HPE NFV Director

OMi and uCMDB for NFVD User Guide

Release 4.1
Second Edition

Hewlett Packard Enterprise

Notices

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Contents

Notices 1

Preface 8
About this guide 8
Audience 8
Document history 8

Chapter 1 Introduction 9
1.1 Overview of resource discovery 9
1.1.1 What is CMDB? 9
1.1.2 Why integration with uCMDB is necessary for NFV Director? 9
1.2 Architecture 10
1.2.1 NFV Director integration with uCMDB and OMi 10
1.2.2 Topology discovery using uCMDB 10
1.2.3 uCMDB integration components 11
1.3 List of NFV Director Resources discovered 11

Chapter 2 Installation and configuration 12
2.1 Installation 12
2.1.1 Prerequisites 12
2.1.2 Channel Adapter installation steps 12
2.1.2.1 Configuration for Channel Adapters 12
2.1.3 Operations Manager integration with NFV Director 14
2.1.3.1 OMi integration with NFV Director for discovery 14
2.1.3.2 BSM-C policy import 14
2.1.3.3 Configure UCA for OMi integration 15
2.2 Enabling and disabling of discovery process 15
2.2.1 Disable discovery even in fresh installation 15
2.2.2 Disable discovery temporarily 15
2.2.3 Enable Discovery 15
2.2.4 Manual Discovery trigger 15
2.2.5 Track Discovery/Reconciliation completion 16

Chapter 3 Post discovery steps 17
3.1 Update VIM Authentication details from NFV Director-GUI 17

Chapter 4 DCN integration 18
4.1 Prerequisites 18
4.2 Integrate DCN with NFV Director 18
4.2.1 Create the SDN Topology manually 18
4.2.2 Upload DCN resource 20
4.2.3 Connect Datacenter with DCN resources 21
4.2.4 Query discovered Networking Artifacts 24
4.2.5 Create relationship between NETWORKING and DCN Artifacts 25

Chapter 5 Monitoring and alarm management 27
5.1 Alarm flow architecture 27
5.2 NFV Director events integration with OMi 27
5.2.1 Configure webservice endpoint in OMi 27
5.2.2 Create forwarding rule to forward events from OMi 32

5.2.3 Property file change 35
5.2.4 Generate new events 35
5.2.4.1 Configuration 35
5.2.5 Send new events 39
5.2.6 Verify event received in OMi-CA log 40
5.2.7 Generate events in OMi using sendEvent tool 40
5.3 NFV Director integration with BSM-C 41
5.3.1 Database Structure 45
5.3.2 Database Query Configuration 46
5.4 BSM-C integration with OMi 47
5.5 OpenStack OMi event payload samples 48
5.6 VMWare Event Payload 48
5.7 OMi Event Payload 48
Appendix A NFV Director topology structure 49

List of tables

Table 1: Document history....8

Table 2: Alarms policy: Alarm-to-event attribute mapping....43

Table 3: Updates policy: Updates-to-event attribute mapping....43

Table 4: Alarm database schema....45

Table 5: Alarm database schema....46

Table 6: Session Variables....46

List of figures

Figure 1: NFV Director integration with uCMDB and OMi 10
Figure 2: Topology discovery using uCMDB 10
Figure 3: uCMDB integration components 11
Figure 4: Discovered resources 11
Figure 5: Setting header and data for BSM-C policy 14
Figure 6: NFV Director: Edit VIM authentication details 17
Figure 7: DCN topology pictorial representation 20
Figure 8: Uploading DCN topology into fulfillment 21
Figure 9: Query ID of Datacenter 22
Figure 10: Response for Datacenter Query 22
Figure 11: Query ID of SHARED_NETRESOURCE:DCN 23
Figure 12: Response for SDN_CONTROLLER:DCN Query 23
Figure 13: Create Relationship 24
Figure 14: Query NETWORKING:OPENSTACK associated with Region 25
Figure 15: Query Response for NETWORKING:OPENSTACK associated with Region 25
Figure 16: REST operation to create relationship between NETWORKING and DCN 26
Figure 17: Alarm flow architecture 27
Figure 18: Configure webservice endpoint in OMi 28
Figure 19: Configure new server 28
Figure 20: Enter webservice endpoint name 29
Figure 21: Enter FQDN 29
Figure 22: Enter URL for webservice server 30
Figure 23: Secure HTTP 30
Figure 24: Enter FQDN 31
Figure 25: Incoming connection setting 31
Figure 26: Choose Event Forwarding option in OMi 32
Figure 27: Create new forwarding rule 32

Figure 28: Create new event forwarding rule 33
Figure 29: Create new simple filter 34
Figure 30: Create additional event property 34
Figure 31: OMi console policy templates 35
Figure 32: Create new test folder 36
Figure 33: Add new template group 36
Figure 34: add new policy template 36
Figure 35: Choose type of policy template 37
Figure 36: Name the policy template 37
Figure 37: Create new rule 37
Figure 38: Select condition for events 38
Figure 39: Assign and deploy policy template 38
Figure 40: Send test event 39
Figure 41: OMi operations console 40
Figure 42: Set DB source 41
Figure 43: BSMC database query 42
Figure 44: Verify BSMC database query 42
Figure 45: Set data mapping 42
Figure 46: Fill event attributes 43
Figure 47: Alarm policy 44
Figure 48: Updates policy 44
Figure 49: Create filtering role 45
Figure 50: Activate policy 45
Figure 51: Relationship between OpenStack and DCN modules 49
Figure 52: DC to SHARED_RESOURCE:DCN relationship 50
Figure 53: Manually create shared resources 51
Figure 54: Manually create L3Domain 51
Figure 55: Manually create L3Domain 52
Figure 56: Management tenant matching L3Domain 53

Preface

About this guide

This document explains the procedure to install and configure the uCMDB Discovery and OMi events. This document also gives an overview of resource discovery, architectural view, enabling/disabling of discovery process, and list of objects discovered.

By following the procedures in this document, Helion CG resources can be discovered using uCMDB.

Audience

This document is any stakeholder requiring to perform resource discovery using the NFV Director. Pre requisite is to have knowledge of NFV Director concepts, OMi concepts, and an understanding of the NFV Director resource model.

Document history

Table 1: Document history

Edition	Date	Description
1.0	October 14, 2016	First edition.

Chapter 1 Introduction

The aim of this document is to provide

- Purpose and Overview of Resource Discovery from uCMDB.
- Architectural view.
- Installation and configuration of Discovery Process.
- Enabling and Disabling of Discovery Process.
- The list of resources discovered.
- Architecture of OMi event flow.
- Event payload

1.1 Overview of resource discovery

NFV Director is responsible for managing the lifecycle of VNF and it’s important for NFVD to know the complete topology of the underlying VIM Resources,

The complete list of VIM resource topology is described below.

The Discovery process described in this document helps in automatic discovery of the VIM Resources and their inter-relationship from CMBD.

1.1.1 What is CMDB?

- A configuration management database (CMDB) is a database that contains all relevant information about the components of the information system used in an organization's IT services and the relationships between those components.
- A CMDB provides an organized view of data and a means of examining that data from any desired perspective.
- Within this context, components of an information system are referred to as configuration items (CI).
- A CI can be any conceivable IT component, including software, hardware, documentation, and personnel, as well as any combination of them.

HPE provides its own configuration management database known as uCMDB.

1.1.2 Why integration with uCMDB is necessary for NFV Director?

Typically in IT organization, uCMDB acts as data warehouse that holds IT assets and relationship between these IT assets. NFV Director is responsible for laying out Virtual topology (VNFs) on top of these Physical Topology judiciously, which is not possible without NFV Director being aware of the underlying Physical Topology

1.2 Architecture

1.2.1 NFV Director integration with uCMDB and OMi

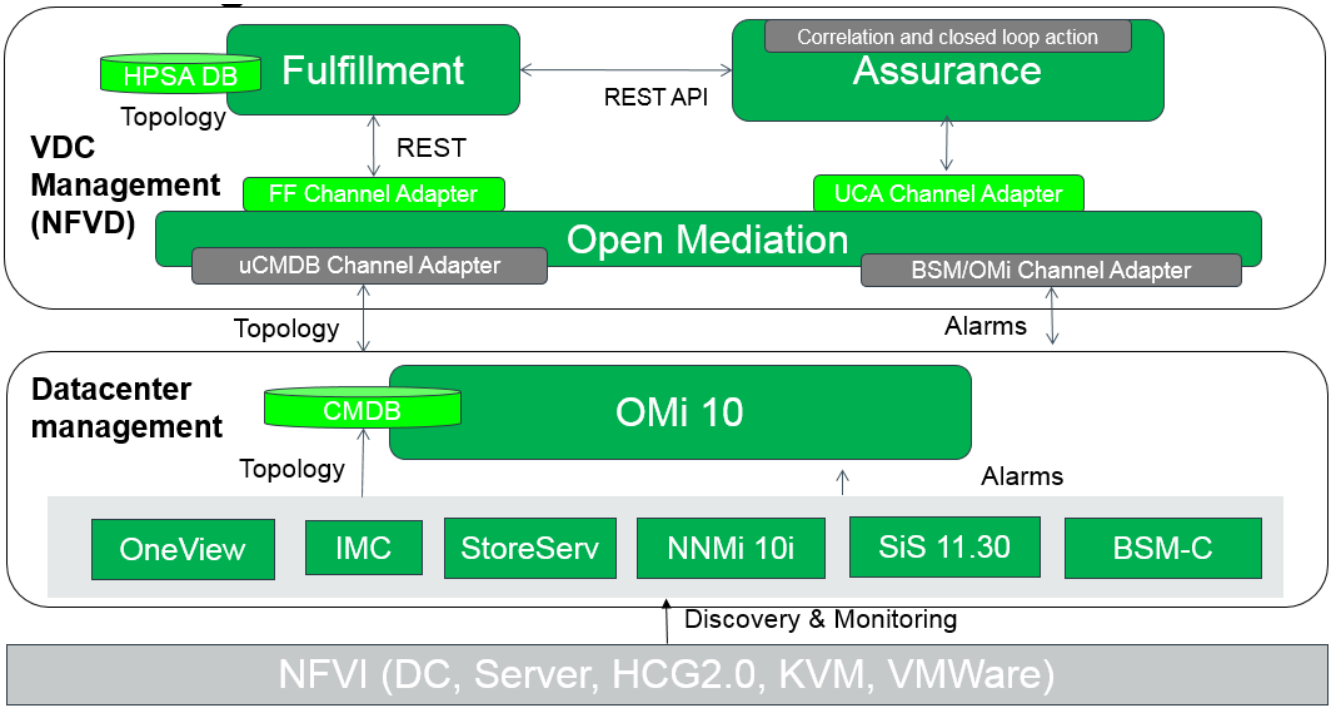


Figure 1: NFV Director integration with uCMDB and OMi

1.2.2 Topology discovery using uCMDB

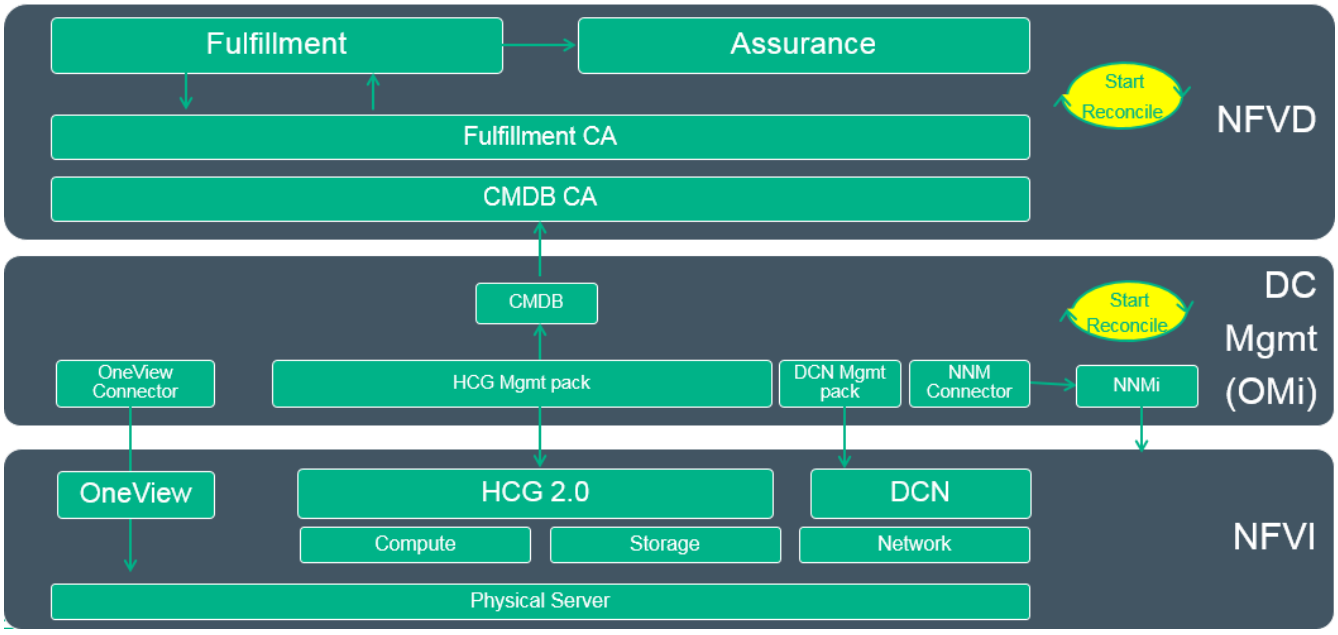


Figure 2: Topology discovery using uCMDB

1.2.3 uCMDB integration components

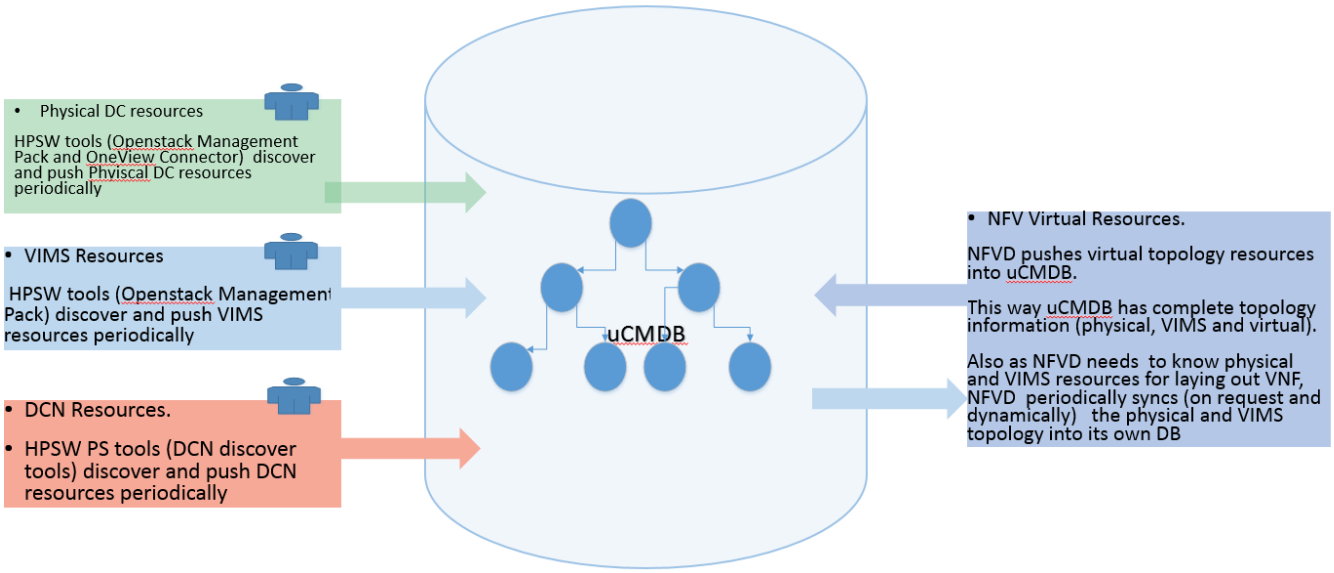


Figure 3: uCMDB integration components

1.3 List of NFV Director Resources discovered

- ✓ Servers
  - CPU, Memory, Disk
  - Port, Interface
  - Total, used and available capacity
- ✓ Regions
- ✓ Tenant
- ✓ OpenStack Services
- ✓ Hypervisors
  - ESX, KVM, Bare metal
- ✓ Availability Zones
- ✓ Host Aggregates
- ✓ Networks
- ✓ Subnetworks
  - IPAddress
- ✓ Virtual Machines
  - vCPU, vMemory, vDisk
  - vPort
- ✓ LUN/vLUN
- ✓ Images
- ✓ Flavor
- ✓ Carrier Grade
  - NUMA, Huge pages
  - PCI-PT
  - SR-IOV
- ✓ DCN
- ✓ TOR Switch
- ✓ Server-TOR Switch connection
- ✓ MicroDC
- ✓ Data center
  - Rack
  - Enclosure

Figure 4: Discovered resources

Chapter 2 Installation and configuration

2.1 Installation

2.1.1 Prerequisites

NOTE: Two servers are required, one for OMi and another for BSM Connector. They cannot collocate. They must be installed on Linux Operating System and are accessible with the recommended configuration.

NOTE: Install and configure the manage packs, following the HPSw documents.

1. OMi 10.00/01 and BSM Connector 10.00.
2. cmdb-ca-1.0.0.zip (part of nfvd-discovery-common-04.00.001-1.el6.noarch.rpm)
    a. NFVD.zip
3. fulfillment-ca -1.0.0.zip (part of nfvd-discovery-common-04.00.001-1.el6.noarch.rpm)
4. omi-ca-1.0.0.zip (part of nfvd-discovery-cmdb-04.00.001-1.el6.noarch.rpm)
    a. BSMC-Policy.zip
5. Helion CG Management Pack
6. One View Management Pack

2.1.2 Channel Adapter installation steps

1. Install the omi and discovery RPMs in the <AA_HOST>, where we have the Open Mediation installed.

```
rpm -ivh nfvd-discovery-common-04.00.001-1.el6.noarch.rpm
rpm -ivh nfvd-discovery-cmdb-04.00.001-1.el6.noarch.rpm
rpm –ivh nfvd-alarms-omi-04.00.001-1.el6.noarch.rpm
```

2. Install omi-ca, cmdb-ca and fulfillment-ca

```
unzip -d /opt/openmediation-70/ips/ /opt/HPE/nfvd/discovery/omi/omi-ca-1.0.0.zip
nom_admin --install-ip omi-ca-10
nom_admin --install-ip-in-container 0 omi-ca-10

unzip -d /opt/openmediation-70/ips/  /opt/HP/nfvd/discovery/common/cmdb-ca-1.0.0.zip
nom_admin --install-ip cmdb-ca-10
nom_admin --install-ip-in-container 0 cmdb-ca-10

unzip -d /opt/openmediation-70/ips/  /opt/HP/nfvd/discovery/common/fulfillment-ca -1.0.0.zip
nom_admin --install-ip fulfillment-ca-10
nom_admin --install-ip-in-container 0 fulfillment-ca-10
```

2.1.2.1 Configuration for Channel Adapters

1. Edit the below file for configurations in fulfillment-ca, and provide <FF_HOST_IP> and <HPSA_PORT>

```
/var/opt/openmediation-70/containers/instance-0/ips/fulfillment-ca-10/etc/config/
reconciliation-endpoints.properties
```

```
#Fulfillment rest endpoint protocol http/https
rest.protocol=http
```

```
#Fulfillment rest endpoint ipaddress/hostname
rest.endpoint=<FF_HOST_IP>

#Fulfillment rest endpoint port
rest.port=<FF_PORT>

#Reconciliation CA rest endpoint for sending trigger message, port has to be changed each
container deployment.
recon.rest.endpoint=http://0.0.0.0:18989

#Reconciliation data log folder for artifact-relationship instances.
log.file.folder=/var/tmp

#Reconciliation interval
rest.endpoint.polling.interval=36000s

#REST/LOG OPTION to be triggered for Reconciliation
REST_CALL=TRUE
LOG_ENTRY=FALSE
```

2. Edit the below file for configurations in cmdb-ca, and provide <OMi IP Address>, <Port>, <username> and <password>

```
/var/opt/openmediation-70/containers/instance-0/ips/cmdb-ca-10/etc/endpoints-
config.properties
```

```
#OMi Ip address
omi.host=<IPAddress of OMi>
omi.port=<port>
omi.username=<username>
omi.password=<password>
```

3. Edit the below file to reflect Open Mediation Host/IP address.

```
/var/opt/openmediation-70/containers/instance-0/ips/omi-ca-10/etc/omi-nfvd.properties
```

```
omi.rest.endpoint=http://<OM_HOSTNAME_OR_IP>:17870
```

4. Deploy cmdb-ca, omi-ca and fulfillment -ca.

```
nom_admin --deploy-ip-in-container 0 cmdb-ca-10
nom_admin --deploy-ip-in-container 0 fulfillment-ca-10
nom_admin --deploy-ip-in-container 0 omi-ca-10
```

NOTE: After performing any property changes, the channel adapters have to be un-deployed and redeployed

IMPORTANT: Deploying the fulfillment-ca will trigger discovery.

```
/opt/open-mediation/bin/nom_admin --undeploy-ip-in-container 0 cmdb-ca-10

/opt/open-mediation/bin/nom_admin --undeploy-ip-in-container 0 fulfillment-ca-10
```

2.1.3 Operations Manager integration with NFV Director

2.1.3.1 OMi integration with NFV Director for discovery

NOTE: Copy the NFVD.zip file present in '/opt/HPE/nfvd/discovery/cmdb/integration' directory to the local workstation from where the OMi GUI is accessed. You can get NFVD.zip on installing the nfvd-discovery-common-04.00.001-1.el6.noarch.rpm

To install NFVD.zip file, follow the below steps -

1. Login to OMi
2. Navigate to Administration >> RTSM Administration >> Package Manager [Under Administration heading]
3. Click the icon -
4. Click on the add button in the 'Deploy Packages to Server' pop-up
5. Browse for the NFVD.zip package in the local directory and click on Open
6. Select/ Click on the NFVD.zip package name
7. Click on the button - to select all resources
8. Click on the button - Deploy
9. Verify that the Package is displayed present in the OMi GUI

2.1.3.2 BSM-C policy import

1. Login to the target BSM Connector.
2. In the BSM Connector user interface, click in the toolbar. A file selection dialog box opens.
3. Unzip the file present in /opt/HPE/nfvd/discovery/omi/integration
4. Navigate to the policy files and, for each policy, select both the header (*_header.xml) and the data (*_data) files.

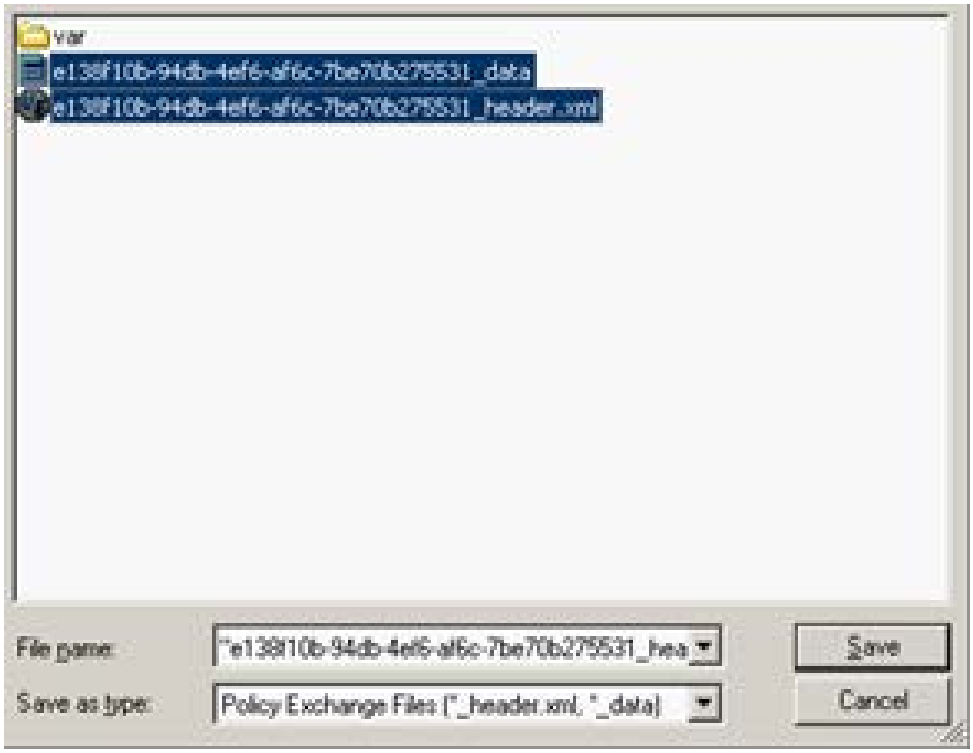


Figure 5: Setting header and data for BSM-C policy

5. Click Open to start the import process.
6. If the policies with the same policy ID already exist in BSM Connector, you are asked whether you would like to replace them with the newly imported policies.
7. The imported policies appear in the list of policies in the BSM Connector user interface. They are by default deactivated.
8. If necessary, edit the imported policies and adapt their contents to the new BSM Connector server.

9. Optional: Activate the policies.

2.1.3.3 Configure UCA for OMi integration

Edit the following file, and add the below content within the <ActionRegistryXML> tag.

```
 /var/opt/UCA-EBC/instances/default/conf/ActionRegistry.xml
```

```
<MediationValuePack MvpName="omi_source" MvpVersion="1.0"
url="http://localhost:18192/uca/mediation/action/ActionService?WSDL"
            brokerURL="failover://tcp://localhost:10000">
         <Action actionReference="OMi_Action_localhost">
                  <ServiceName>alertService</ServiceName>
                  <NmsName>localhost</NmsName>
            </Action>
</MediationValuePack>
```

2.2 Enabling and disabling of discovery process

By default discovery is enabled, when NFV Director discovery components are installed.

2.2.1 Disable discovery even in fresh installation

Execute the below script when you install the fulfillment-ca, before deploying it.

```
cd /opt/HPE/nfvd/discovery/scripts/

sh disable_discovery.sh
```

2.2.2 Disable discovery temporarily

Execute the below script. Once disabled subsequent Discovery runs will not be triggered. Disabling while discovery in progress will not impact the current run.

```
cd /opt/HPE/nfvd/discovery/scripts/
sh disable_discovery.sh
```

2.2.3 Enable Discovery

Execute the below script.

```
cd /opt/HPE/nfvd/discovery/scripts/
sh enable_discovery.sh
```

2.2.4 Manual Discovery trigger

Execute the below script. Manual discovery can be triggered any time. It will not get triggered when another instance of Discovery is already running.

```
cd /opt/HPE/nfvd/discovery/scripts/
./trigger_reconciliation.sh
```

NOTE: If you want to make some changes in properties files of FF-CA, you must

1. disable discovery
2. undeploy the CA
3. make changes to properties
4. deploy CA
5. enable discovery

2.2.5 Track Discovery/Reconciliation completion

Open Mediation log file will have a status message of Discovery:

```
/var/opt/openmediation-70/containers/instance/data/log/service-mix-info.log
```

```
****** Discovery/Reconciliation Service has been completed successfully, Quota Calculation
is in Progress ******
```

Chapter 3 Post discovery steps

3.1 Update VIM Authentication details from NFV Director-GUI

- Go to Instance view as domain user
- Select Other as Authentication
- Select the VIM, you want to edit
- From ACTION menu, select EDIT
- Enter the VIM’s credentials and click Update

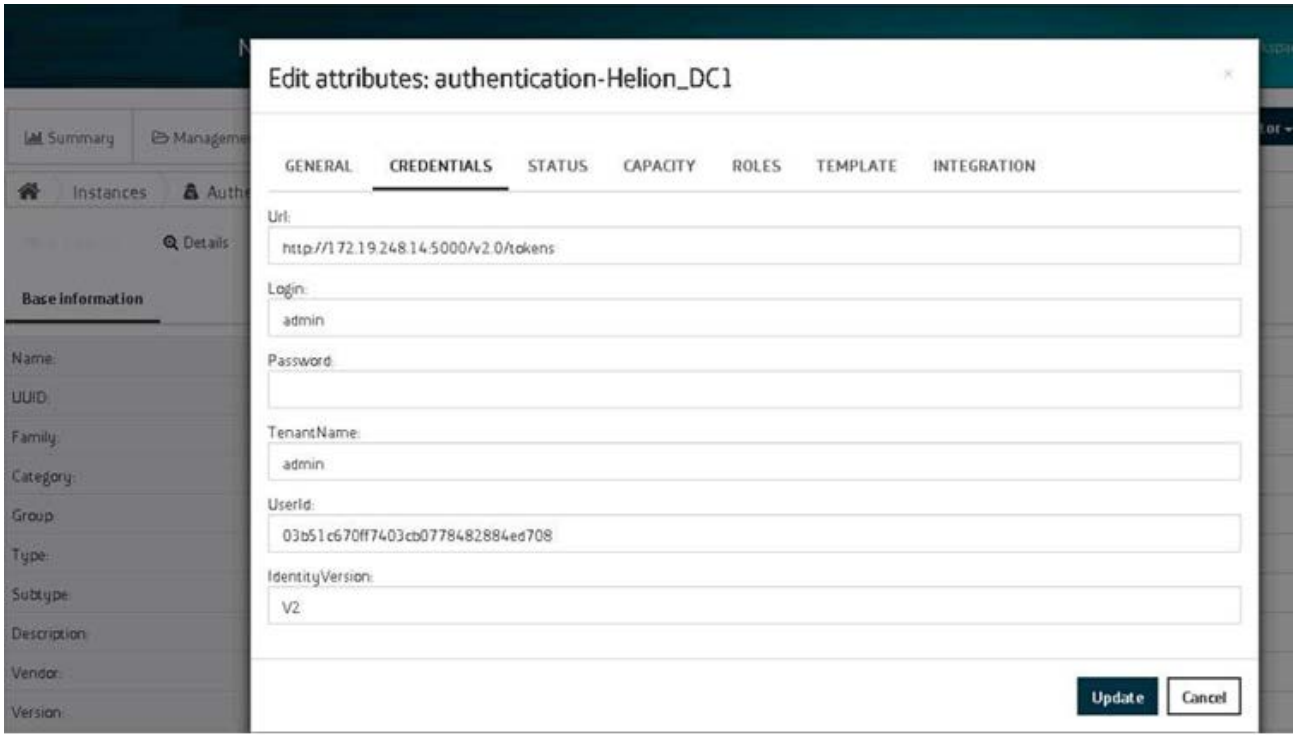


Figure 6: NFV Director: Edit VIM authentication details

Chapter 4 DCN integration

4.1 Prerequisites

If integration with external DCN (Alcatel Lucent Nuage) is considered, we would need the following

1. DCN (Nuage) v3.2.1.1, if external DCN is used.
2. OMi Management Pack for DCN (Nuage).
3. DCN_Topology.xml → SDN Topology manually created.

DCN Integration with NFV Director is an optional step. This would be required in case an external DCN has to be used for Networking. In current release DCN (Nuage) is supported.

DCN Topology has to be attached manually once Discovery has been completed. .

Below section explains the procedure to be followed to integrate DCN with NFV Director.

4.2 Integrate DCN with NFV Director

4.2.1 Create the SDN Topology manually

Attachment file 'DCN_Topology.xml' contains the default SDN topology

In the DCN_Topology.xml, edit the following attributes:

NOTE: You can use the NFVD Resource Modeler to edit the DCN_Topology.

- AUTHENTICATION > CREDENTIALS > Url

Value	Example
https://<nuage_ip>:<port>/nuage/api/v3_2	`https://172.19.244.225:8443/nuage/api/v3_2`

- AUTHENTICATION > CREDENTIALS > Login
- AUTHENTICATION > CREDENTIALS > Password
- AUTHENTICATION > CREDENTIALS > Admin_enterprise
- L3DOMAIN > DOMAIN > RouteDistinguisher

Value	Example
RD Value	`65534:12538`

- L3DOMAIN > DOMAIN > RouteTarget

Value	Example
RD Value	`65534:56825`

- L3DOMAIN > DOMAIN > BackHaulRouteDistinguisher

Value	Example
RD Value	`65534:62251`

- L3DOMAIN > DOMAIN > BackHaulRouteTarget
- L3DOMAIN > DOMAIN > ExportRouteTarget
- L3DOMAIN > DOMAIN > ImportRouteTarget

Value	Example
RT Value	`65534:32060`

- L3DOMAIN > DOMAIN > BackHaulVNID

Value	Example
VPN ID	`314849`

- L3DOMAIN > DOMAIN > BackHaulVNID

Value	Example
VPN ID	`314849`

- L3DOMAIN > DOMAIN > TunnelType

Value	Example
TunnelType	`VXLAN`

- MACRONET > MACRONET > address
- MACRONET > MACRONET > netmask
- SHARED_NETRESOURCE > RESOURCE > Address
- SHARED_NETRESOURCE > RESOURCE > Netmask
- SHARED_NETRESOURCE > RESOURCE > DomainRouteDistinguisher
- SHARED_NETRESOURCE > RESOURCE > DomainRouteTarget
- SHARED_NETRESOURCE > RESOURCE > Gateway

Below is the pictorial representation of DCN Topology

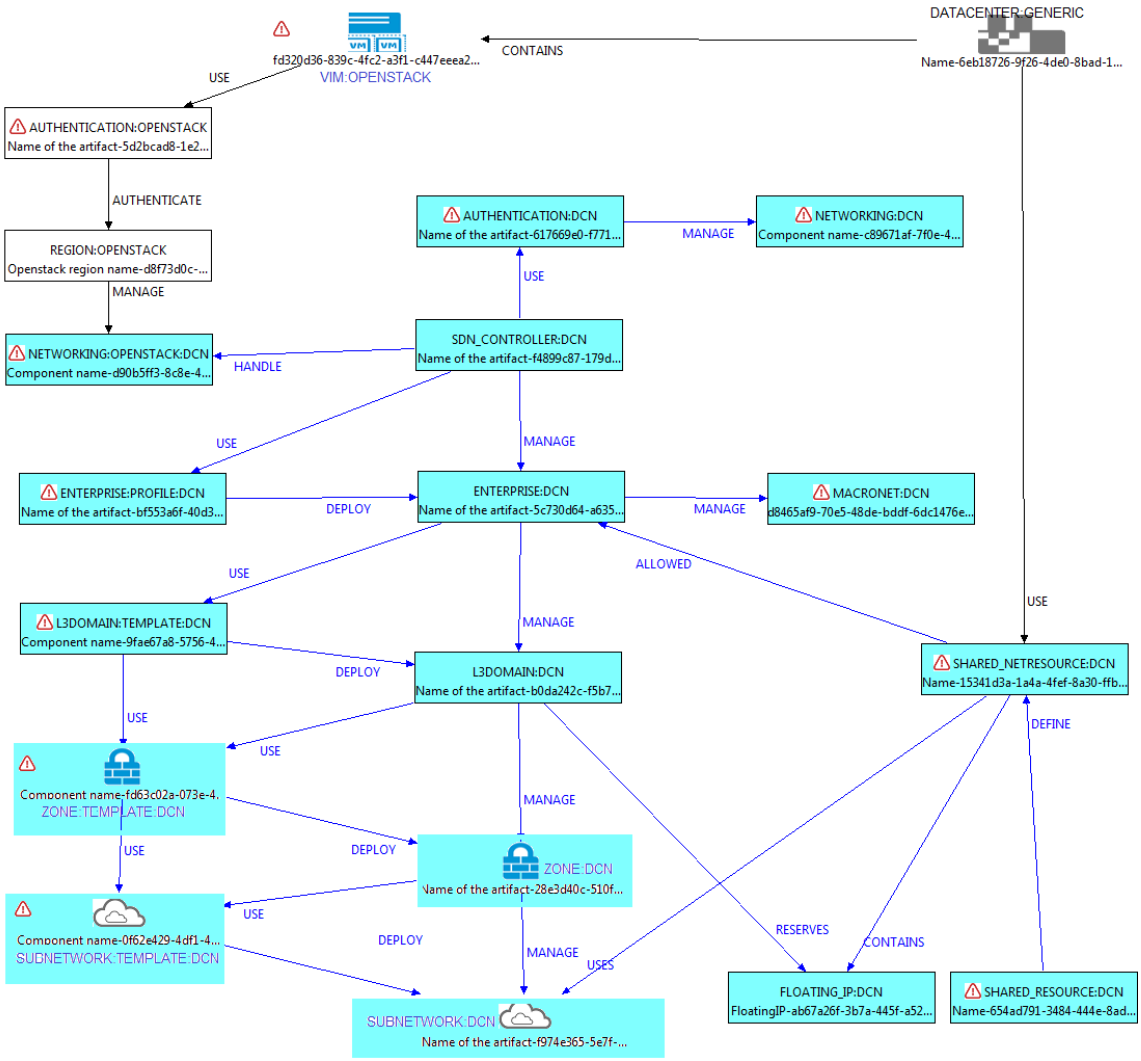


Figure 7: DCN topology pictorial representation

4.2.2 Upload DCN resource

1 Open REST Client.
2 Provide FF_HOST_IP and FF_PORT details in the REST URL. Select POST HTTP Operation.
3 Copy the content of file DCN_Topology.xml inside payload section.

IMPORTANT: For all Rest operations add the below headers:

Content-Type: application/xml

X-Auth-Token: 3778fe88-e71d-4004-86bc-3188f7fd450b.

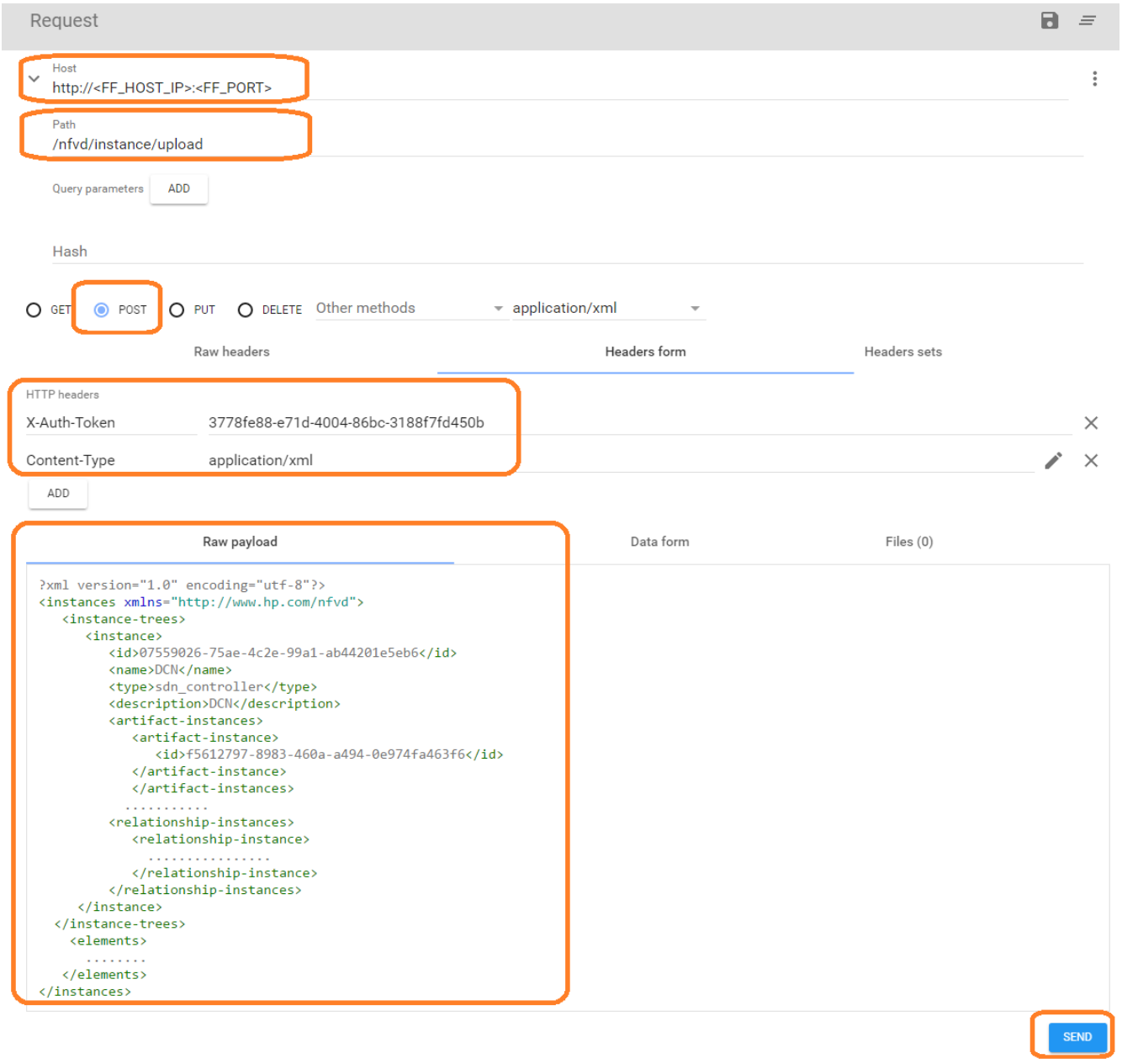


Figure 8: Uploading DCN topology into fulfillment

4.2.3 Connect Datacenter with DCN resources

⚠ CAUTION: Execute it per DC.

1 Query Datacenter ID

- Provide FF_HOST_IP and FF_PORT details in the REST URL. Select GET HTTP Operation.
- Enter the Path and Query parameters and Headers as shown in sample below.
- GENERAL.Name attribute filter is used to filter by Datacenter Name DC1 or DC2 (Name of your Datacenter)

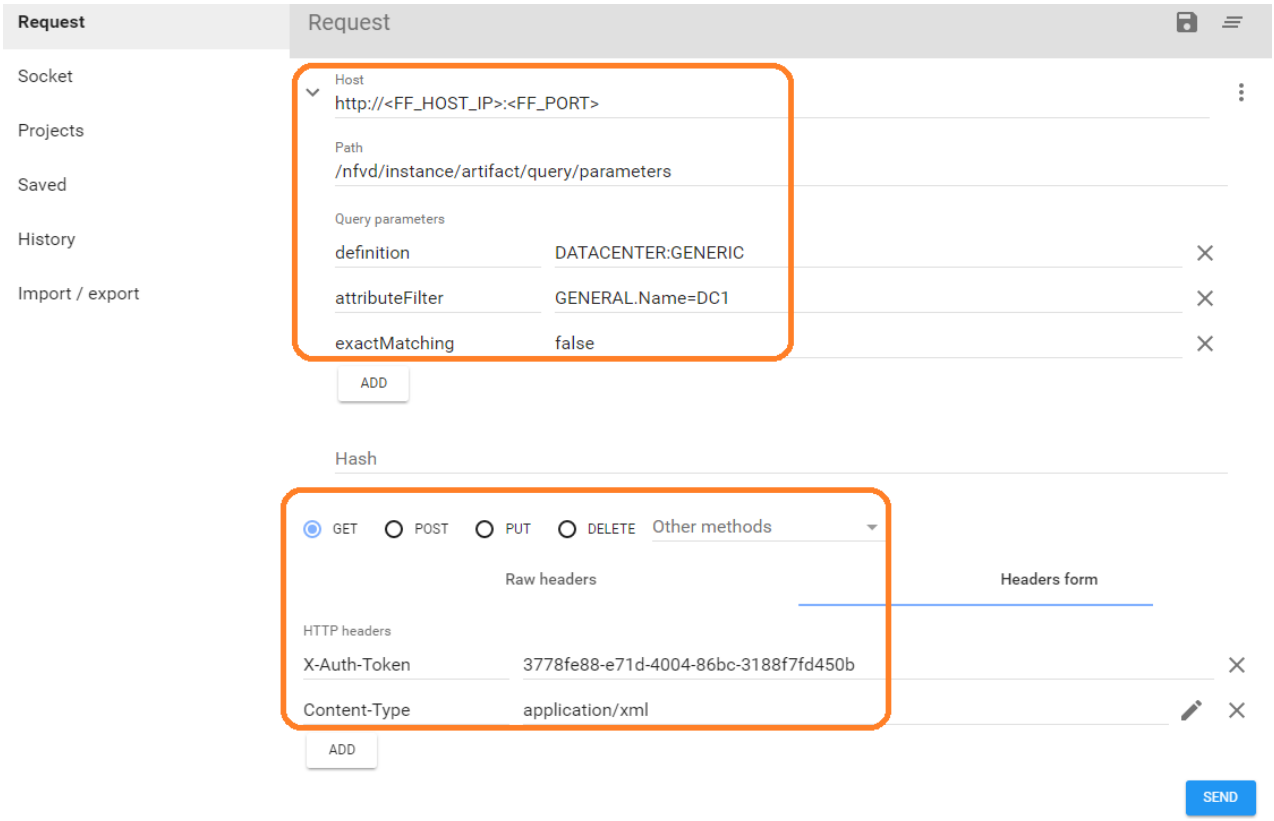


Figure 9: Query ID of Datacenter

Figure 10: Response for Datacenter Query

2 Query SHARED_NETRESOURCE:DCN ID

a. Provide FF_HOST_IP and FF_PORT details in the REST URL. Select GET HTTP Operation.
b. Enter the Path and Query parameters and Headers as shown in sample below.
c. INFO.DC.Name attribute filter is used to filter by Datacenter Name

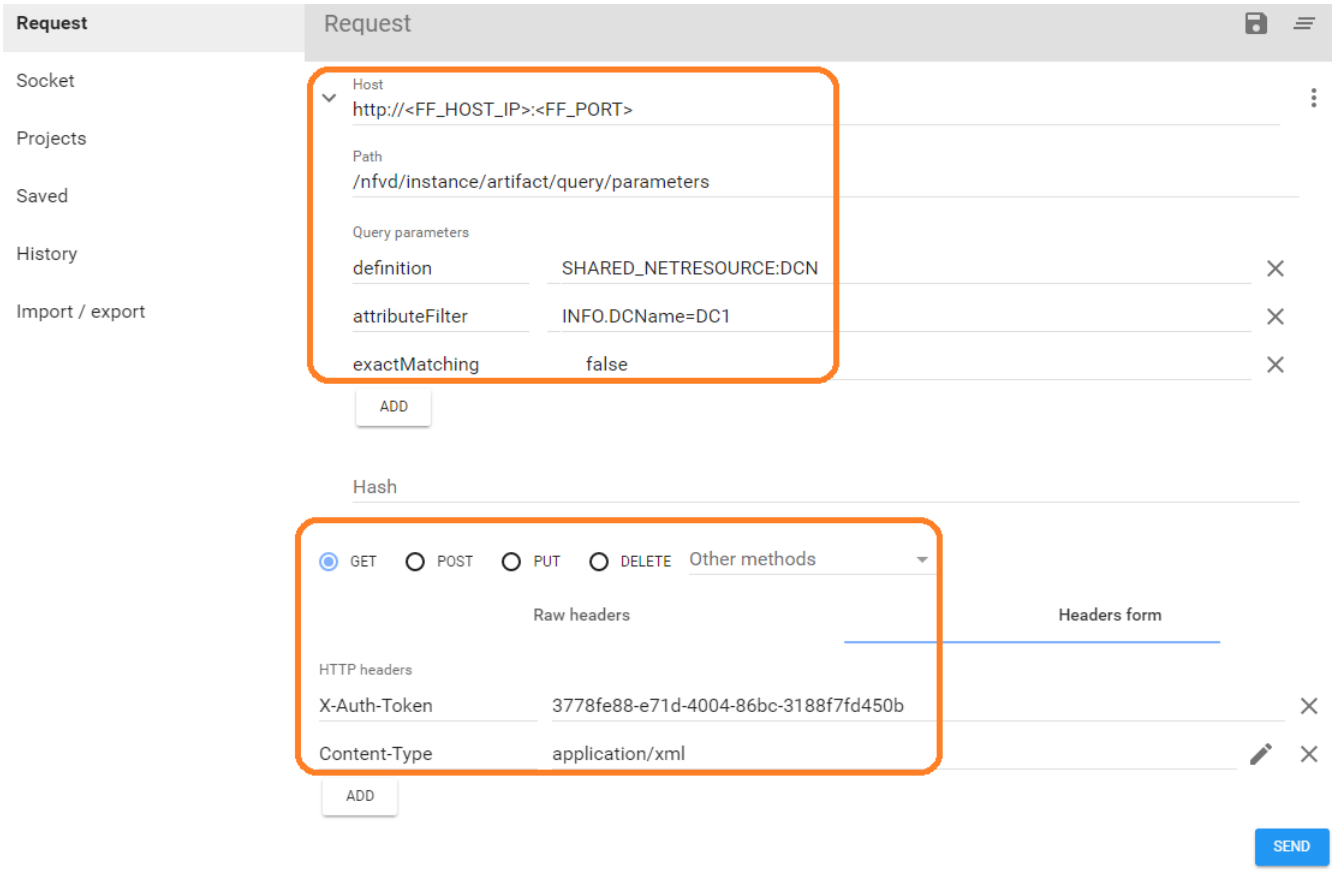


Figure 11: Query ID of SHARED_NETRESOURCE:DCN

Figure 12: Response for SDN_CONTROLLER:DCN Query

3 Create Relationship between DATACENTER and each SHARED_NETRESOURCE retrieved from response above. Relationship sample is shown below:
   a. parent-artifact-id: DC ID returned from “Query Datacenter ID” step
   b. child-artifact-id: Shared_NetResource ID returned from “Query SHARED_NETRESOURCE:DCN ID” step

For the above example,

```
<relationship-instances xmlns="http://www.hp.com/nfvd">
   <relationship-instance>
      <categories/>
      <parent-artifact-id>8f2e6b76-a367-4fa2-8444-637aab6ff73f</parent-artifact-id>
      <child-artifact-id>a2d4aee3-25a4-4e3c-a353-a9679046f7a9</child-artifact-id>
      <status>
         <enabled>true</enabled>
         <label>ENABLED</label>
         <visible-label>ENABLED</visible-label>
      </status>
      <relationship-type>USE</relationship-type>
   </relationship-instance>
</relationship-instances>
```

Use the above block as payload section in the Rest client, as shown below.

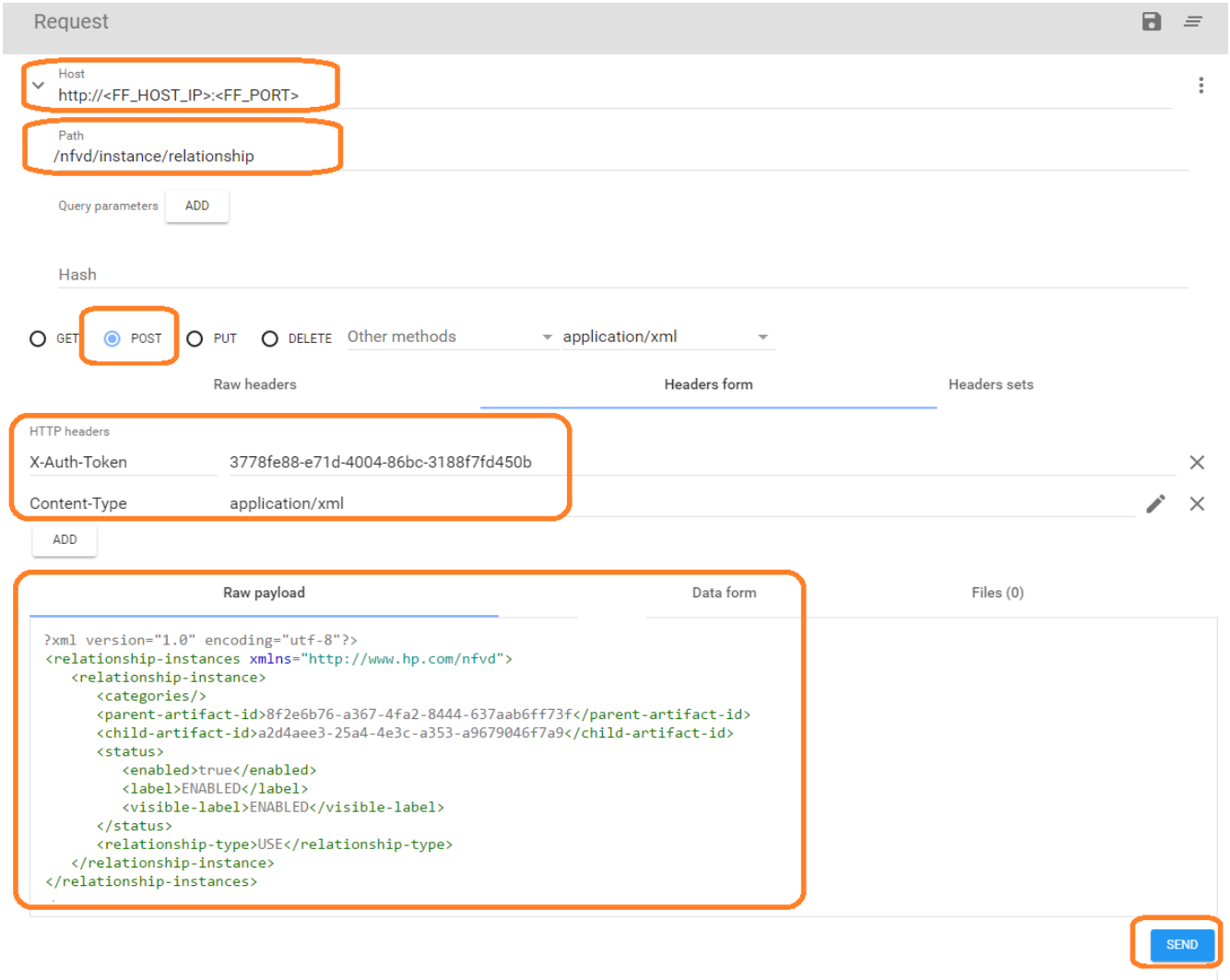


Figure 13: Create Relationship

4.2.4 Query discovered Networking Artifacts

1. Query NETWORKING:OPENSTACK associated with each Region of the Datacenter

IMPORTANT: Execute the below steps for each region, **sacramento** region is used as an example.

a. Provide FF_HOST_IP, FF_PORT details in REST URL.
b. Select GET HTTP operation.
c. Provide headers, path and query parameters as shown in below sample.

id: DC ID returned from “Query Datacenter ID” step
expression:
DATACENTER>VIM>AUTHENTICATION>REGION#GENERAL.Name=**sacramento**>NETWORKING

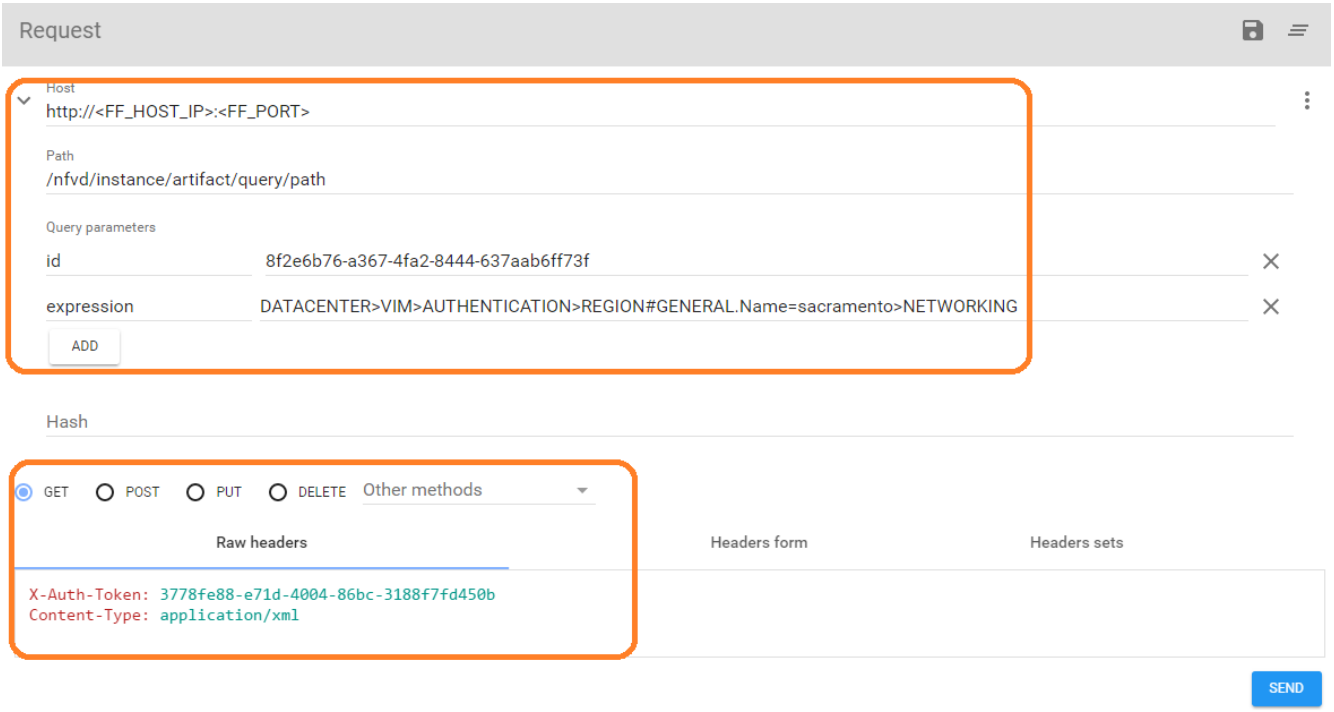


Figure 14: Query NETWORKING:OPENSTACK associated with Region

Below is the response received.

Figure 15: Query Response for NETWORKING:OPENSTACK associated with Region

4.2.5 Create relationship between NETWORKING and DCN Artifacts

IMPORTANT: Execute the below steps for each region.

1 Create Relationship between NETWORKING_OPENSTACK:DCN and SDN_CONTROLLER:DCN. Relationship sample is shown below:

a. parent-artifact-id: Id of SDN_CONTROLLER:DCN Artifact. If you use the DCN_Template.xml, the value MUST be 94c80294-2175-4011-bdf2-78db5c689158
b. child-artifact-id: NETWROKING:OPENSTACK Id's returned from "Query NETWORKING:OPENSTACK associated with each Region of the Datacenter" step.

For our example:

```
<relationship-instances xmlns="http://www.hp.com/nfvd">
   <relationship-instance>
      <categories/>
      <parent-artifact-id>94c80294-2175-4011-bdf2-78db5c689158</parent-artifact-id>
      <child-artifact-id>a7fc5aa9-e10d-3380-a3be-da9ed6f213c3</child-artifact-id>
      <status>
         <enabled>true</enabled>
         <label>ENABLED</label>
         <visible-label>ENABLED</visible-label>
      </status>
      <relationship-type>HANDLE</relationship-type>
   </relationship-instance>
</relationship-instances>
```

Paste the above content in the payload section of the REST client.

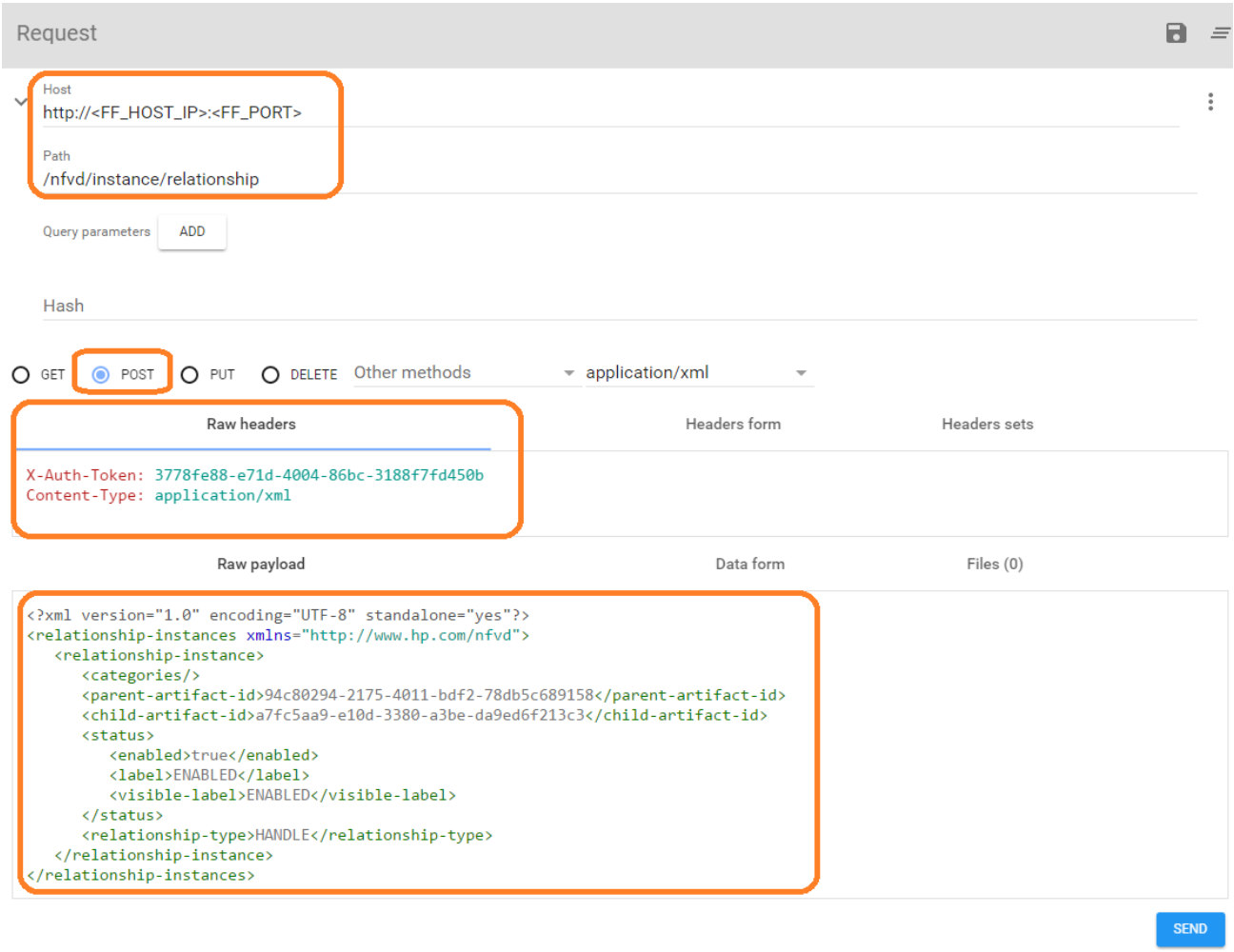


Figure 16: REST operation to create relationship between NETWORKING and DCN

Chapter 5 Monitoring and alarm management

5.1 Alarm flow architecture

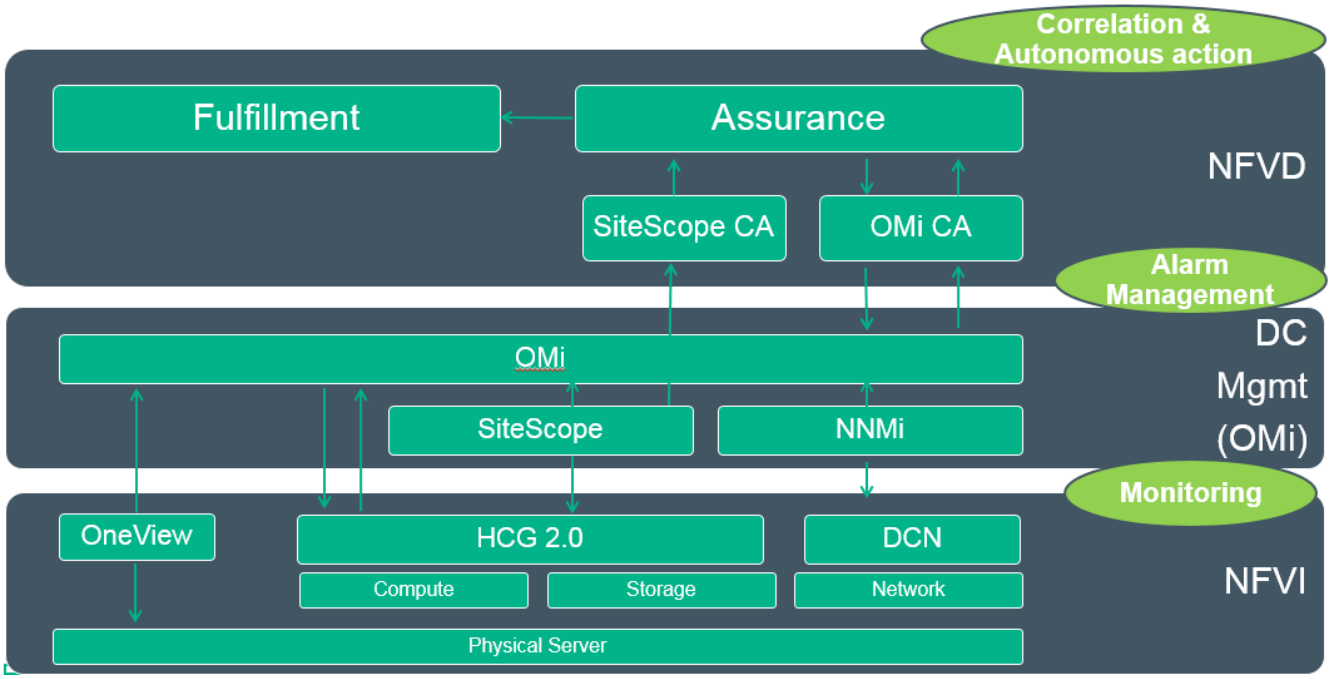


Figure 17: Alarm flow architecture

5.2 NFV Director events integration with OMi

⚠ CAUTION: OMi server has a known issue with supporting hostname with characters - hyphen “-“, underscore “_”. Configure VM hostname in OMi server /etc/hosts file without these characters. [in case of DNS registrations not in place].

5.2.1 Configure webservice endpoint in OMi

To manually forward events to external webservice , webservice endpoint should be configured in OMi GUI. To configure this, go to Administration > Setup and Maintenance > Connected Servers:

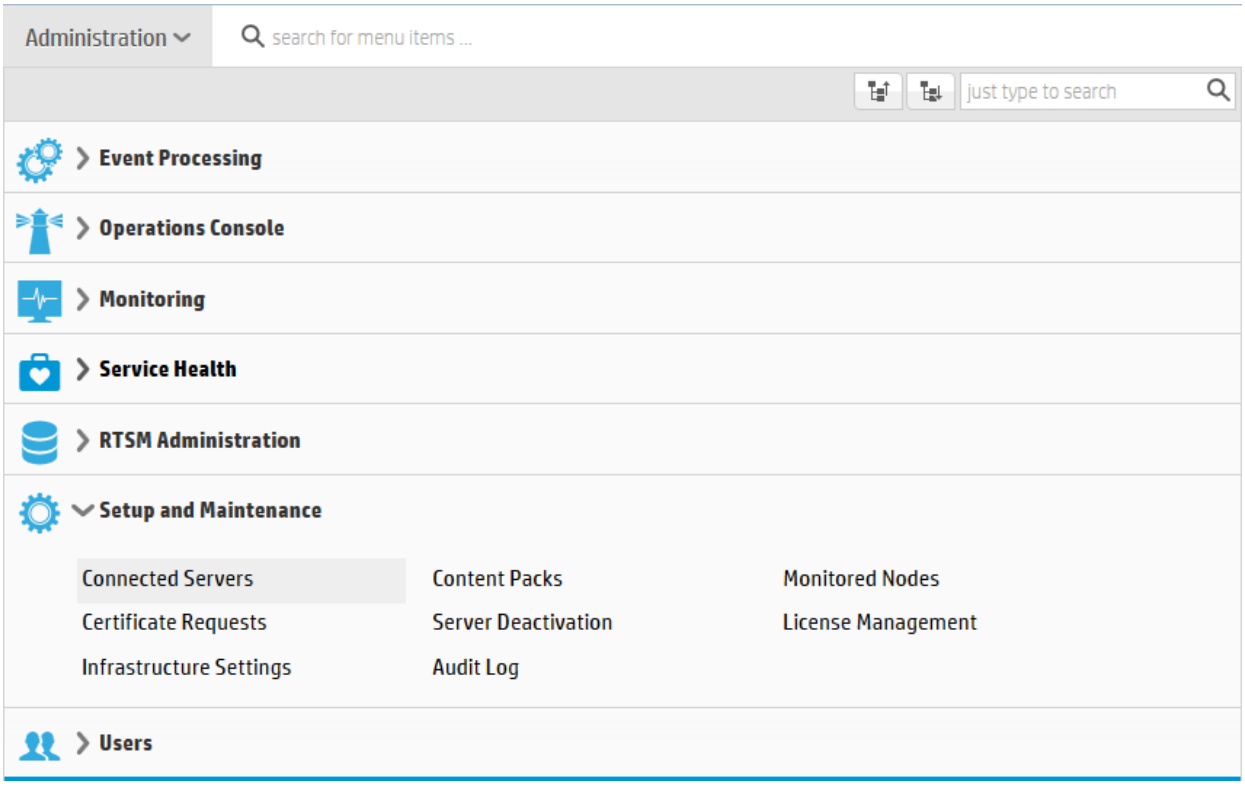


Figure 18: Configure webservice endpoint in OMi

In the right pane, under Connected Servers, configure new server selecting ‘External Event Processing’ using star button:

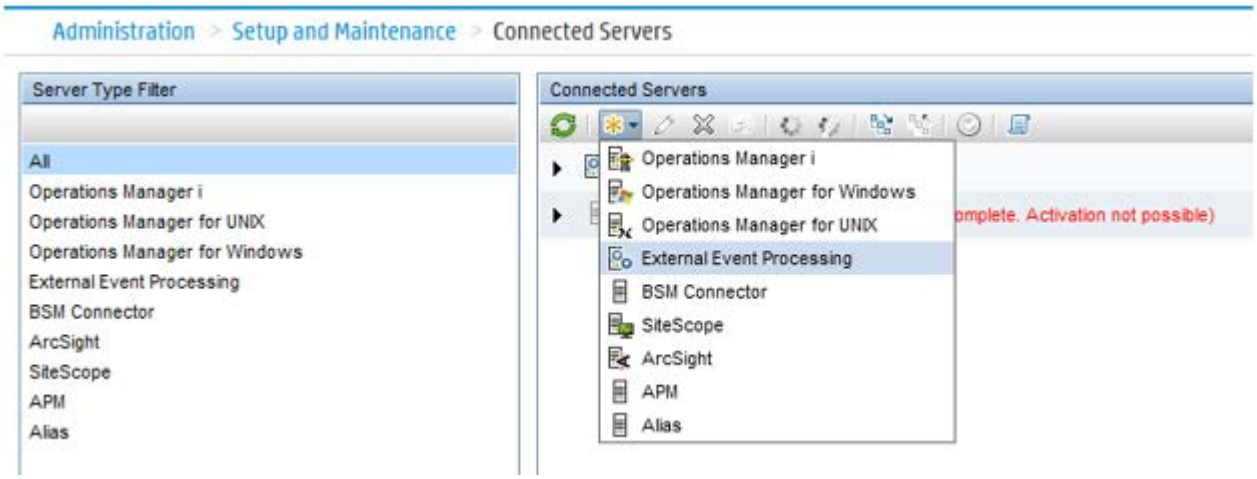


Figure 19: Configure new server

This will open new window as below. Enter name for webservice endpoint in Display Name field. Name field is auto filled. Enter valid description in Description field.

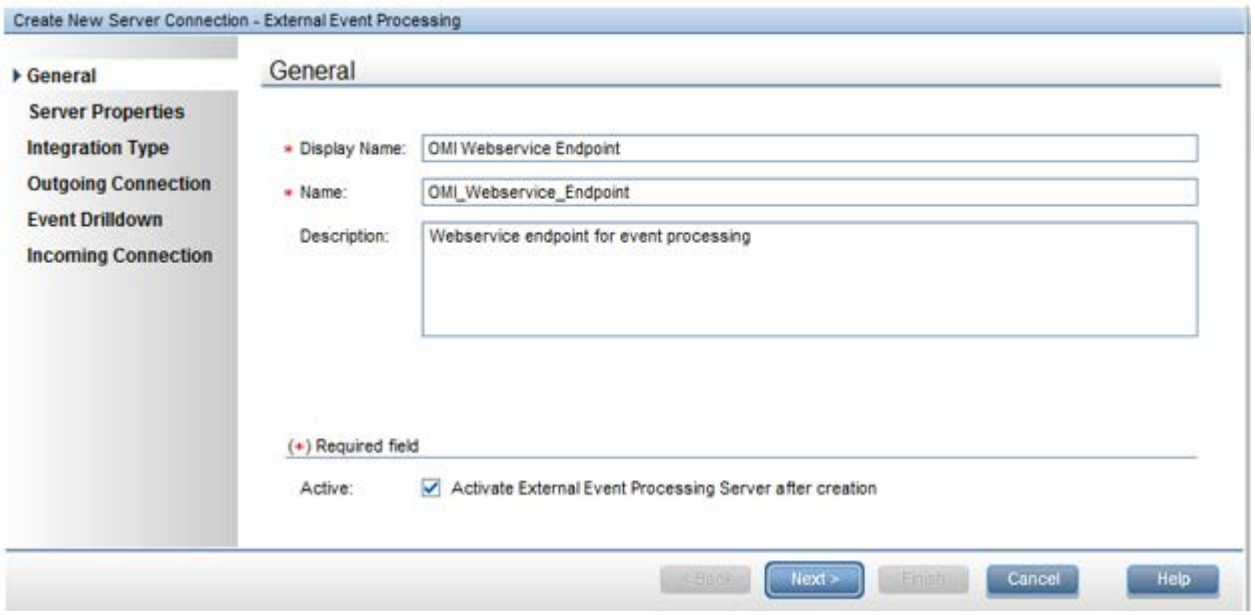


Figure 20: Enter webservice endpoint name

Click Next.

In Server Properties tab, Enter fully qualified DNS Name of the machine having webservice running. Select CI Type as ‘Management System’ (Default).

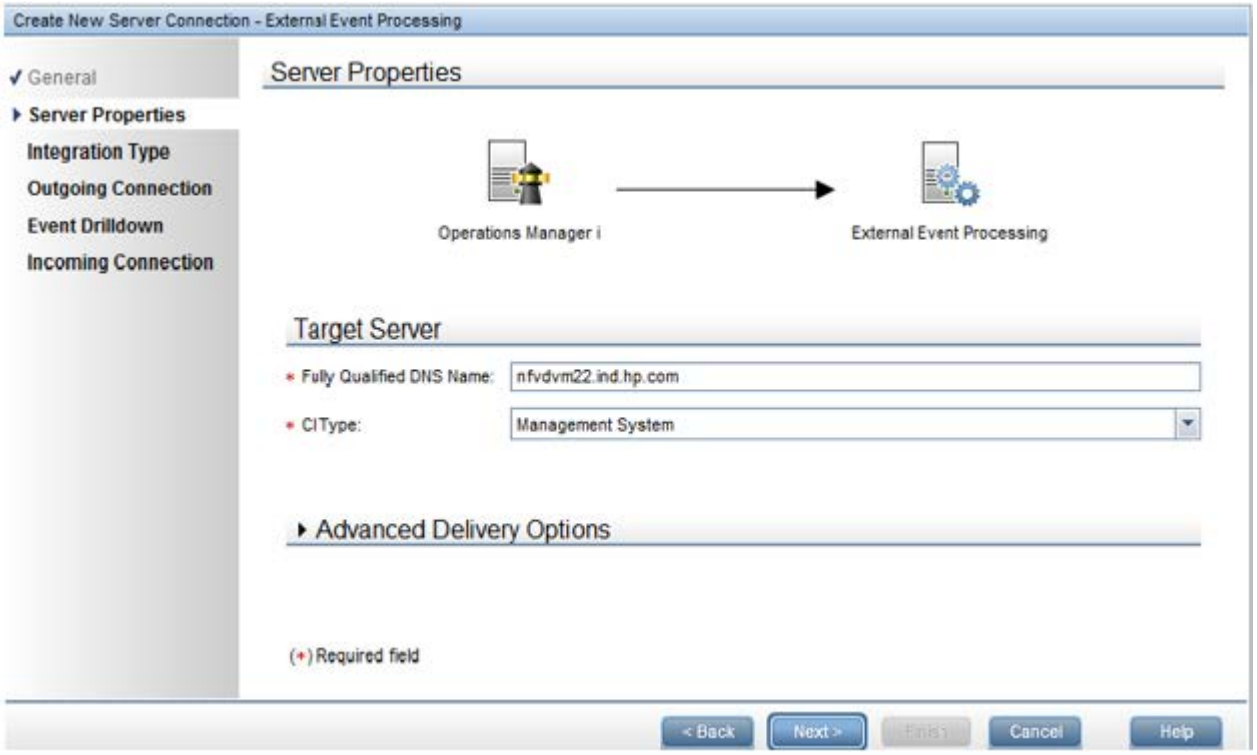


Figure 21: Enter FQDN

Click Next.

In Integration Type tab, select Call External Event Web Service. Enter URL path for the webservice server endpoint. Select ‘Support Bulk Transfer’ for bulk transfer of events from OMi to webservice endpoint.

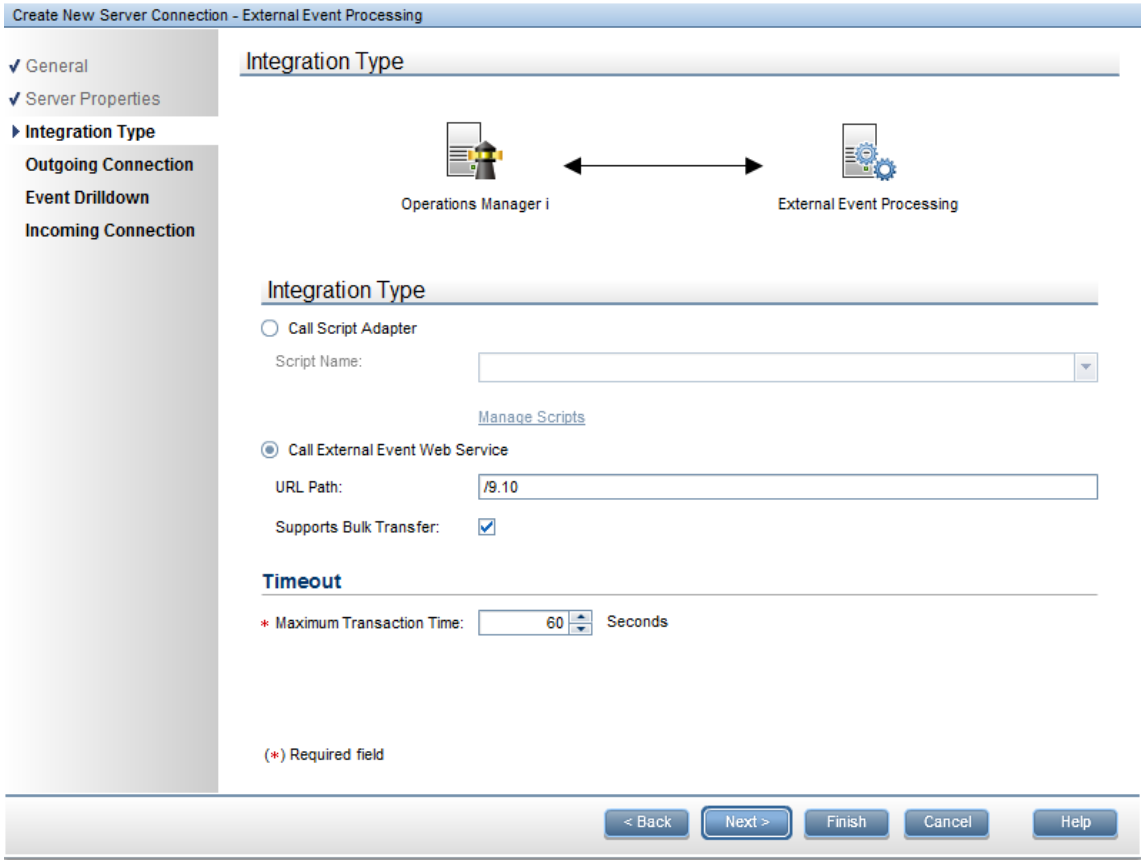


Figure 22: Enter URL for webservice server

Click Next.

In Outgoing Connection, Enter the port configured for rest webservice. By default, Use Secure HTTP will be selected, unselect this check.

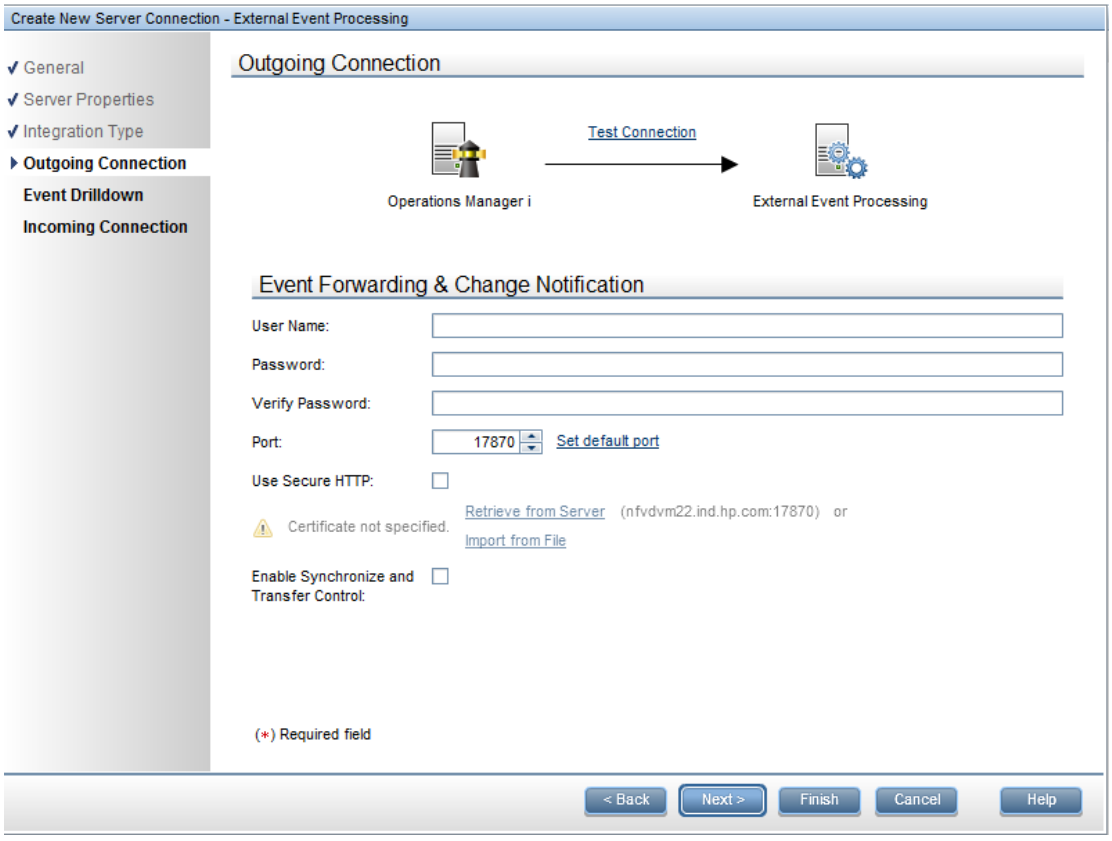


Figure 23: Secure HTTP

Click Next.

In Event Drilldown, Enter Fully Qualified DNS name of the server running webservice. By default, Use Secure HTTP will be selected, unselect this check. Enter port of the webservice configured and the User Name, password & Verify Password fields.

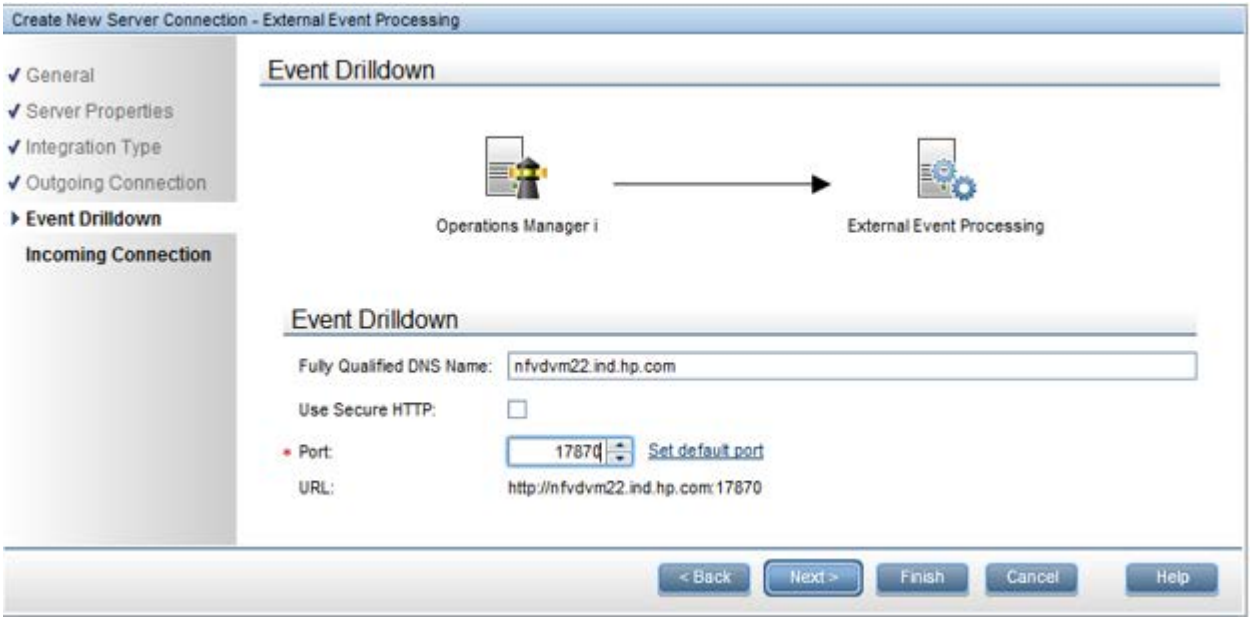


Figure 24: Enter FQDN

Click Next.

In Incoming Connection, Please leave the fields blank.

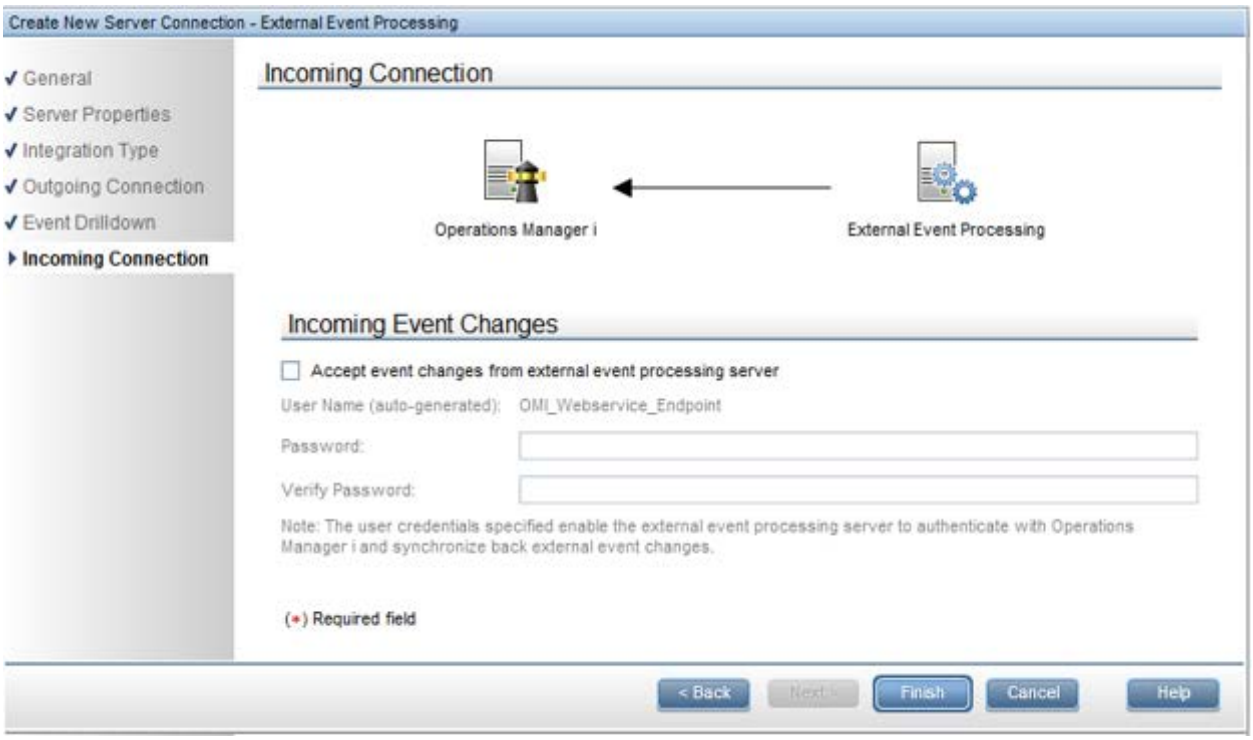


Figure 25: Incoming connection setting

Click Finish.

5.2.2 Create forwarding rule to forward events from OMi

New rule should be created using OMi console to forward events from OMi to external webservice URL configured in Connected Server. This rule will filter events and will forward relevant events to each server configured.

To create new forwarding rule, go to Administration > Event Processing > Event Forwarding.

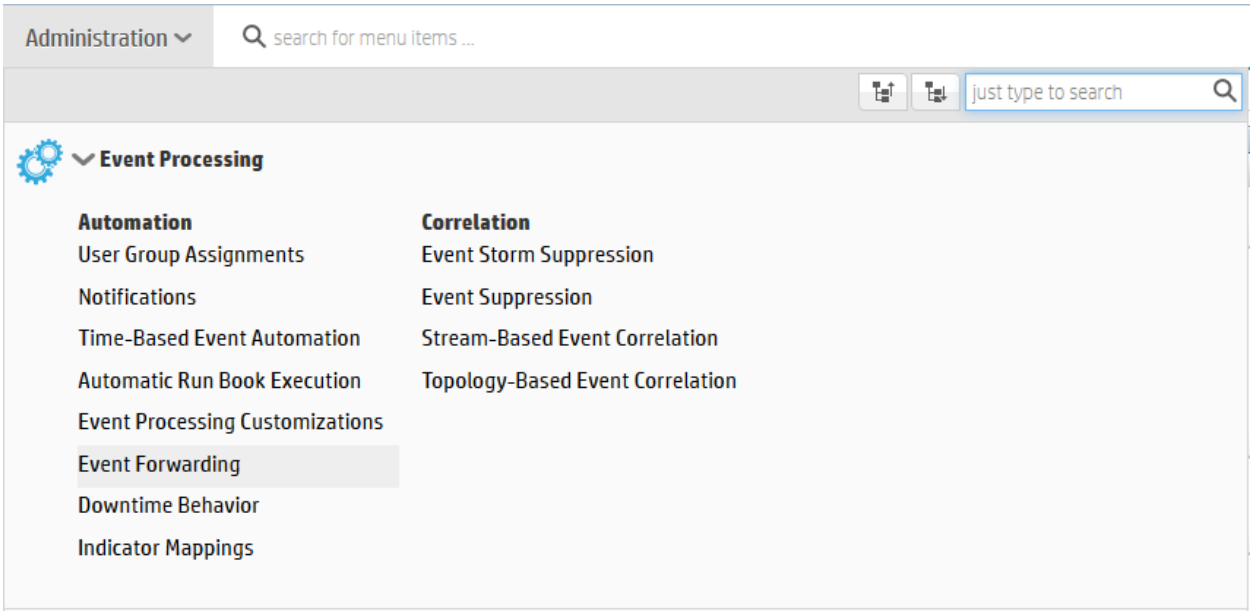


Figure 26: Choose Event Forwarding option in OMi

In the left pane, under Event Forwarding Rules, create new forwarding rule using star button.

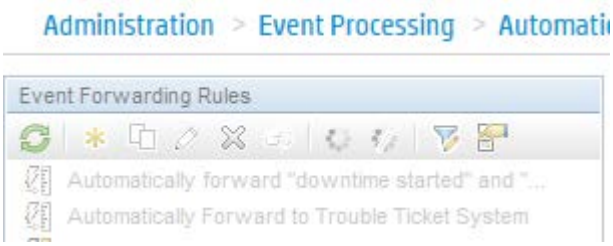


Figure 27: Create new forwarding rule

Enter valid name in Display Name, Enter description (optional).

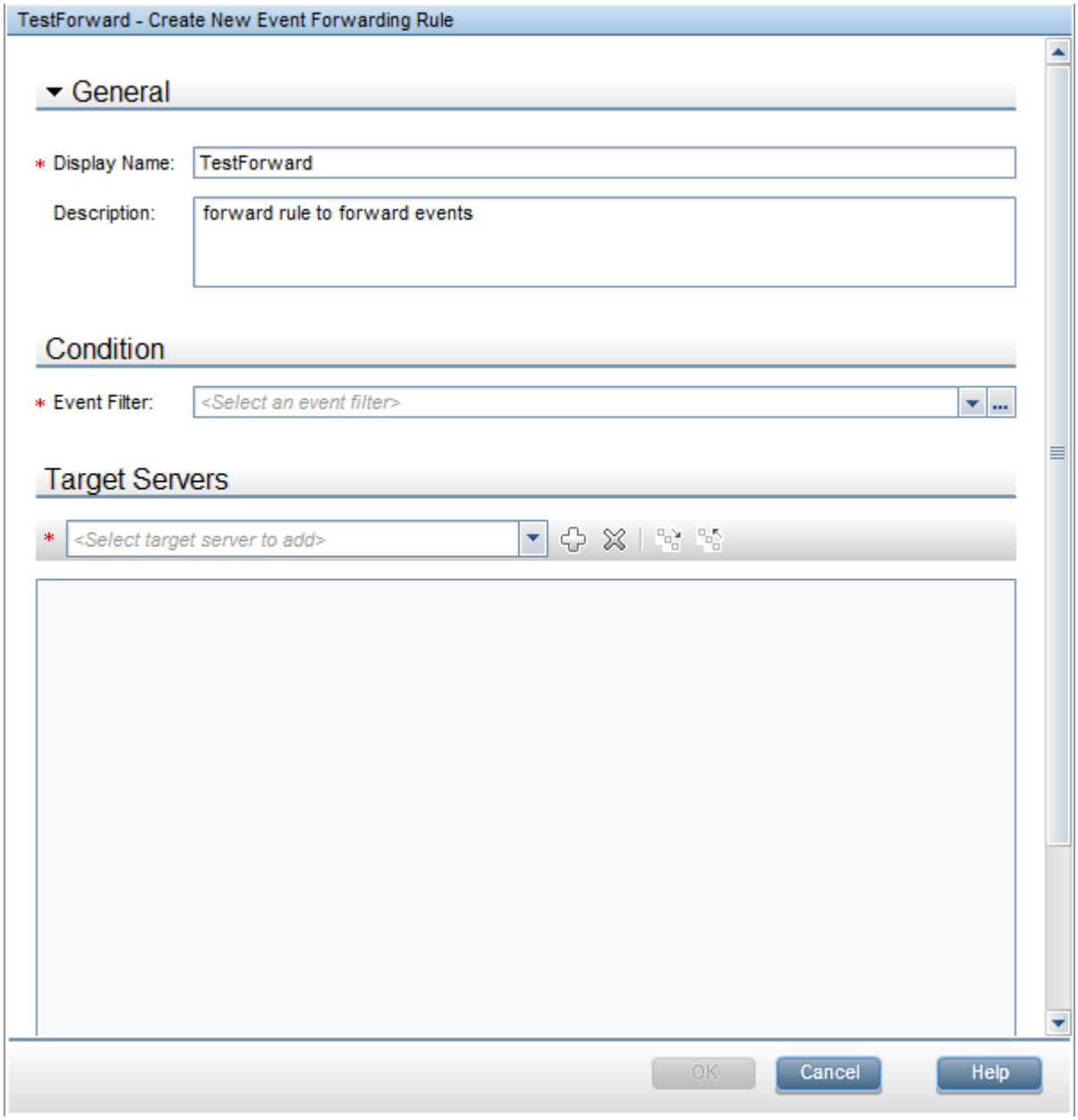


Figure 28: Create new event forwarding rule

Click browse button next to Event Filter field. Select an Event filter dialog box will open. Click on star button to create New Simple Filter.

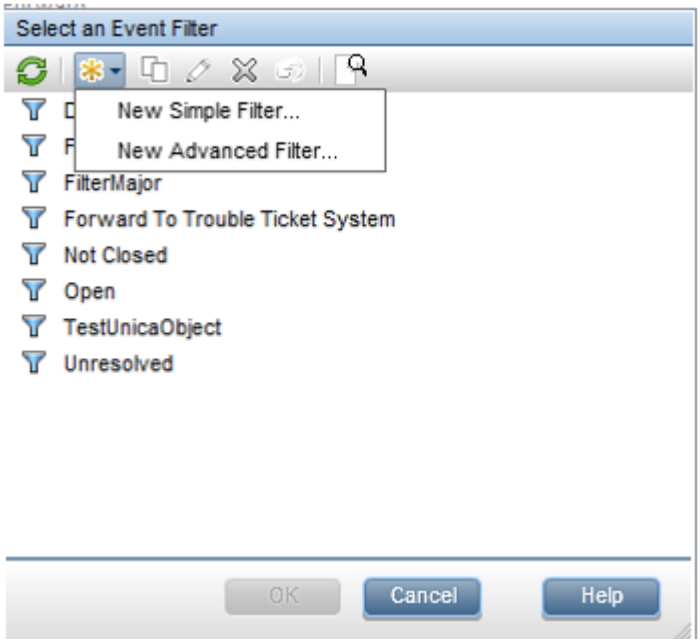


Figure 29: Create new simple filter

In the filter Display Name field, enter name of the filter. Click on Additional Event Properties, Select ‘Object’. Enter value as ‘HPE’ (This can be changed).

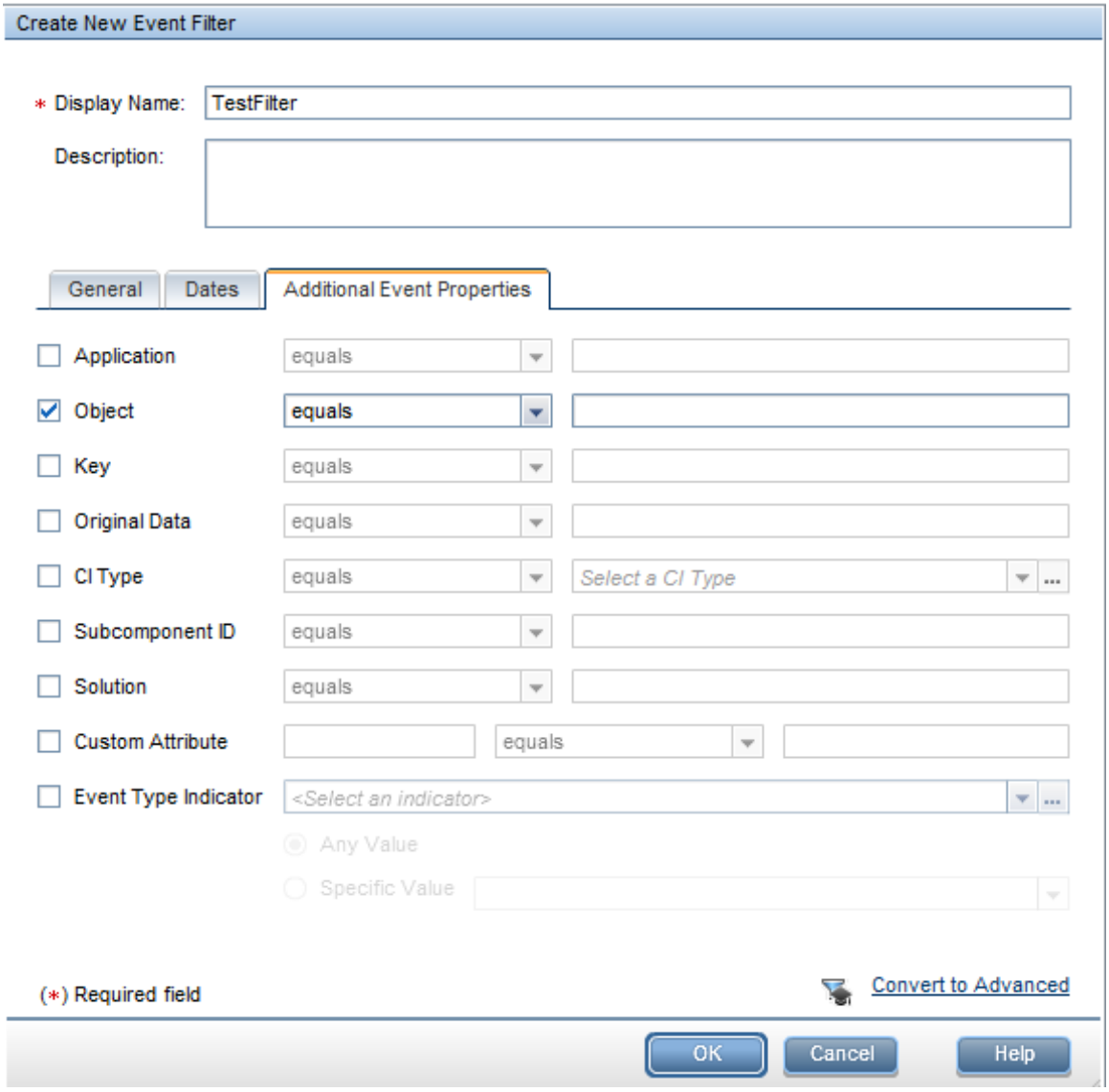


Figure 30: Create additional event property

Click OK.

Select Target Server as configured webservice endpoint and add it.

5.2.3 Property file change

Got to /var/opt/openmediation-70/containers/instance-0/ips/omi-ca-10/etc/ directory on the VM where OMi-CA is installed.

Edit omi-nfvd.properties

Edit omi.rest.endpoint key to the actual URL where webservice endpoint is running.

NOTE: After performing the property changes, the channel adapter have to be un-deployed and redeployed

5.2.4 Generate new events

5.2.4.1 Configuration

In order to manually create events in OMi 10 a policy should be created and deploy to the server.

In OMi console, go to Administration > Monitoring > Policy Templates:

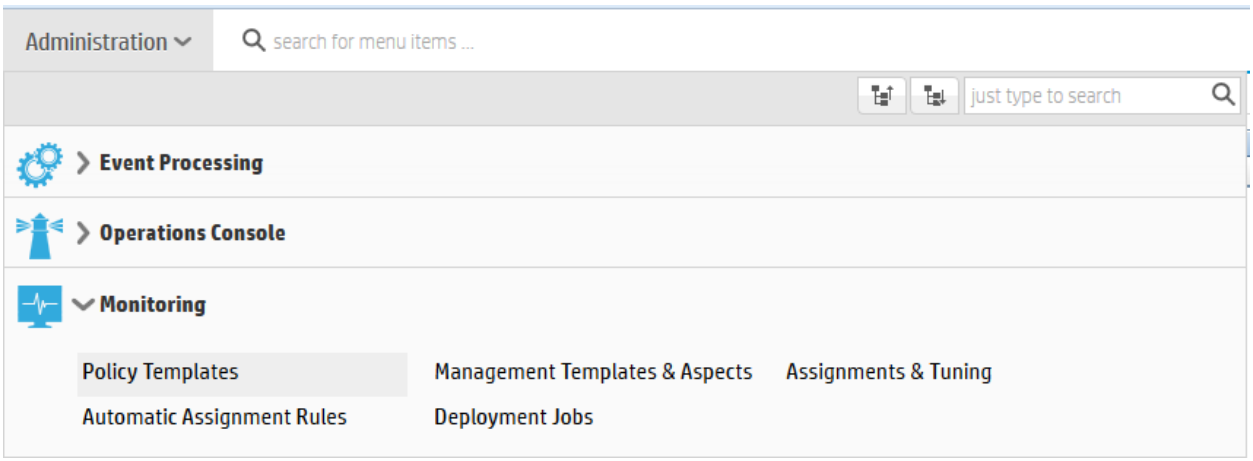


Figure 31: OMi console policy templates

In the left pane, under Policy template Groups, Policy Management > Template Groups, create a new test folder using the star button:

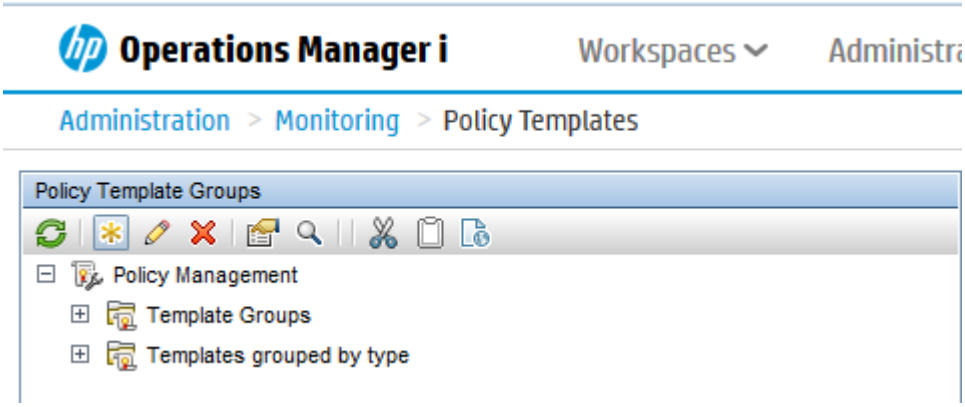


Figure 32: Create new test folder

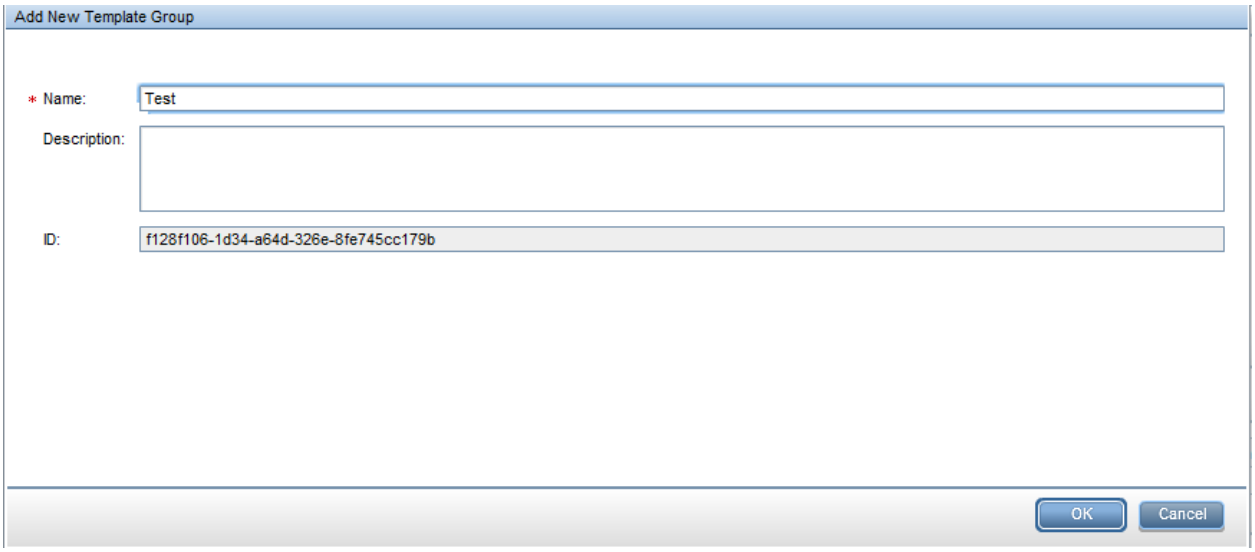


Figure 33: Add new template group

Select this new group, and in the middle pane, use the star to create a New Policy Template

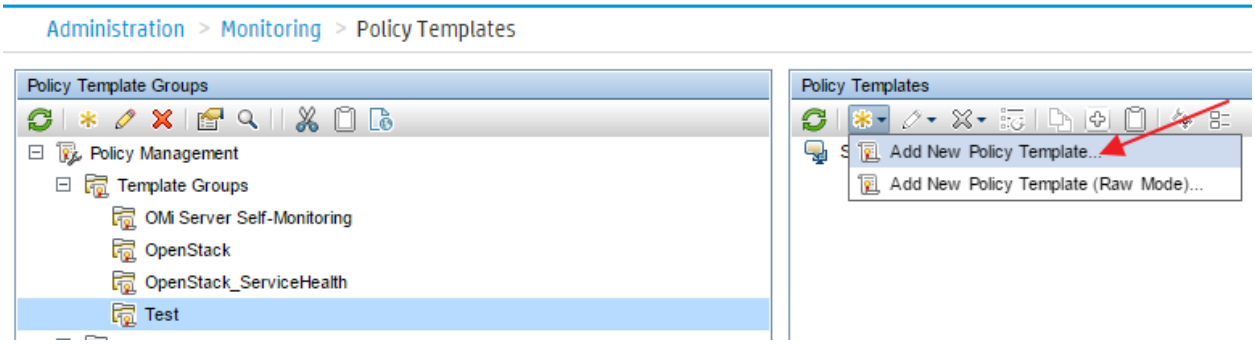


Figure 34: add new policy template

In Type, select ‘Open Message Interface’:

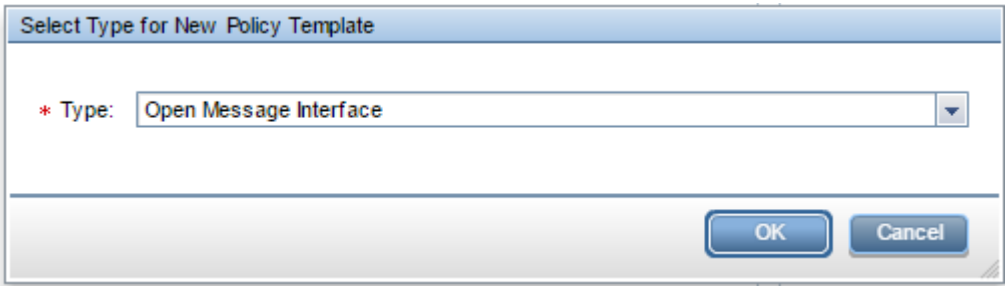


Figure 35: Choose type of policy template

In Properties tab enter a valid name, e.g. ‘Send test events’:

Figure 36: Name the policy template

Leave Defaults tab predefined.

In Rules tab, create a new rule:

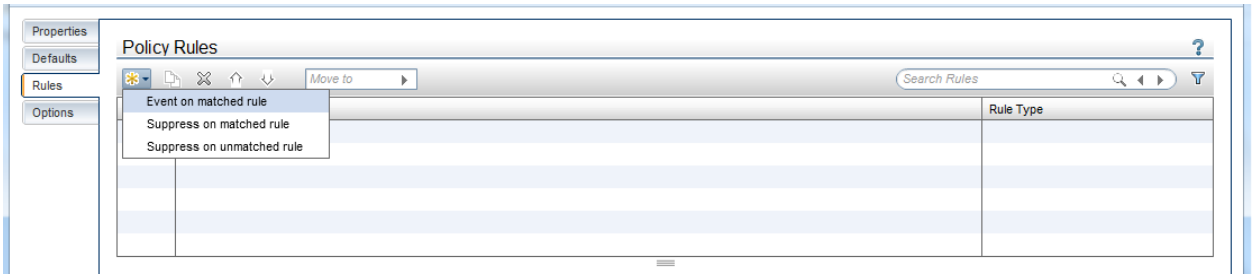


Figure 37: Create new rule

Enter a name for the rule (e.g. ‘Test’) and select condition for events

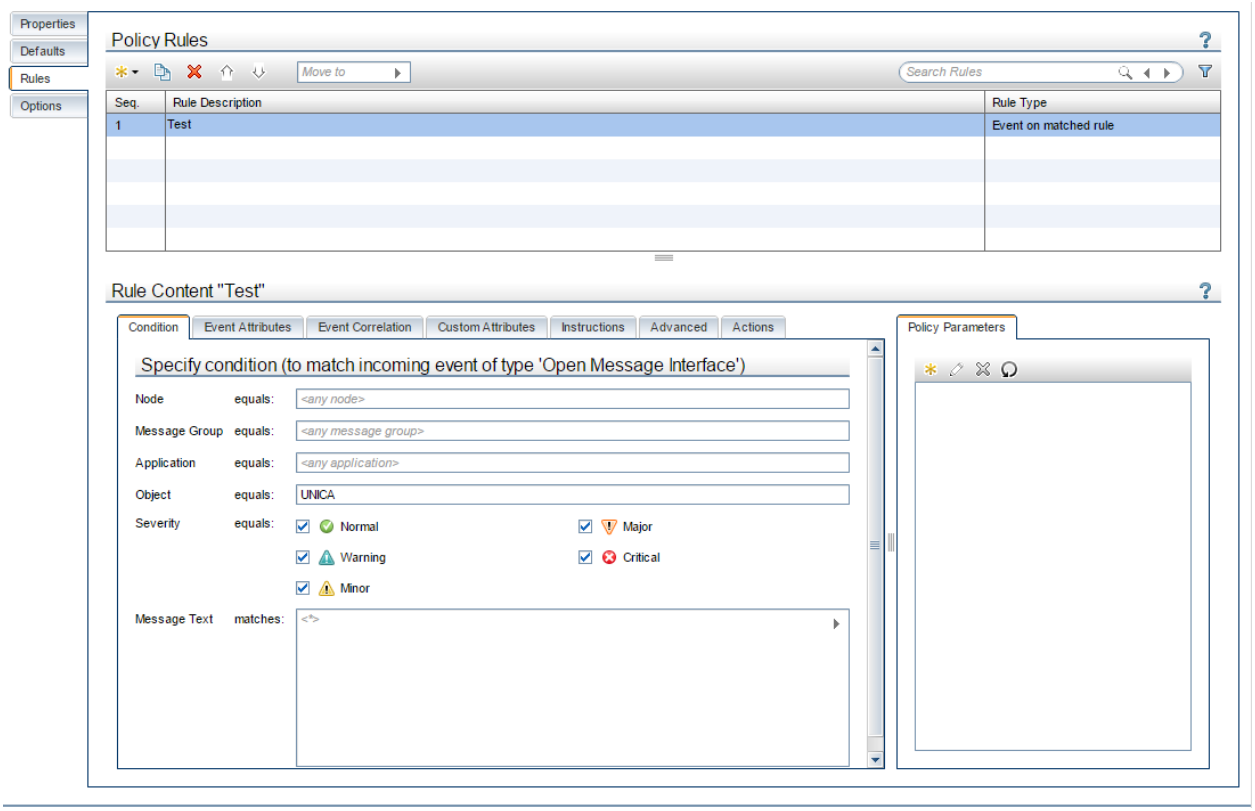


Figure 38: Select condition for events

Save and close.

In Policy Templates screen, select this new ‘Send Test Events Policy’ and press the assignment button:

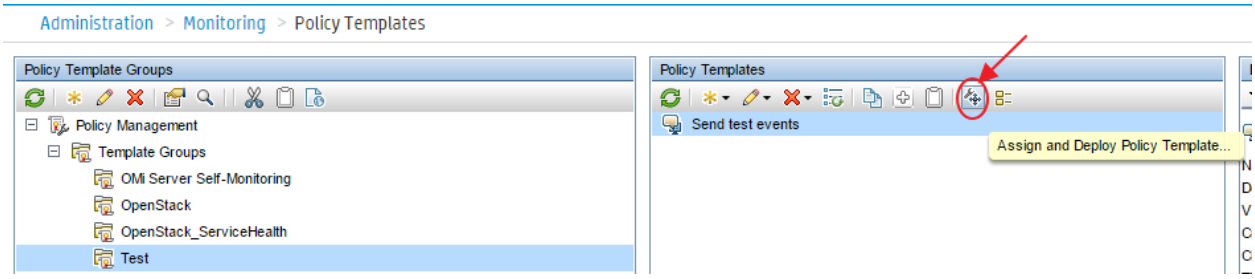


Figure 39: Assign and deploy policy template

And select OMi10 server from the list that appears (e.g., localhost is selected):

Click Next

Click Finish

Note: The below is optional and is only for troubleshooting purposes

Policy will be the automatically deployed to the OMi server. You can check it by running ‘ovpolicy –list’ on OMi server and see these ‘Send Test Event’ appears:

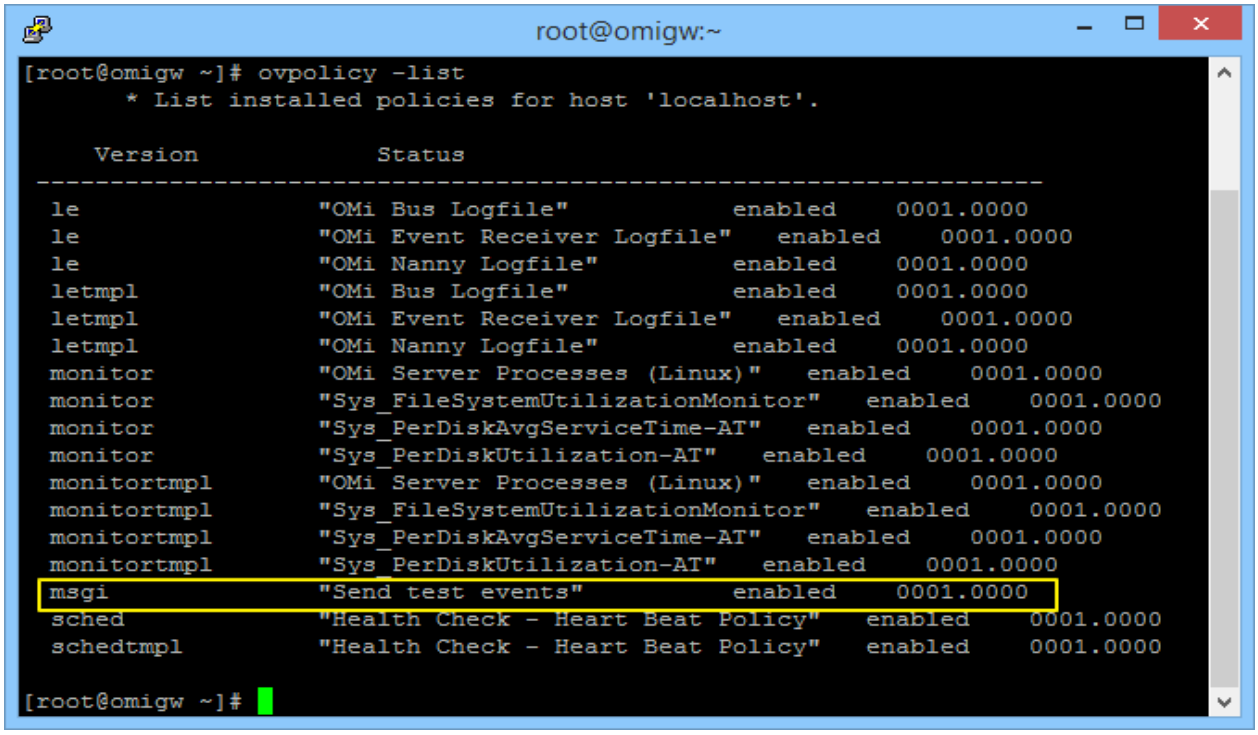


Figure 40: Send test event

5.2.5 Send new events

Enter OMi 10 server and generate new messages using command ‘opcmsg’ and object HPE

For example:

opcmsg a=a o=HPE msg_t=TESTAA

To view the above sent message in OMi, login to OMi and navigate to Workspaces >> Operations Console >> Event Perspective and select the infrastructure endpoint created for the same.

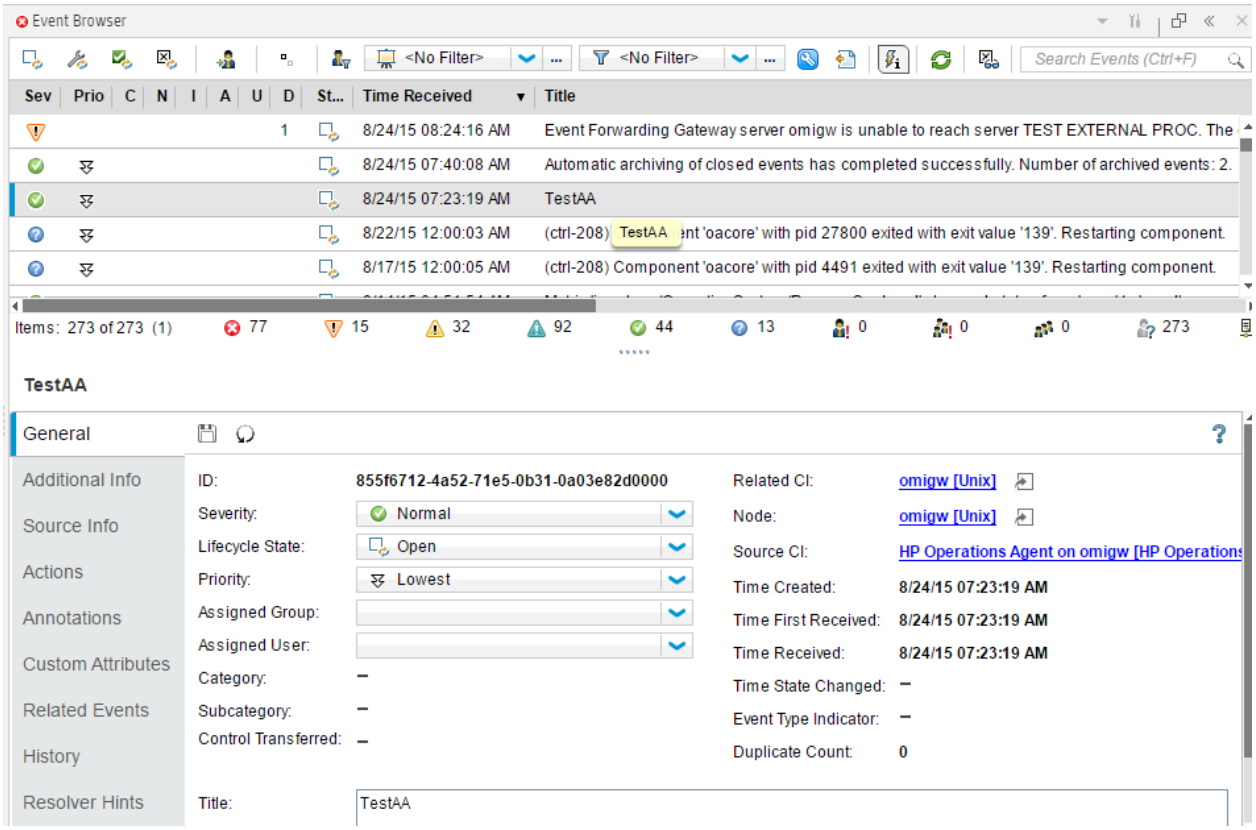


Figure 41: OMi operations console

Opcmsg requires object (o=<*>), application (a=<*>) and message text (msg_t=<*>) to work, but you can also set:

Severity (severity=critical|major|minor|warning|normal)

CI (node=<*>)

5.2.6 Verify event received in OMi-CA log

Go to directory /var/opt/openmediation-70/containers/instance-0/data/log

Open servicemix-info.log log file.

Events submitted by OMi should be present in servicemix-info.log log file.

Response should be send to OMi. This can be verified also if OMi doesn't send event again

5.2.7 Generate events in OMi using sendEvent tool

1. Navigate to directory /opt/HP/BSM/opr/support/
2. Execute below command to see all available options :

   ./sendEvent.sh -help

1. The options to be passed to the below scripts can be added as required.

   As an example please find below command:

   # ./send_event.sh -s critical -t "Instance is live migrated." -a NNMi -o HPE

5.3 NFV Director integration with BSM-C

NOTE:

- Oracle JDBC driver needs to be downloaded from the manufacturers site [NFVDv4.0 supports Oracle database 11gR2]; After download, rename it to oracle_jdbc.jar and it has to be placed in /opt/HPE/nfvd/tpp/jboss/standalone/deployments directory.
- Alternately this file can be copied from the Assurance VM [/opt/HPE/nfvd/tpp/jboss/standalone/deployments/oracle_jdbc.jar] or FulFillment VM from /opt/HP/jboss/modules/com/hp/ov/activator/edb/main/oracle_jdbc.jar to /opt/HPE/nfvd/tpp/jboss/standalone/deployments directory
- Rename the file as required to say ojdbc7.jar based on the JDK built version

1. Login into or access the BSM Connector UI
2. Access Event >> Database.
3. In the 'Connection' tab (inside the 'Source' tab), specify the connection settings:
   - Classpath: path of the *.jar* file of the JDBC driver in the BSMC server.
   - The suggested path is: **/usr/lib/java/ojdbc7.jar**
   - JBDC Driver Class: name of the class.
     - For Oracle: **'oracle.jdbc.driver.OracleDriver'**
   - Connect string: with the following format:
     - Oracle: **'jdbc:oracle:thin:@<db_host_IP>:1521:xe'**
   - User and password of the database.
   - Polling interval: interval to execute the query of the policy (by default 5 minutes).

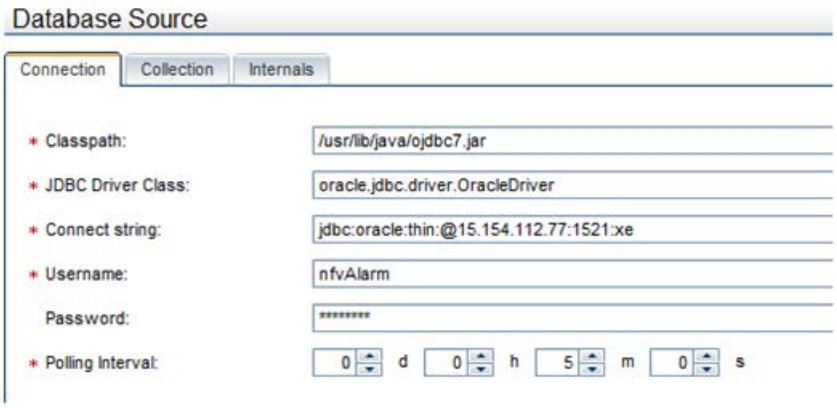


Figure 42: Set DB source

4. In the 'Collection' tab (inside the 'Source' tab), write the query that BSMC will execute. Session variables can be configured, as well as an initial statement. In BSMC the query can be as complex and specific as desired, there are no limits while it is a valid query in the database installed. The queries for the NFV Database can be found in the Database Query Configuration Section.

NOTE:

- The query for Alarms Policy and the query for Updates Policy are different.
- The below are sample queries to check connectivity and data collection. The can be obtained from the link – 'Database Query Configuration Section'

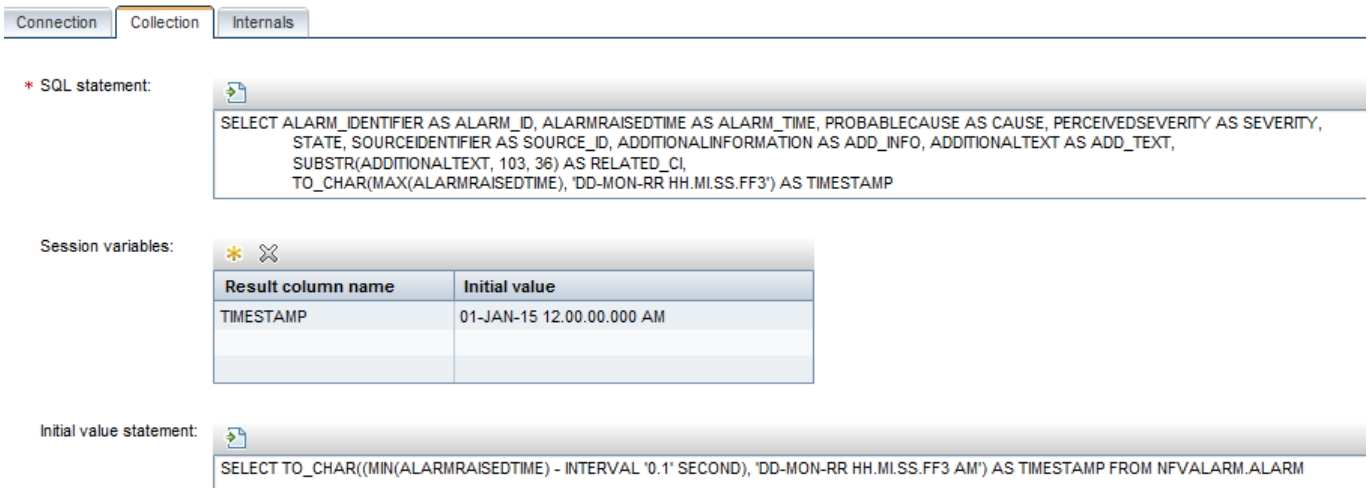


Figure 43: BSMC database query

5. To check if the query works and gets the fields, click on the icon just over the query text field, to execute the SQL statement. This is required to map the data in the mapping section later. The same execution can be done for the initial value statement (and the data will appear on 'Initial value sample data').

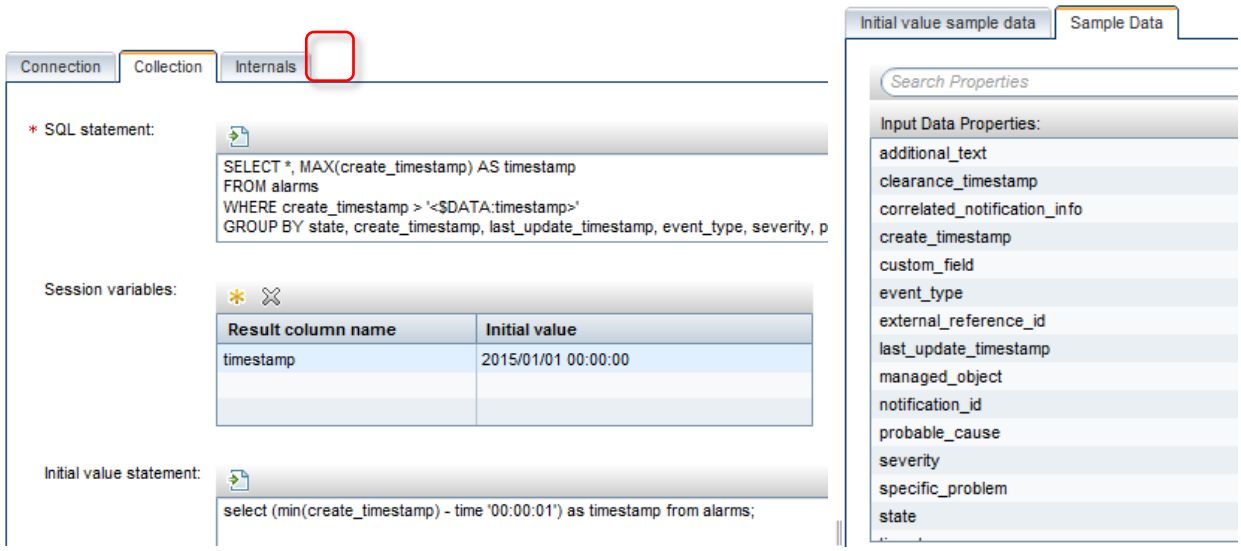


Figure 44: Verify BSMC database query

6. In the 'Mappings' tab, data mappings can be set (if necessary). To do so, in the left table, click on New, set a Map Name and in the input Data Property drag and drop one of the input data. Then, with the map selected, in the left table add as many data values to be mapped as needed. Values can be written or dropped from an input data, policy variables or OMi indicators. For NFV Database, the field Severity {'CLEAR', 'CRITICAL'} has to be mapped to recognizable states for the 'Severity' parameter: {'Normal','Critical'}. In the following screenshot shows how it should be set.

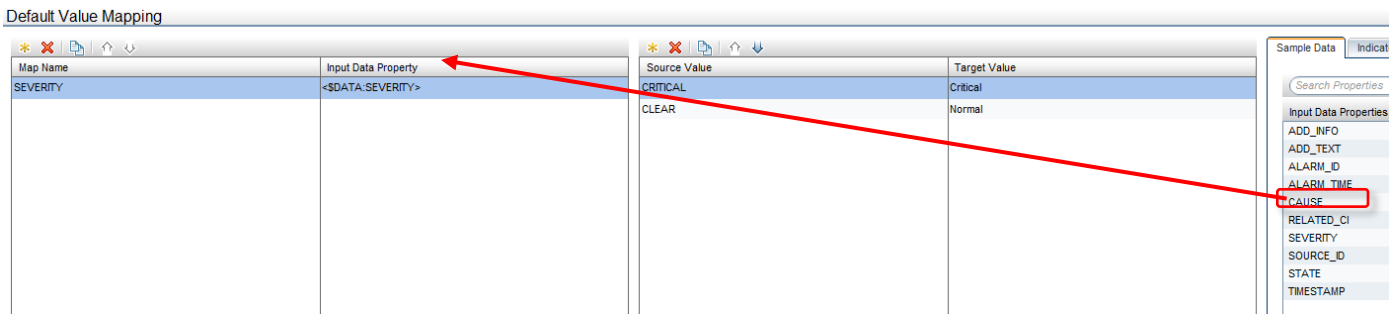


Figure 45: Set data mapping

7. In the ‘Event Attributes’ tab (inside the ‘Defaults’ tab), fill all the parameters needed. This attributes will be evaluated in OMi console; this is important because they will be the parameters that permit OMi to associate the event to an existing CI. The attributes can be data from the database, mapped data, a string directly written in the text field, operators, OMi indicators, or policy variables.

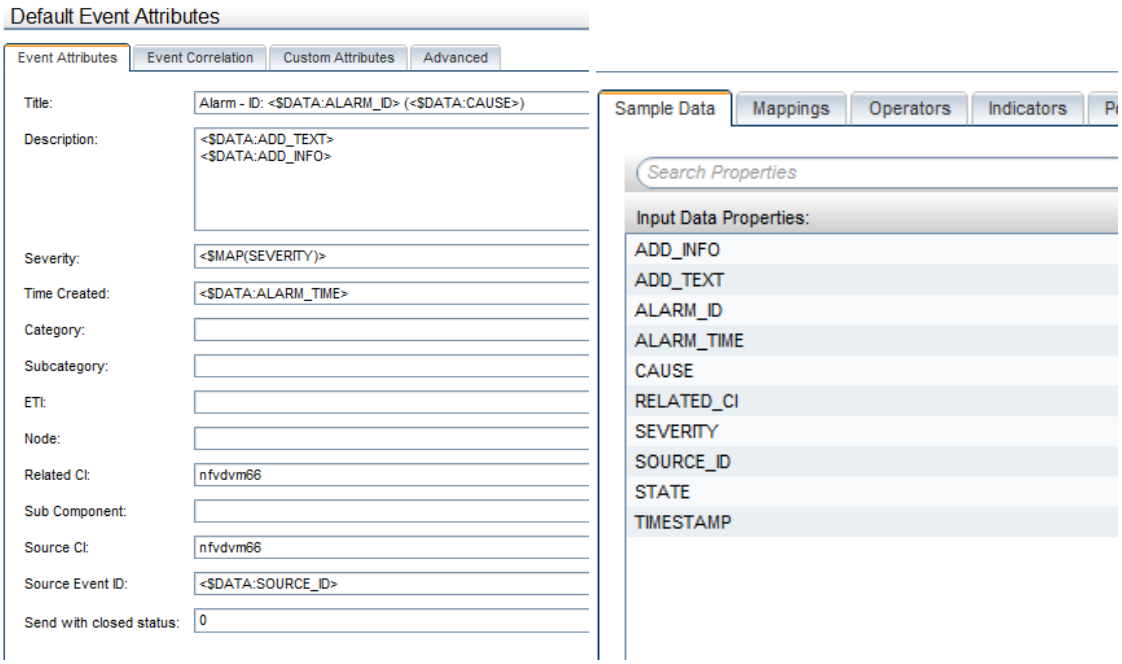


Figure 46: Fill event attributes

The following tables contain the fields to fill in the ‘Event Attributes’ tab for both Alarms and Updates policies, the specific string to copy in the fields and the database data used:

Table 2: Alarms policy: Alarm-to-event attribute mapping

Event Attributes (OMi)	**BSMC String**	**Data Used (NFV Director)**
Title	Alarm - ID: <$DATA:ALARM_ID> (<$DATA:CAUSE>)	ALARMIDENTIFIER, PROBABLECAUSE
Description	<$DATA:ADD_TEXT> <$DATA:ADD_INFO>	ADDITIONALINFORMATION, ADDITIONALTEXT
Severity	<$MAP(SEVERITY)>	PERCEIVEDSEVERITY
Time Created	<$DATA:ALARM_TIME>	ALARMRAISEDTIME
Related CI	nfvdvm66	None
Source CI	nfvdvm66	None
Source Event ID	<$DATA:SOURCE_ID>	SOURCEIDENTIFIER
Send with closed status	0	None

Table 3: Updates policy: Updates-to-event attribute mapping

Event Attributes (OMi)	**BSMC String**	**Data Used (NFV Director)**
Title	Alarm update - ID: <$DATA:UPDATE_ID> (Source alarm ID: <$DATA:ALARM_ID>) (<$DATA:CAUSE>)	IDENTIFIER, ALARMIDENTIFIER, PROBABLECAUSE
Description	<$DATA:ADD_TEXT>	ADDITIONALINFORMATION, ADDITIONALTEXT

	<$DATA:ADD_INFO>	
Severity	<$MAP(SEVERITY)>	PERCEIVEDSEVERITY
Time Created	<$DATA:ALARM_TIME>	ALARMRAISEDTIME
Related CI	nfvdvm66	None
Source CI	nfvdvm66	None
Source Event ID	<$DATA:SOURCE_ID>	SOURCEIDENTIFIER
Send with closed status	0	None

8. In the 'Event Correlation' tab, an event key is assigned for the alarms. This permits to OMi to relate ID's between alarms and updates, and close related events. The data to introduce are the following:

   - *For Alarms policy:*

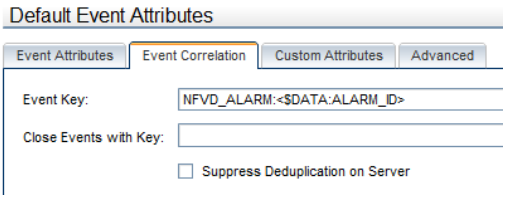


Figure 47: Alarm policy

   - *For Updates policy:*

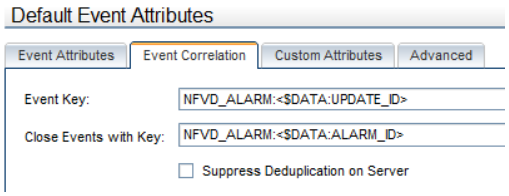
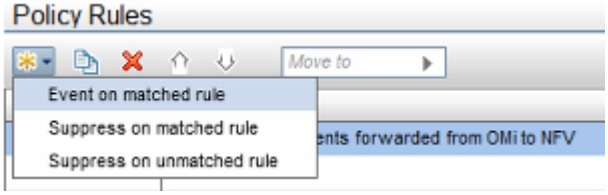


Figure 48: Updates policy

9. In the 'Rules' tab, a filtering rule must be created. To avoid looping of events between OMi and NFVD, the rule is set to generate an event for OMi, as long as the 'SOURCE_ID' parameter of the alarm does not have the value 'OMi' (temporary value, to be defined by NFV). To do so, click on '*New* > *Event on Matched Rule*', fill the description if desired and generate a condition in the Condition tab as shown below:



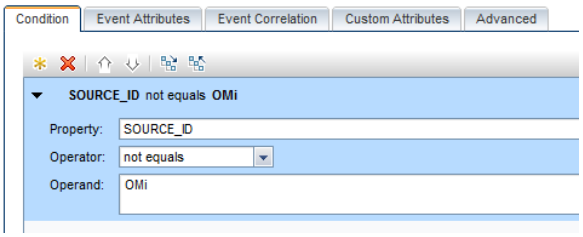


Figure 49: Create filtering role

10. Finally, on the Options tab, specify that **unmatched events are ignored**.
11. When finished configuring, click on 'Save and Close' and the policy can be seen on the main dashboard. The policy is deactivated by default, to activate it select the policy and click on the blue icon on the top, or right click > Activate.

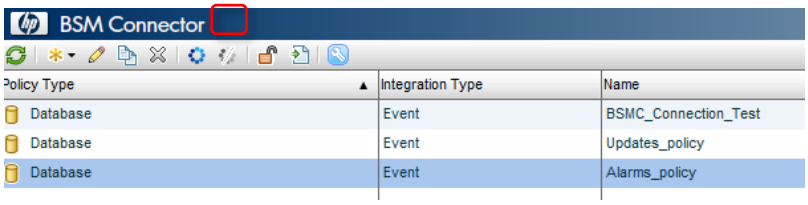


Figure 50: Activate policy

12. For further information regarding the policy creation, check the BSM Connector User Guide available in the OMi Complete Documentation Set.

5.3.1 Database Structure

The tables provided by NFV will have the following fields:

1. Alarms:

Table 4: Alarm database schema

Column	Type	Comment
ALARM_IDENTIFIER	Number	Unique ID
ADDITIONALINFORMATION	Text	
ADDITIONALTEXT	Text	Contains Related CI
ALARMRAISEDTIME	Timestamp	Timestamp for BSMC
ALARMTYPE	Text	
CLEARANCETIME	Timestamp	
CORRELATIONNOTIFICATIONID	Text	
EXTERNALREFERENCEIDENTIFIER	Text	
LASTUPDATETIME	Timestamp	
NOTIFICATIONIDENTIFIER	Text	
ORIGINATINGMANAGEDENTITY	Text	
PERCEIVEDSEVERITY	Text	{CLEAR, CRITICAL}
PROBABLECAUSE	Text	
SOURCEIDENTIFIER	Text	
SPECIFICPROBLEM	Text	
STATE	Text	

2. Updates:

Table 5: Alarm database schema

Column	Type	Comment
IDENTIFIER	Number	Unique ID of the update
ADDITIONALINFORMATION	Text	
ADDITIONALTEXT	Text	Contains Related CI
ALARMRAISEDTIME	Timestamp	Timestamp for BSMC
CLEARANCETIME	Timestamp	
CORRELATIONNOTIFICATIONID	Text	
EXTERNALREFERENCEIDENTIFIER	Text	
LASTUPDATETIME	Timestamp	
NOTIFICATIONIDENTIFIER	Text	
PERCEIVEDSEVERITY	Text	{CLEAR, CRITICAL}
PROBABLECAUSE	Text	
SOURCEIDENTIFIER	Text	
SPECIFICPROBLEM	Text	
STATE	Text	
ALARM_IDENTIFIER	Number	Unique ID of the source alarm

5.3.2 Database Query Configuration

NOTE: OMi integrates with Oracle

Collection tab

- Session Variables (Same for Alarms Policy and Updates Policy):

Table 6: Session Variables

Result Column Name	Initial Value
TIMESTAMP	01-JAN-15 12.00.00.000 AM

'TIMESTAMP' variable will act as a pointer who controls the last field read in the table (so that when the query executes periodically, does not read data more than once). The timestamp will be updated every time the query executes.

- Initial Value Statement:
  - Alarms Policy:

```
SELECT TO_CHAR((MIN(ALARMRAISEDTIME) - INTERVAL '0.1' SECOND), 'DD-MON-RR HH.MI.SS.FF3 AM') AS
TIMESTAMP FROM NFVALARM.ALARM
```

  - Updates Policy:

```
SELECT TO_CHAR((MIN(ALARMRAISEDTIME) - INTERVAL '0.1' SECOND), 'DD-MON-RR HH.MI.SS.FF3 AM') AS
TIMESTAMP FROM NFVALARM.ALARM_UPDATE
```

This query will be executed when the policy starts. It set the session variable 'TIMESTAMP' to the minimum date value of the table (actually 0.1 seconds earlier, so that the first field is read correctly in the main query).

- SQL Statement:

- Alarms Policy:

```
SELECT ALARM_IDENTIFIER AS ALARM_ID, ALARMRAISEDTIME AS
      ALARM_TIME, PROBABLECAUSE AS CAUSE, PERCEIVEDSEVERITY AS
      SEVERITY, STATE, SOURCEIDENTIFIER AS SOURCE_ID,
      ADDITIONALINFORMATION AS ADD_INFO, ADDITIONALTEXT AS ADD_TEXT,
      SUBSTR(ADDITIONALTEXT, 103, 36) AS RELATED_CI,
      TO_CHAR(MAX(ALARMRAISEDTIME), 'DD-MON-RR HH.MI.SS.FF3 AM') AS
      TIMESTAMP
FROM NFVALARM.ALARM
WHERE ALARMRAISEDTIME > '<$DATA:TIMESTAMP>' AND ROWNUM < 1001
GROUP BY ALARM_IDENTIFIER, ALARMRAISEDTIME, PROBABLECAUSE,
        PERCEIVEDSEVERITY, STATE, SOURCEIDENTIFIER,
        ADDITIONALINFORMATION, ADDITIONALTEXT
ORDER BY ALARM_TIME ASC
```

- Updates Policy:

```
SELECT IDENTIFIER AS UPDATE_ID, ALARM_IDENTIFIER AS ALARM_ID,
      ALARMRAISEDTIME AS ALARM_TIME, PROBABLECAUSE AS CAUSE,
      PERCEIVEDSEVERITY AS SEVERITY, STATE, SOURCEIDENTIFIER AS
      SOURCE_ID, ADDITIONALINFORMATION AS ADD_INFO, ADDITIONALTEXT
      AS ADD_TEXT, SUBSTR(ADDITIONALTEXT, 103, 36) AS RELATED_CI,
      TO_CHAR(MAX(ALARMRAISEDTIME), 'DD-MON-RR HH.MI.SS.FF3 AM') AS
      TIMESTAMP
FROM NFVALARM.ALARM_UPDATE
WHERE ALARMRAISEDTIME > '<$DATA:TIMESTAMP> AND ROWNUM < 1001
GROUP BY IDENTIFIER, ALARM_IDENTIFIER, ALARMRAISEDTIME,
       PROBABLECAUSE, PERCEIVEDSEVERITY, STATE, SOURCEIDENTIFIER,
       ADDITIONALINFORMATION, ADDITIONALTEXT
ORDER BY ALARM_TIME ASC
```

Each query sets the timestamp to the highest value of the result set, gets new alarms/updates since the last timestamp, and orders it by date.

A limit of 1000 events per interval (5 minutes by default) is set. This is in case the connection between NFVD and BSMC is lost and a big number of alarms are to be read from the database when reconnecting. This measure will avoid event storm in OMi and make the data easier to read and control.

5.4 BSM-C integration with OMi

To configure BSM Connector to forward events to OMi after finishing the installation, on the BSMC server, navigate to the following path:

```
cd /var/opt/OV/installation/HPOprBSMC
```

Execute the following instruction:

```
bsmc-conf.sh -srv <hostname> [-cert_srv <hostname>]  -admin_user <username> <password>
```

NOTE: The above instruction has some more input parameters available, but this is the basic configuration. The Certificate Server must be introduced in case OMi Gateway and OMi DPS are installed in distributed machines. In that case, the main server should be the gateway and the certificate server should be the DPS

5.5 OpenStack OMi event payload samples

Event Payload Samples	Example
700.001 Instance Failed	
700.003 Instance Rebooted	
700.004 Instance Paused	
Instance Suspended	
Compute Node Down/Up	
Live Migration	
Cold Migration	
Evacuation	
Server/Compute node brought down for maintenance	

5.6 VMWare Event Payload

Event Payload Samples	Example
VM Power Off/On	
VM Migrating/Migrated	
Compute node Up/Down	

5.7 OMi Event Payload

Event Payload Samples	Example
Compute node Up/Down	
Server/Compute node brought down for maintenance	

Appendix A NFV Director topology structure

What is needed

Within NFV Director it is needed to have at least 1 Datacenter tree attached to the resource pool of the domain. The Datacenter tree is the representation of the VIM with all its structure including:

- Servers and its OpenStack available resources
- Regions and the OpenStack modules related to them

Some Datacenters may have the Networking module handled by a DCN module so it is needed to have a

RELATIONSHIP between the OpenStack module and the DCN module

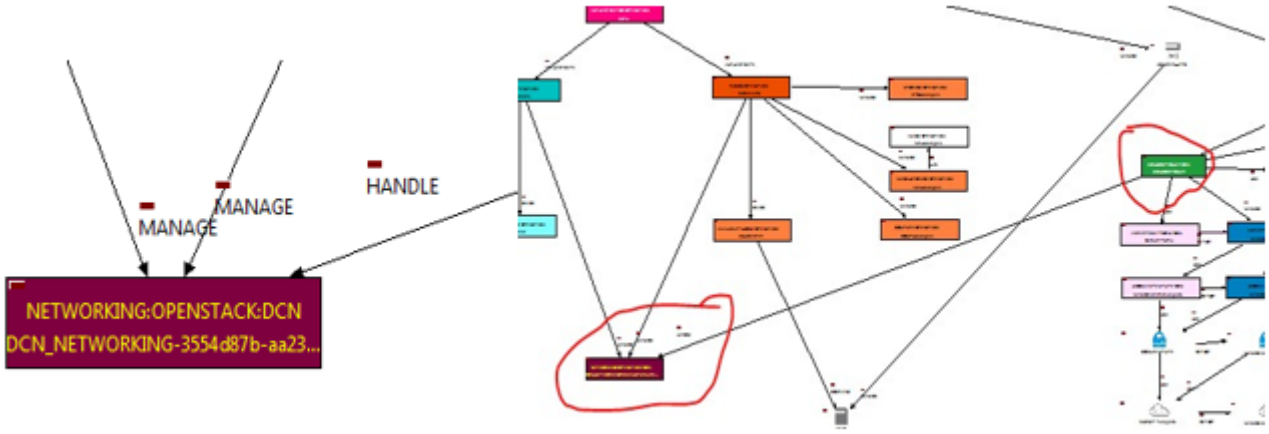


Figure 51: Relationship between OpenStack and DCN modules

Also in order to make use of DCN floating ips, the shared management network the datacenter must have REATIONSHIP to the corresponding SHARED_RESOURCE:DCN

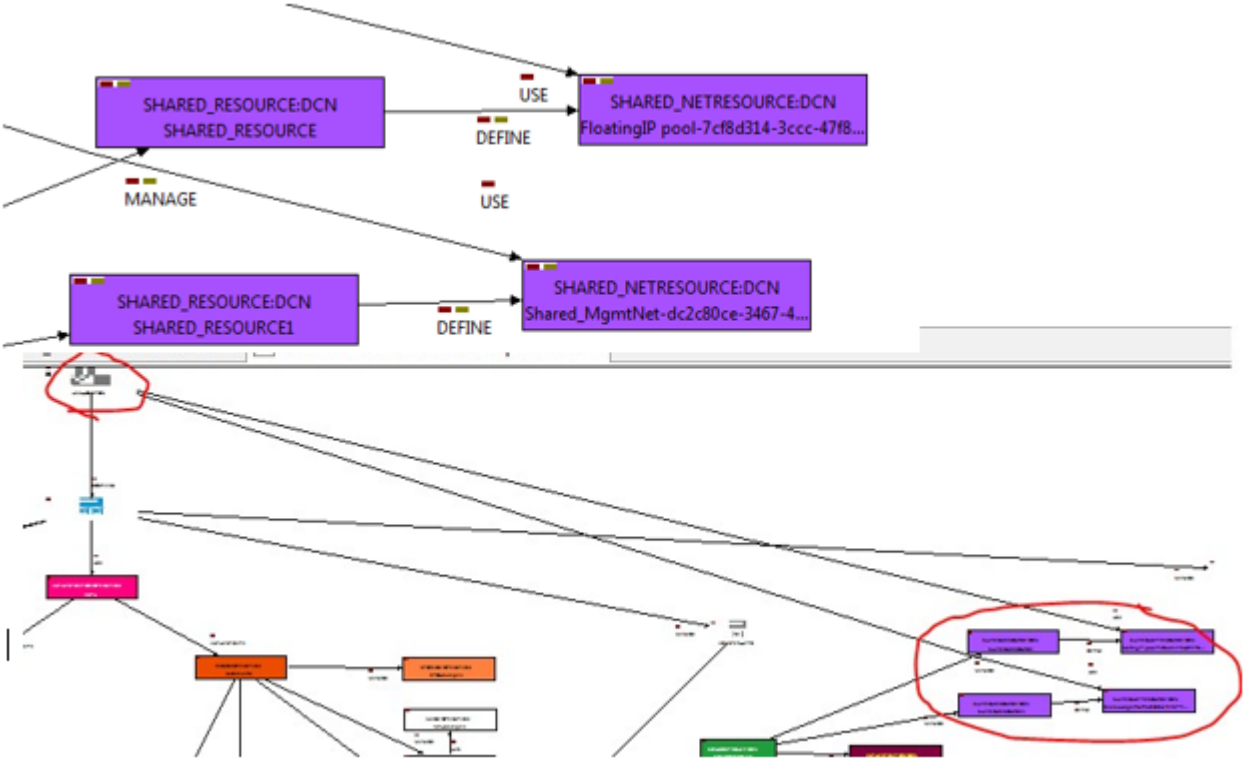


Figure 52: DC to SHARED_RESOURCE:DCN relationship

If the Discovery version installed only discover the Datacenter the DCN side must be manually uploaded.

If the Discovery version installed discover the Datacenter AND the DCN side it is still needed to create the relationships:

- From datacenter to SHARED_RESOURCE:DCN
- From SDN_CONTROLLER:DCN to NETWORKING:OPNESTACK:DCN to

NFV Director SDN work

Important attributes

Authorization

Make sure user password and URL are manually and correctly set into AUTHORIZATION artifact

Shared network artifacts

Make sure those do NOT have allocation pools configured (start / end ip)

Subnetwork of Virtual Link on Tenant_mngt template

Make sure it has blank value on the gateway_ip attribute of the subnetwork

What is needed

As starting point at least 2 shared resources must be MANUALLY created in DCN at platform level (so NOT tied to any organization) AND the corresponding OpenStack side OpenStack

- One management network for the Datacenter
- At least One floating ip pool

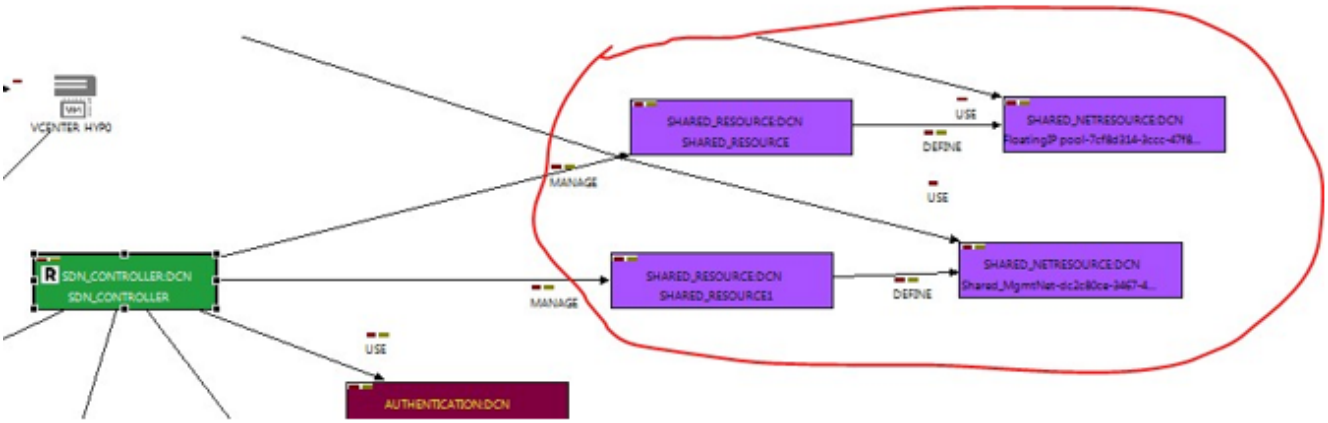


Figure 53: Manually create shared resources

MANAGEMENT organization with a MANAGEMENT L3Domain must be manually created in DCN containing the management network with its macros with its corresponding on the OpenStack side

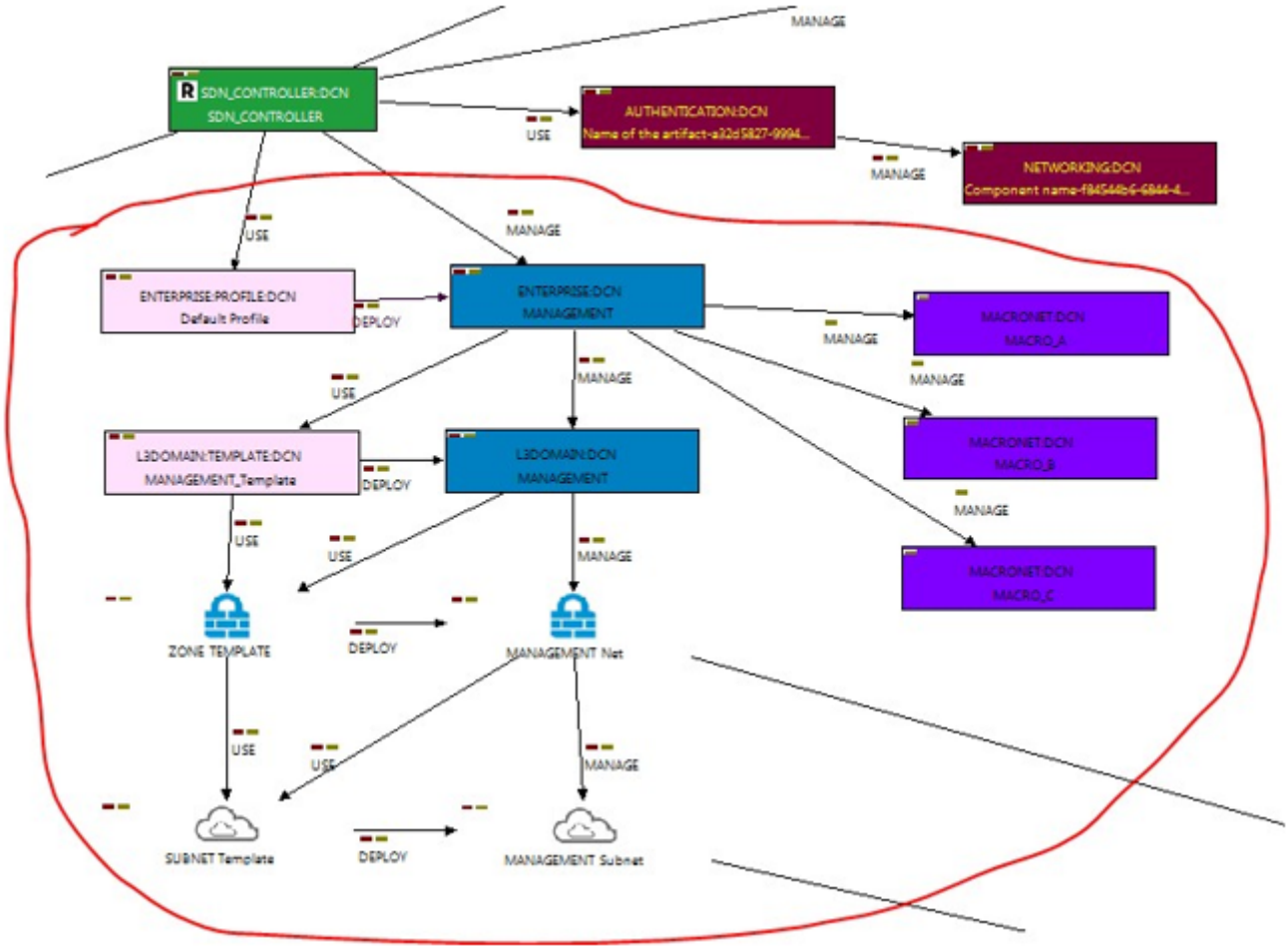


Figure 54: Manually create L3Domain

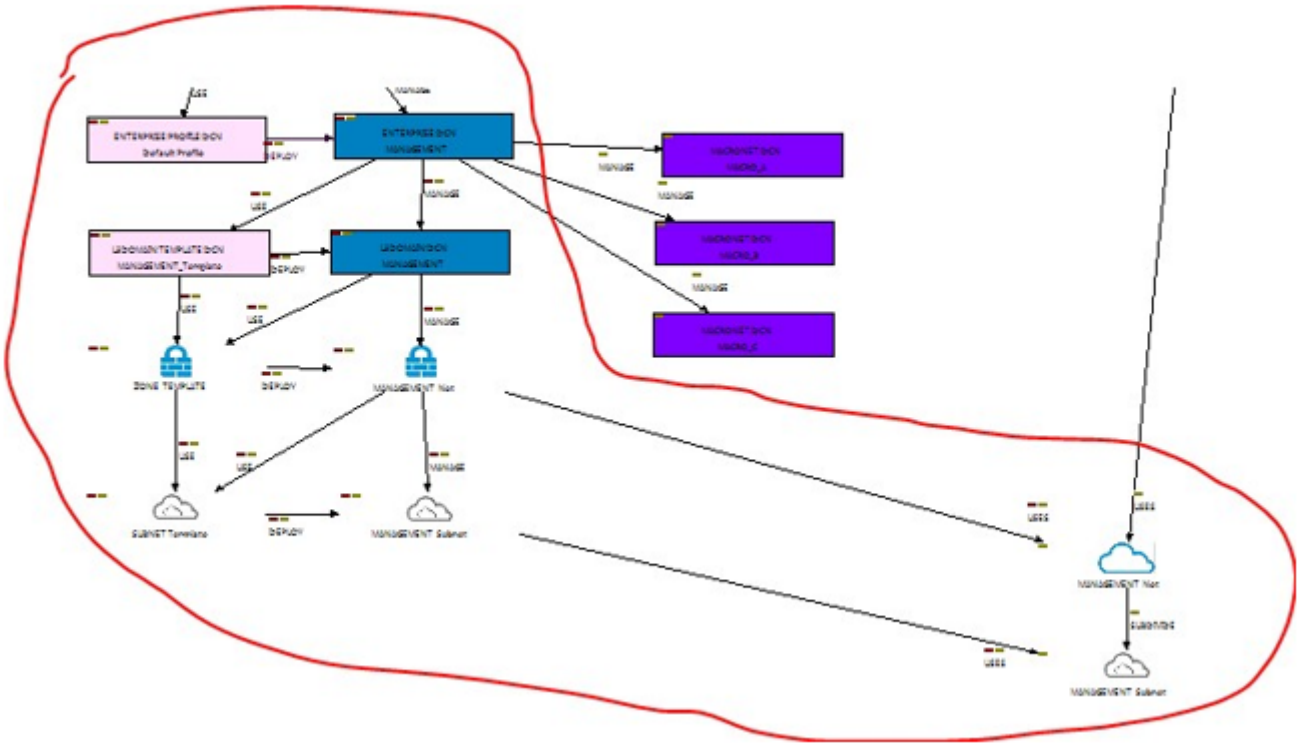


Figure 55: Manually create L3Domain

NFV Director OpenStack work

Important attributes

Authorization

Make sure user password and URL are manually and correctly set into AUTHORIZATION artifact

Server hostnames

Make sure hostnames of server matches (case sensitive) the OpenStack names

Subnetwork of Virtual Link on virtual link template

Make sure it has NO_GATEWAY value on the gateway_ip attribute of the subnetwork

What is needed

Within OpenStack it must exist the management tenant MATCHING the management L3domain containing a management network matching the Management DCN network.

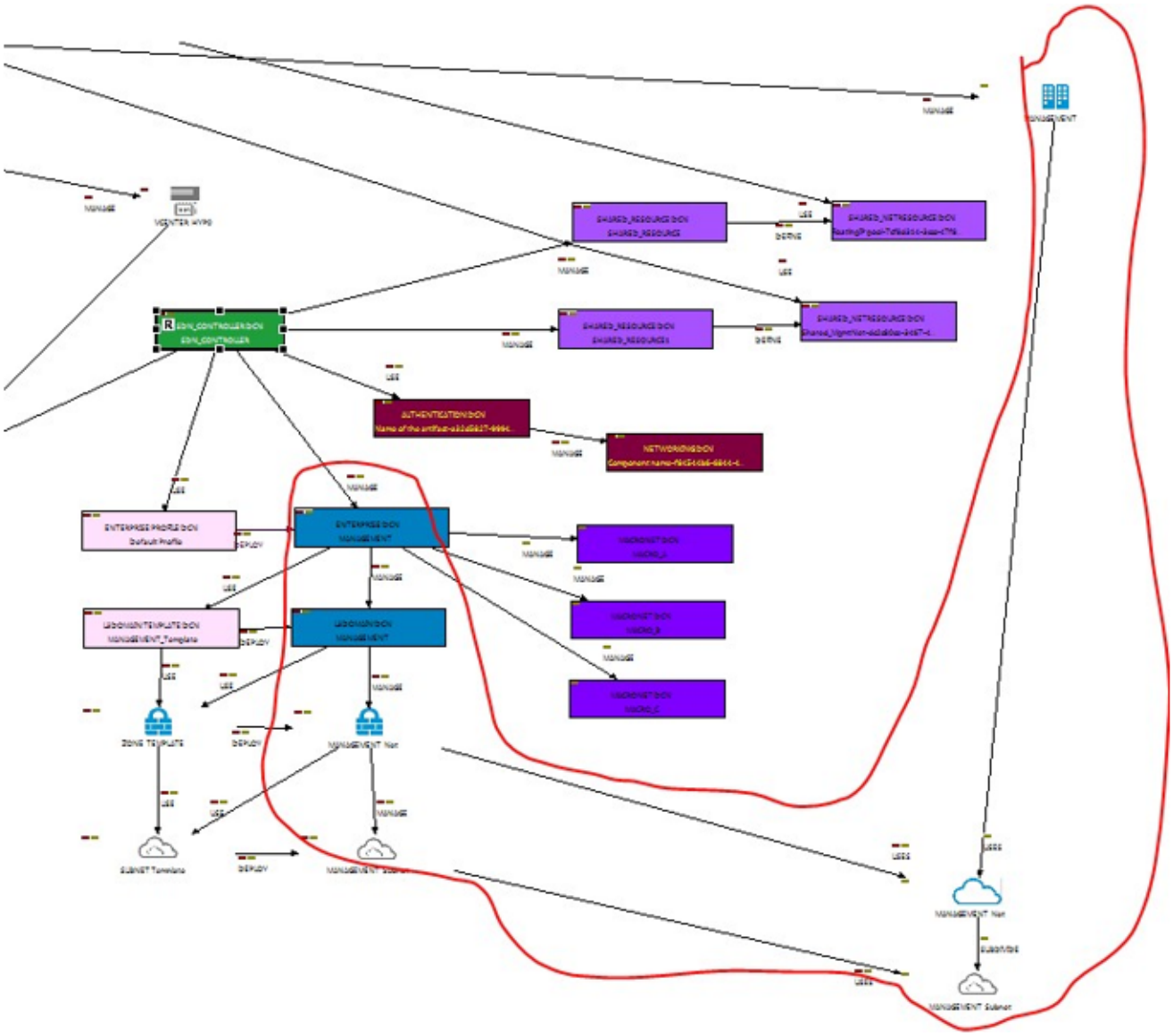


Figure 56: Management tenant matching L3Domain