACE> cp <inventory-certificate-file> <NAMESPACE>/
<OHS_POD_NAME>:/u01/oracle/ohssa/user_projects/domains/<project>-
<instance>-oam-ohs/config/fmwconfig/components/OHS/instances/ohs1/
keystores/
```

2. Enter the OHS pod using:

```
kubectl -n <NAMESPACE> exec -it <OHS_POD_NAME> bash
```

3. Run the below commands inside the OHS pod:

```
cd /u01/oracle/ohssa/user_projects/domains/<project>-<instance>-oam-ohs/
config/fmwconfig/components/OHS/instances/ohs1/keystores

/u01/oracle/ohssa/oracle_common/bin/orapki wallet create -wallet <wallet-
name> -auto_login_only

/u01/oracle/ohssa/oracle_common/bin/orapki wallet add -wallet <wallet-
name> -trusted_cert -cert <inventory-certificate-file> -auto_login_only

cd ..
```

```
vim mod_wl_ohs.conf

#edit the file for the locations mentioned as below

<Location /Inventory>
    WLSRequest On
    WebLogicHost <inventory.host>
    WeblogicPort <inventory.port>
    #WLProxySSL ON
    WLProxySSLPassThrough ON
    SecureProxy On
    WLSWallet "${ORACLE_INSTANCE}/config/fmwconfig/components/${
{COMPONENT_TYPE}}/instances/${COMPONENT_NAME}/keystores/<wallet-name>"
    SetHandler weblogic-handler
</Location>
<Location /InventoryWS>
    WLSRequest On
    WebLogicHost <inventory.host>
    WeblogicPort <inventory.port>
    #WLProxySSL ON
    WLProxySSLPassThrough ON
    SecureProxy On
    WLSWallet "${ORACLE_INSTANCE}/config/fmwconfig/components/${
{COMPONENT_TYPE}}/instances/${COMPONENT_NAME}/keystores/<wallet-name>"
    SetHandler weblogic-handler
</Location>
<Location /InventoryRSOpenAPI>
    WLSRequest On
    WebLogicHost <inventory.host>
    WeblogicPort <inventory.port>
    #WLProxySSL ON
    WLProxySSLPassThrough ON
    SecureProxy On
    WLSWallet "${ORACLE_INSTANCE}/config/fmwconfig/components/${
{COMPONENT_TYPE}}/instances/${COMPONENT_NAME}/keystores/<wallet-name>"
    SetHandler weblogic-handler
</Location>
<Location /cartridge>
    WLSRequest On
    WebLogicHost <inventory.host>
    WeblogicPort <inventory.port>
    #WLProxySSL ON
    WLProxySSLPassThrough ON
    SecureProxy On
    WLSWallet "${ORACLE_INSTANCE}/config/fmwconfig/components/${
{COMPONENT_TYPE}}/instances/${COMPONENT_NAME}/keystores/<wallet-name>"
    SetHandler weblogic-handler
</Location>
<Location /mapviewer>
    WLSRequest On
    WebLogicHost <inventory.host>
    WeblogicPort <inventory.port>
    #WLProxySSL ON
    WLProxySSLPassThrough ON
    SecureProxy On
    WLSWallet "${ORACLE_INSTANCE}/config/fmwconfig/components/${
```

```
{COMPONENT_TYPE}/instances/${COMPONENT_NAME}/keystores/<wallet-name>"
  SetHandler weblogic-handler
</Location>
```

4. Restart the OHS server:

```
echo '<WL_ADMIN_PWD>' | /u01/oracle/ohssa/user_projects/domains/<project>-
<instance>-oam-ohs/bin/restartComponent.sh ohs1
```

5. See the **Configuring a Plug-In for One-Way SSL** section from *Using Oracle WebLogic Server Proxy Plug-Ins 12.2.1.4.0* and perform the following:

 Note:

Perform this in UIM administrator console.

- a. Log into the Oracle WebLogic Server administration console.
- b. In the **Domain Structure** pane, expand the **Environment** node. If the server instances that are used to proxy the requests from Oracle HTTP Server are in a cluster, select **Clusters**. Otherwise, select **Servers**.
- c. Select the server or cluster that you want to proxy the requests from Oracle HTTP Server.
- d. In the **Configuration: General** tab, scroll down to the **Advanced** section and expand it.
- e. Do one of the following:
 - To enable one-way SSL, select **WebLogic Plug-In Enabled**.
 - To enable two-way SSL where client certificates are used to authenticate, select **Client Cert Proxy Enabled**.
 - To enable two-way SSL with client certificates, select **Both**.
- f. If you have selected **Servers** in Step 2, repeat steps 3 and 4 for the other servers to which you want to proxy the requests from Oracle HTTP Servers.
- g. Click **Save**.
- h. For the change to take effect, you must restart the server instances.

See the "Configuring the SSL Policy/Certificate" section from *UIM System Administrator's Guide* for configuring SSL with Oracle WebLogic server.

B

SSL Certificates

This appendix provides information on generating your SSL certificates.

The following DNS entries require a CA-signed certificate, based on the services you use for your production environment. Alternatively, you use a CA-signed certificate with wildcard for the corresponding `<hostSuffix>`. For example: `*.uim.org`.

You use self-signed certificates for a development environment.

Note:

- DNSs for Message Bus are required only when the service is accessed by Traditional UIM or by any external system such as Assurance. The number of DNS entries for Message Bus are in proportional to the number of Kafka brokers configured.
- OpenSearch can be installed in `<project>` namespace or a different namespace `<opensearch-namespace>`. CA-Signed certificate `opensearch-cluster-master.<opensearch-namespace>.svc.cluster.local` is required with the namespace when OpenSearch is deployed.

Table B-1 DNS Entries for Services

DNS Entry	Service
<code><instance>.<project>.<hostSuffix></code>	UIM CN
<code>admin.<instance>.<project>.<hostSuffix></code>	UIM CN
<code>t3.<instance>.<project>.<hostSuffix></code>	UIM CN
<code><instance>.<project>.topology.<hostSuffix></code>	ATA
<code><INSTANCE>.<PROJECT>.messaging.broker0.<hostSuffix></code> <code><instance>.<project>.messaging.broker<N>.<hostSuffix></code> <code><instance>.<project>.messaging.bootstrap.<hostSuffix></code>	Message Bus
<code><instance>.<project>.opensearch.<hostSuffix></code>	Open Search
<code>opensearch-cluster-master.<opensearch-namespace>.svc.cluster.local</code>	Open Search
<code><INSTANCE>.<PROJECT>.oam.<hostSuffix></code>	OAM
<code><INSTANCE>.<PROJECT>.ohs.<hostSuffix></code>	OAM

Generating Self-signed Certificates

To generate self-signed certificates:

1. Create the **certs** folder under the **\$COMMON_CNTK** directory.

```
mkdir $COMMON_CNTK/certs
```

2. Update the following command with the appropriate values of **INSTANCE**, **PROJECT**, and **hostSuffix** names and execute it to generate a common self-signed certificate and key that can be used for OAM, Message Bus, UIM, and ATA. You can add or remove the DNS entries from the below command based on requirements.

```
openssl req -x509 -nodes -days 365 -newkey rsa:2048 -keyout $COMMON_CNTK/
certs/commonkey.pem -out $COMMON_CNTK/certs/commoncert.pem -subj "/"
CN=<INSTANCE>.<PROJECT>.admin.<hostSuffix>" -extensions san -config <(echo
'[req]'; echo 'distinguished_name=req'; echo '[san]';echo
'subjectAltName=@alt_names'; \echo '[alt_names]'; \
echo 'DNS.1=<INSTANCE>.<PROJECT>.admin.<hostSuffix>'; \
echo 'DNS.2=<INSTANCE>.<PROJECT>.oam.<hostSuffix>'; \
echo 'DNS.3=<INSTANCE>.<PROJECT>.ohs.<hostSuffix>'; \
echo 'DNS.4=<INSTANCE>.<PROJECT>.topology.<hostSuffix>'; \
echo 'DNS.5=<INSTANCE>.<PROJECT>.<hostSuffix>'; \
echo 'DNS.6=admin.<INSTANCE>.<PROJECT>.<hostSuffix>'; \
echo 'DNS.7=t3.<INSTANCE>.<PROJECT>.<hostSuffix>'; \
echo 'DNS.8=<INSTANCE>.<PROJECT>.messaging.broker0.<hostSuffix>'; \
echo 'DNS.9=<INSTANCE>.<PROJECT>.messaging.broker<N>.<hostSuffix>'; \
echo 'DNS.10=<INSTANCE>.<PROJECT>.messaging.bootstrap.<hostSuffix>'; \
echo 'DNS.11=opensearch-cluster-master.<opensearch-
namespace>.svc.cluster.local'; \
echo 'DNS.12=<INSTANCE>.<PROJECT>.opensearch.<hostSuffix>'; \
)
```

3. You can add or remove the DNS entries in the above sample certificate. Check the following scenarios for removing or adding the DNS entries:

- If the Message Bus ingress listener is not enabled, you can remove the following DNS entries:

```
quick.sr.messaging.broker0.uim.org
quick.sr.messaging.broker1.uim.org
quick.sr.messaging.bootstrap.uim.org
```

- For traditional UIM, you can remove the following DNS entries and add the hostnames of traditional UIM servers:

```
quick.sr.uim.org
admin.quick.sr.uim.org
t3.quick.sr.uim.org
```

- If OAM is not used as IdP, you can remove following hostnames from the certificate:

```
quick.sr.admin.uim.org
quick.sr.oam.uim.org
quick.sr.ohs.uim.org
```

- If the DNS entry is for ATA: quick.sr.topology.uim.org
- If the DNS entry is for OpenSearch service: opensearch-cluster-master.sr.cluster.local

- If the DNS entry is for OpenSearch dashboard: `quick.sr.opensearch.uim.org`

Generating Self-Signed Wild Card SSL Certificate

To generate self-signed wild card SSL certificate:

1. Create the **certs** folder in **\$COMMON_CNTK** directory as follows:

```
mkdir $COMMON_CNTK/certs
```

2. To generate a wild card SSL certificate you can update `<hostSuffix>` value. The default is **uim.org** and run following command:

```
openssl req -x509 -nodes -days 365 -newkey rsa:2048 -keyout $COMMON_CNTK/
certs/wildcardkey.pem -out $COMMON_CNTK/certs/wildcardcert.pem -subj "/
CN=*.<hostSuffix>" -extensions san -config <(echo '[req]'; echo
'distinguished_name=req';
echo '[san]';echo 'subjectAltName=@alt_names'; \echo '[alt_names]'; \
echo 'DNS.1=*.<hostSuffix>'; \
)
```



Note:

- To use wild card certificates, you must configure **subDomainNameSeperator** field as `-`, in **applications.yaml** and **project.yaml** in the **spec** path location.
- WebLogic by default does not recognizes wild card certificates. In production environment, you must configure the custom hostname verifier as `weblogic.security.utils.SSLWLSWildcardHostnameVerifier`. See WebLogic documentation for setting up **hostNameVerifier**.
- In development environment, you can disable hostname verification.

C

Migrating from Traefik Ingress Controller to Annotations Based Generic Ingress Controller

Prerequisites

Here are the prerequisites you need:

- Install annotation-based ingress controller.
- Delete Traefik Ingress Controller. For more information, see [Setting Up Automation](#)

Installing Generic Ingress Controller

To install generic ingress controller:

1. You can use any annotation-based ingress controller that supports standard Kubernetes ingress API. The samples for NGINX **ingressController** are provided.
2. For installation of NGINX, the sample values are provided under \$COMMON_CNTK/samples/charts/nginx. For more information, see [Working with Ingress, Ingress Controller, and External Load Balancer](#)

Migrating to Generic Ingress Controller for ATA

To migrate to generic ingress controller for ATA:

1. Delete Traefik Ingress Controller. For more information, see [Setting Up Automation](#).
2. Download the latest common-cntk, copy the latest applications.yaml file to spec path and retain your old, required values.
3. Make sure the value of **ingressController** in spec path is `GENERIC`.

```
ingressController: "GENERIC"
```

4. Update the **loadbalancerport** value in applications.yaml with your **ingressController** loadbalancer or NodePort port.
5. Uncomment and provide required ingress annotations and **ingressClassName** in applications.yaml file according to your ingress controller. The samples are provided for NGINX ingress controller.

```
ingress:
  className: "nginx"
  annotations:
    nginx.ingress.kubernetes.io/affinity: "cookie"
    nginx.ingress.kubernetes.io/affinity-mode: "persistent"
    nginx.ingress.kubernetes.io/session-cookie-name: "nginxingresscookie"
    nginx.ingress.kubernetes.io/proxy-body-size: "50m"
    nginx.ingress.kubernetes.io/proxy-buffer-size: 64k
```

6. (Optional) Provide additional annotations under **ata.ingress.annotations** tag that is specific to ATA.

7. Upgrade the ATA instance.

```
$COMMON_CNTK/scripts/upgrade-instance.sh -p project -i instance -
f $SPEC_PATH/project/instance/applications.yaml -a ata
```

8. Verify if your application is accessible through your **ingressController** port.

Migrating to Generic Ingress Controller for Message Bus

To migrate to generic ingress controller for Message Bus:

1. Download the latest common-cntk, copy the latest applications.yaml file to spec path and retain your old, required values.
2. Make sure the value of **ingressController** in spec path is **GENERIC**.

```
ingressController: "GENERIC"
```

3. If TLS is **True**, update the **loadbalancerport** value in applications.yaml with your **ingressController** loadbalancer or NodePort port.
4. If TLS is **False**, update **ingressSslPort** inside the **kafka-cluster** section in applications.yaml with **ingressController** loadbalancer or NodePort port.

```
ingress:
  className: "nginx"
  annotations:
    nginx.ingress.kubernetes.io/affinity: "cookie"
    nginx.ingress.kubernetes.io/affinity-mode: "persistent"
    nginx.ingress.kubernetes.io/session-cookie-name: "nginxingresscookie"
    nginx.ingress.kubernetes.io/proxy-body-size: "50m"
    nginx.ingress.kubernetes.io/proxy-buffer-size: 64k
```

5. Uncomment and provide required ingress annotations specific to Kafka cluster and **ingressClassName** in applications.yaml file according to your ingress Controller. The samples are provided for NGINX ingress controller.
6. For Message Bus, annotations given in **kafka-cluster** section are mandatory, under **kafka-cluster.listeners.ingress.annotations** tag.

```
kafka-cluster:
  listeners:
    ingress:
      ingressSslPort:
      annotations:
        nginx.ingress.kubernetes.io/ingress.allow-http: "false"
        nginx.ingress.kubernetes.io/backend-protocol: "HTTPS"
        ingress.kubernetes.io/ssl-passthrough: "true"
        nginx.ingress.kubernetes.io/ssl-passthrough: "true"
```

7. Upgrade the Message Bus instance.

```
$COMMON_CNTK/scripts/upgrade-application.sh -p project -i instance -
f $SPEC_PATH/project/instance/applications.yaml -a messaging-bus
```

8. Verify your application is accessible through your **ingressController** port.

Migrating to Generic Ingress Controller for OAM

To migrate to generic ingress controller for OAM:

1. Download the latest common-cntk, copy the latest applications.yaml file to spec path and retain your old, required values.
2. Make sure the value of **ingressController** in spec path is `GENERIC`.

```
ingressController: "GENERIC"
```

3. Update the **loadbalancerport** value in applications.yaml with your **ingressController** loadbalancer or NodePort port.
4. Uncomment and provide the required ingress annotations and **ingressClassName** in applications.yaml file according to your ingress controller, samples are provided for NGINX ingress controller.

```
ingress:
  className: "nginx"
  annotations:
    nginx.ingress.kubernetes.io/affinity: "cookie"
    nginx.ingress.kubernetes.io/affinity-mode: "persistent"
    nginx.ingress.kubernetes.io/session-cookie-name: "ngxingresscookie"
    nginx.ingress.kubernetes.io/proxy-body-size: "50m"
    nginx.ingress.kubernetes.io/proxy-buffer-size: 64k
```

5. If SSL enabled, provide additional annotations under **oam-server.ingress.annotations** tag.

```
oam-server:
  ingress:
    annotations:
      nginx.ingress.kubernetes.io/configuration-snippet: |
        more_clear_input_headers "WL-Proxy-Client-IP" "WL-Proxy-SSL" "X-
Custom-Request-Header" ;
        more_set_input_headers "X-Forwarded-Proto: https";
        more_set_input_headers "WL-Proxy-SSL: true";
        more_set_input_headers "IS_SSL: ssl";
```

6. Upgrade the OAM instance.

```
$COMMON_CNTK/scripts/upgrade-instance.sh -p project -i instance -
f $SPEC_PATH/project/instance/applications.yaml -a oam
```

7. Verify your application is accessible through your **ingressController** port.

D

Managing Certificate Expiry

Oracle provides utility scripts to analyze the certificates used by ATA, MB, Authorization, and SmartSearch services. You can renew the expired certificates using this script. You must follow the prerequisites and post-requisites for this script.

The guidelines for using the utility script are:

- If you are using **SSL TERMINATE** at ingress for ATA, Authorization, Message Bus, and SmartSearch services. You can run this script with appropriate arguments and renew or verify the expiry of certificates for the services one after the other or all together.
- If Ingress listener is enabled for Message Bus, you can use this script to renew the certificate of message bus.
- This script also supports renewal of certificates for any egress communication. If your IDP certificate is expired, you can replace or add a new certificate to the truststore of all services using this script.

Prerequisites

Here are the prerequisites:

- You should have a new SSL certificates that needs to be imported.
- All services must be running over SSL Terminate at ingress, except the message bus.

Renewing Ingress Certificates

To renew the ingress certificates:

1. Run the following to verify ingress certificates:

```
$COMMON_CNTH/scripts/manage-certificates.sh -p project -i instance -c  
verify -t ingress
```

This command shows the validity for all ingress certificates for all services. You can use `-a <servicename>` option in the above command to verify certificates for any particular service.

2. Run the following command to renew ingress certificates:

```
$COMMON_CNTH/scripts/manage-certificates.sh -p project -i instance -c  
import -t ingress
```

This command prompts for the certificate and key inputs. You should provide new certificates and then all ingress certificates will be renewed. You can also use `-a <servicename>` option to renew certificates for any particular service.

Import Egress Certificates

To import egress certificates:

1. Run the following command to verify egress certificates:

```
$COMMON_CNTK/scripts/manage-certificates.sh -p project -i instance -c  
verify -t egress
```

This command shows the validity for all egress certificates from the truststore of all services.

2. Run the following command to renew egress certificates:

```
$COMMON_CNTK/scripts/manage-certificates.sh -p project -i instance -c  
import -t egress
```

This command prompts for the certificate and alias name inputs. You should provide the new certificate along with alias to store the certificate.

 Note:

- If the provided alias name already exists, the older certificates will be overridden by the new certificate. Therefore, if you want to retain the old certificate, provide a new alias name.
- To perform any egress operation for smart search service, you should run the above command separately by providing the `-a smartsearch` option.

Postrequisites

Following are the postrequisites:

- If you have imported egress certificates for any application, make sure you restart it.
- In case of message bus ingress certificate renewal, you must restart message bus to get changes reflected.
- After the renewal of ingress certificates, make sure that you have imported the new certificates into the client's trust.