

# Getting Your Cisco ACI Fabrics Ready for Cisco Nexus Dashboard Insights

September 15, 2021

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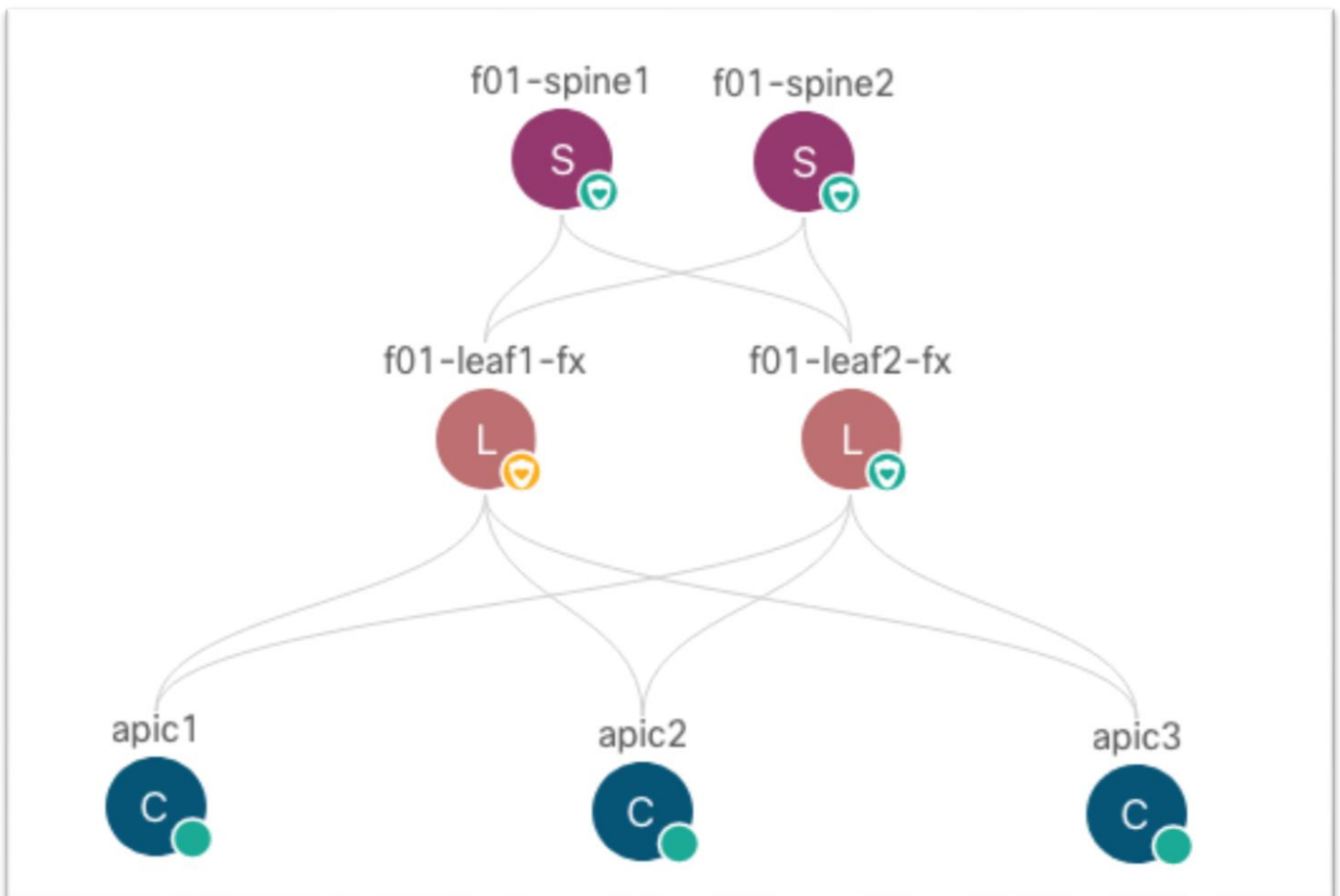
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## Introduction

Cisco Nexus Dashboard Insights is the Day-2-Operations tool for Cisco Data Center fabrics. Focusing on anomalies in the network, Cisco Nexus Dashboard Insights gives operators quick visibility into the network health through a modern and scalable architecture. For more information, see the [Cisco Nexus Dashboard Insights White Paper](#).

This document is intended to serve as a checklist and guide for configuring Cisco ACI fabrics to support Cisco Nexus Dashboard Insights. In this white paper, prerequisites such as in-band management, how to connect Cisco Nexus Dashboard to Cisco ACI, Network Time Protocol (NTP), Precision Time Protocol (PTP), and Monitoring policies will be discussed. Further, the configuration of Cisco Nexus Dashboard and Cisco Nexus Dashboard Insights to onboard apps will be covered. Finally, there will be a verification and troubleshooting section.

We will use an example fabric with the following topology to configure the below settings. This fabric is running release 5.1(3e) and is cabled in the following manner:



**Note:** The documentation set for this product strives to use bias-free language. For the purposes of this documentation set, bias-free is defined as language that does not imply discrimination based on age, disability, gender, racial identity, ethnic identity, sexual orientation, socioeconomic status, and intersectionality. Exceptions may be present in the documentation due to language that is hardcoded in the user interfaces of the product software, language used based on RFP documentation, or language that is used by a referenced third-party product.

# Cisco Nexus Dashboard Insights Configuration Prerequisites for Cisco ACI Fabrics

## In-band Management

The Cisco Nexus Dashboard Insights service uses the Cisco ACI in-band management network to receive the network telemetry data from the Cisco APIC controllers and all the switches in the fabric. Therefore, you must configure in-band management for your Cisco ACI fabric. The in-band management configuration can be summarized with the following major pieces:

- Access Policies for Cisco APIC interfaces (access ports)
- MGMT tenant in-band bridge domain with a subnet
- MGMT tenant node management address (Cisco APIC, leaf switch, and spine switch)
- MGMT tenant node management EPG for in-band management

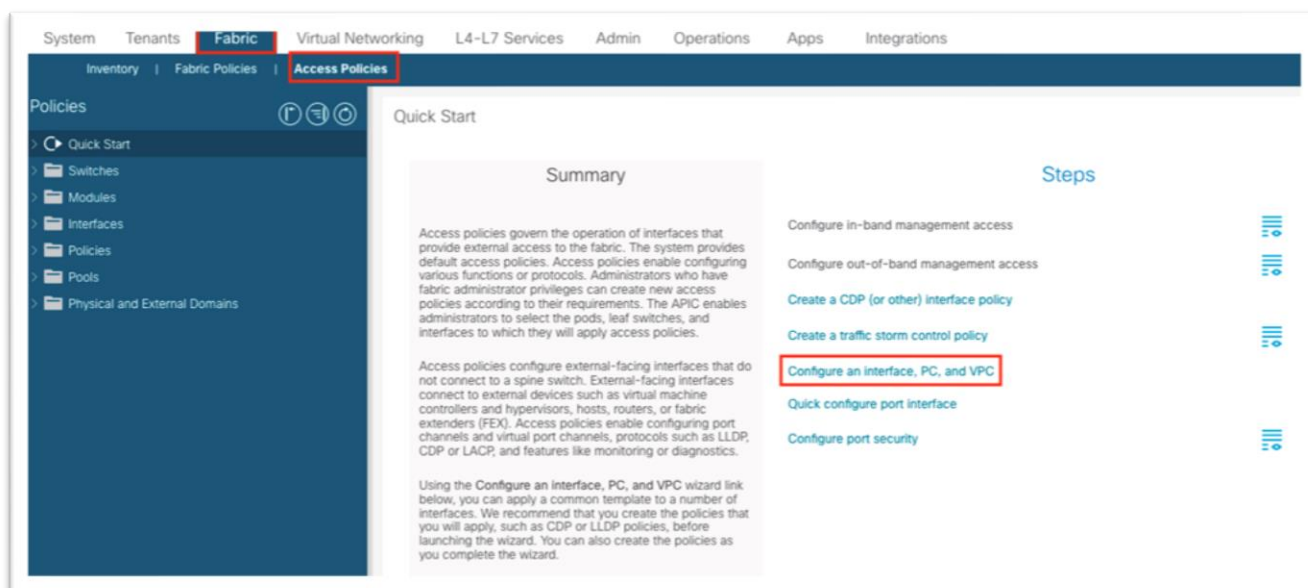
This section shows how to configure the in-band management EPG and allocate in-band IP addresses to the fabric devices. For more information, see the [Cisco APIC Basic Configuration Guide, Release 5.1\(x\) - Management](#).

You must open specific ports to use in-band management. For information about which ports to open, see the various "Communication Ports" sections of the [Cisco Nexus Dashboard User Guide](#) for the release that you deployed.

### Configuration Steps

The steps include:

1. Navigate to **Fabric > Access Policies** and in the **Quick Start** menu, choose **Configure Interface, PC and vPC**.



2. In the dialog, click the green plus + symbol twice to expand the wizard.
  - a. Select the two switches where the Cisco APIC ports are connected from the drop-down list.
  - b. Enter a name in the **Switch Profile Name** field.

- 
- c. Set the **Interface Type** to **Individual**.
  - d. In the **Interfaces** field, enter the Cisco APIC interfaces either as a comma-separated list or as a range.
  - e. Enter a name in the **Interface Selector Name** field.
  - f. Set the **Interface Policy Group** to **Create One**. You do not need to select an interface-level policy; the defaults are sufficient.
  - g. In the **Attached Device Type** drop-down list, choose **Bare Metal**.
  - h. The **Domain** and **VLAN** should both be set to **Create One**.
    - i. Enter a name in the **Domain Name** field to name the physical domain that is associated with in-band management.
    - ii. Enter a VLAN ID that will be used for in-band management in the fabric.

Select Switches To Configure Interfaces: **Quick** Advanced

Switches:  Switch Profile Name:

Interface Type: **Individual** PC VPC FC FC PC

Interfaces:  Interface Selector Name:   
Select interfaces by typing, e.g. 1/17-18.

Interface Policy Group: **Create One** Choose One

Link Level Policy:  CDP Policy:

MCP Policy:  LLDP Policy:

STP Interface Policy:  Monitoring Policy:

Storm Control Policy:  L2 Interface Policy:

Port Security Policy:  PoE Policy:

Ingress Data Plane Policing Policy:  Egress Data Plane Policing Policy:

Priority Flow Control Policy:  IPv4 NetFlow Monitor Policy:

Slow Drain Policy:  IPv6 NetFlow Monitor Policy:

Fibre Channel Interface Policy:  Layer2-Switched (CE type) NetFlow Monitor Policy:

---

Attached Device Type:

Domain: **Create One** Choose One Domain Name:

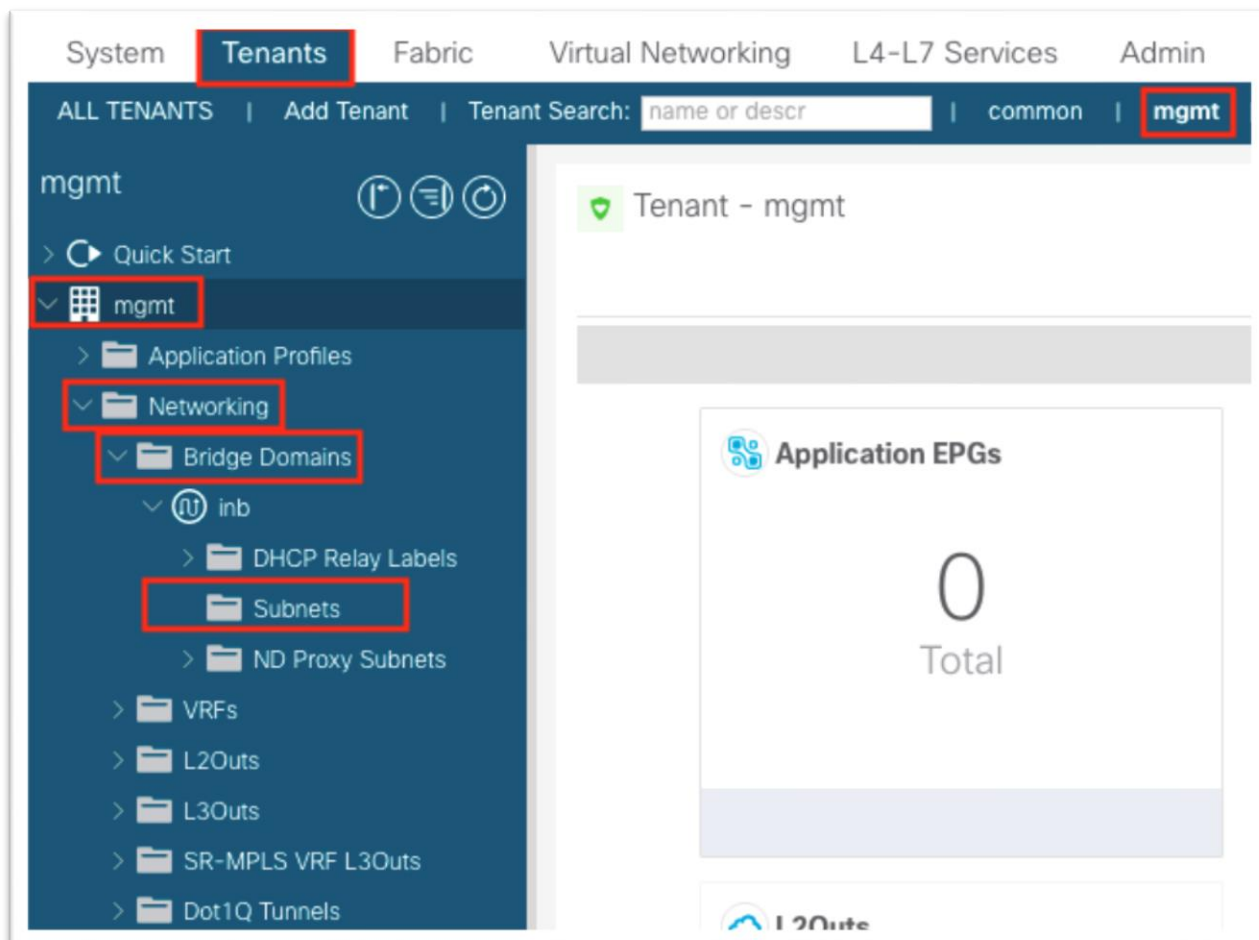
VLAN: **Create One** Choose One VLAN Range:   
Please use comma to separate VLANs.

- i. Click **Save**.
- j. Click **Save** again.

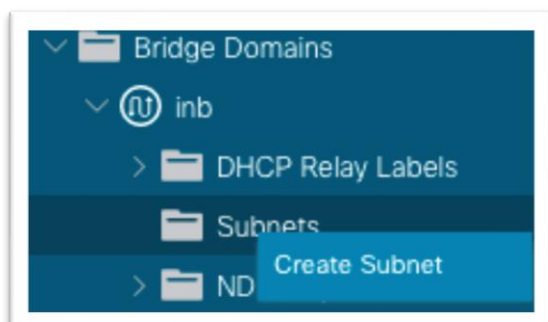




3. Navigate to **Tenants > mgmt**.
4. Expand **Networking > Bridge Domains > inb**.

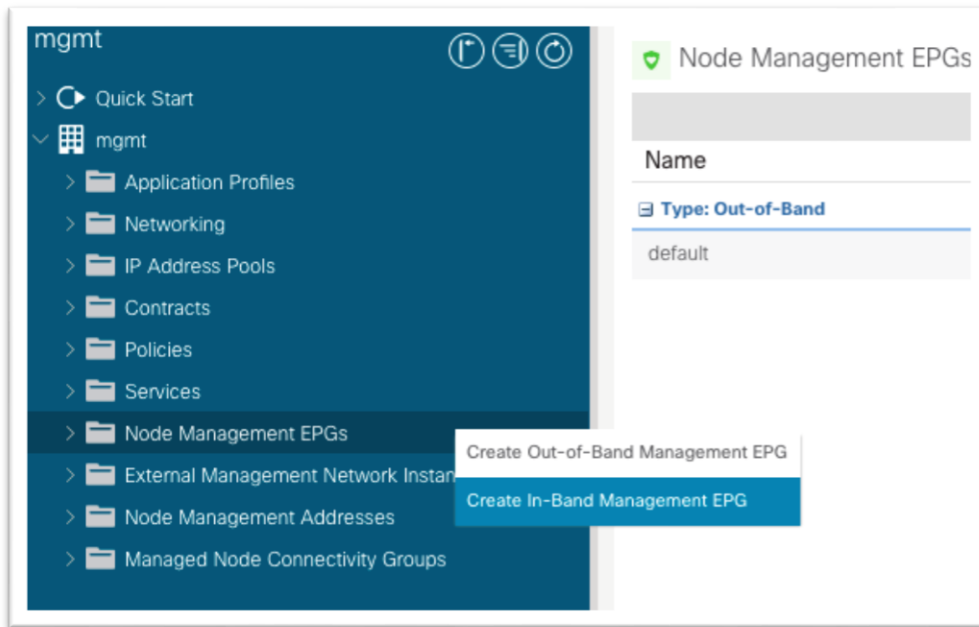


5. Right-click the **Subnets** folder and choose **Create Subnet**.



6. In the dialog, enter the gateway IP address of the in-band management subnet.
  - a. Choose **Advertised Externally** if needed for L3Out advertisement.
7. Click **Submit**.

8. Still in the mgmt tenant, right-click the **Node Management EPGs** folder and choose **Create In-Band Management EPG**.



9. In the dialog:
  - a. Enter a name for the in-band management EPG.
  - b. Enter the VLAN defined in step 2.h.ii when configuring access policies. Use "VLAN-####" as the format.
  - c. In the **Bridge Domain** drop-down list, choose the in-band bridge domain.
  - d. Click **Submit**.

Create In-Band Management EPG

Name: inb

Tags: + Click to add a new tag annotation

Encap: vlan-999  
e.g. vlan-1

Bridge Domain: inb

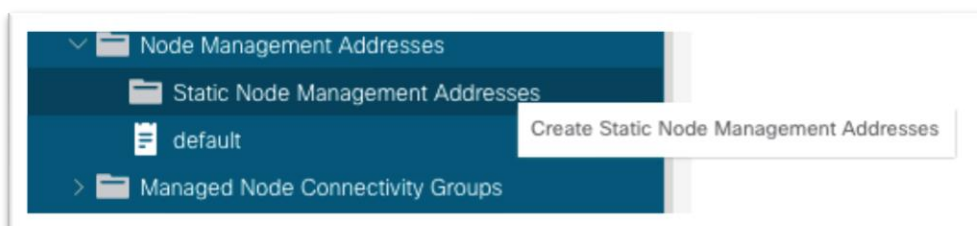
Static Routes:

IP Address
------------

Cancel Submit

10. Still in the mgmt tenant, expand **Node Management Addresses**.

11. Right-click **Static Node Management Addresses** and choose **Create Static Node Management Addresses**.



12. In the dialog:

- For **Node Range**, enter a range of 1 to 1 to configure Cisco APIC 1.
- Put a check in the **In-band Addresses** check box.
- In the **In-Band Management EPG** drop-down list, choose the EPG that you created in step 9.
- In the **In-Band IPv4 Address** field, enter the IP address that should be used for the node with the CIDR mask.
- In the **In-Band IPv4 Gateway** field, enter the IP address of the gateway assigned to the in-band bridge domain in step 6.

f. Click **Submit**.

13. Repeat step 12 for each Cisco APIC using node ID 1, 2, 3 and so on as needed. Likewise, repeat the step for each leaf and spine node ID in the fabric.

## Connecting Cisco ACI In-band Management Network with the Cisco Nexus Dashboard Data Network - Option 1a: Directly Connected to an EPG via Physical Domain and Static Path Binding

Cisco Nexus Dashboard data interfaces network should be reachable to the Cisco ACI in-band network. For simplicity, there are two major connectivity options available to accomplish this:

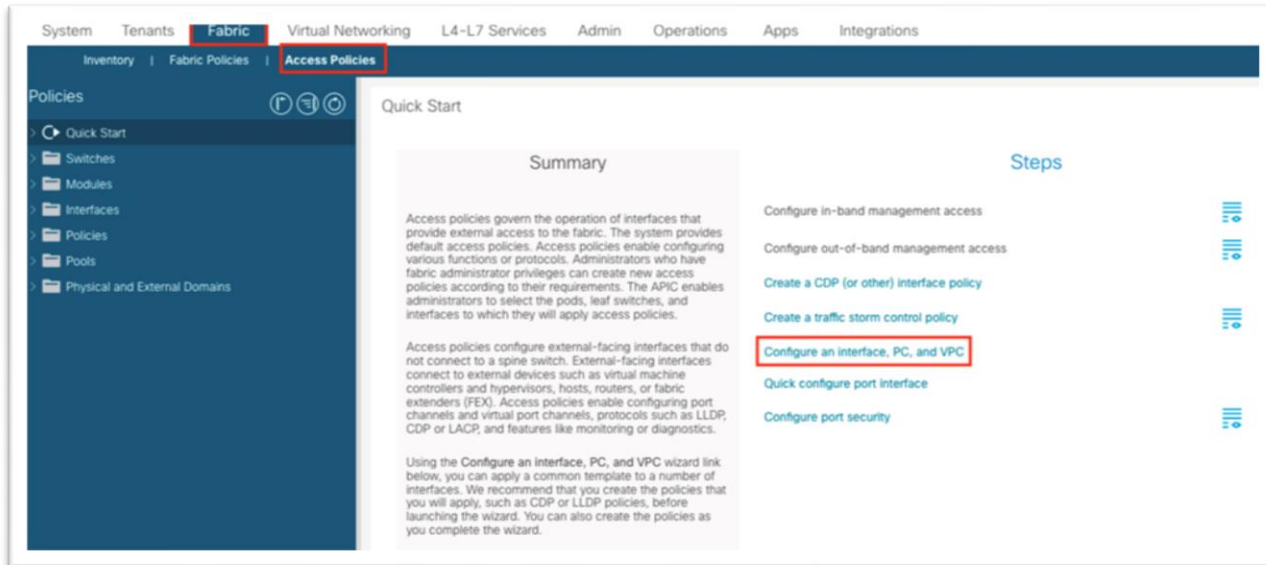
- Cisco Nexus Dashboard as an endpoint inside Cisco ACI, residing in a new and unique bridge domain and EPG combination
- Cisco Nexus Dashboard reachable using a L3Out in the MGMT tenant in-band VRF instance

With the first option, the Cisco Nexus Dashboard should be learned as a Layer 3 endpoint in Cisco ACI and the Cisco ACI fabric should act as the gateway for the Cisco Nexus Dashboard. To reach the in-band bridge domain subnet, either deploy the Cisco Nexus Dashboard bridge domain locally inside the MGMT tenant tied to the in-band VRF instance, otherwise route leaking would be necessary to leak the Cisco Nexus Dashboard subnet into the in-band VRF instance and likewise the in-band bridge domain subnet into the Cisco Nexus Dashboard VRF instance.

### Configuration Steps

The steps include:

1. Navigate to **Fabric > Access Policies** and in the **Quick Start** menu choose **Configure Interface, PC and vPC**.



2. In the dialog, click the green plus + symbol twice to expand the wizard.
  - a. Select the two switches where the Cisco Nexus Dashboard Data ports are connected from the drop-down list.
  - b. Enter a name in the **Switch Profile Name** field.
  - c. Set the **Interface** to **Individual**.
  - d. In the **Interfaces** field, enter the Cisco Nexus Dashboard interfaces as either a comma-separated list or as a range.
  - e. Enter a name in the **Interface Selector Name** field.
  - f. Set the **Interface Policy Group** to **Create One**. You do not need to select an interface-level policy; the defaults are sufficient.
  - g. In the **Attached Device Type** drop-down list, choose **Bare Metal**.
  - h. The **Domain** and **VLAN** should both be set to **Create One**.
    - i. Enter a name in the **Domain Name** field to name the physical domain that is associated with in-band management.
    - ii. Enter a VLAN ID that will be used for static path bindings in the fabric.

Select Switches To Configure Interfaces: **Quick** Advanced

Switches:  Switch Profile Name:

Interface Type: **Individual** PC VPC FC FC PC

Interfaces:  Interface Selector Name:   
Select interfaces by typing, e.g. 1/17-18.

Interface Policy Group: **Create One** Choose One

Link Level Policy:  CDP Policy:

MCP Policy:  LLDP Policy:

STP Interface Policy:  Monitoring Policy:

Storm Control Policy:  L2 Interface Policy:

Port Security Policy:  PoE Policy:

Ingress Data Plane Policing Policy:  Egress Data Plane Policing Policy:

Priority Flow Control Policy:  IPv4 NetFlow Monitor Policy:

Slow Drain Policy:  IPv6 NetFlow Monitor Policy:

Fibre Channel Interface Policy:  Layer2-Switched (CE type) NetFlow Monitor Policy:

---

Attached Device Type:


Domain: **Create One** Choose One Domain Name:


VLAN: **Create One** Choose One VLAN Range:   
Please use comma to separate VLANs.

- i. Click **Save**.
- j. Click **Save** again.

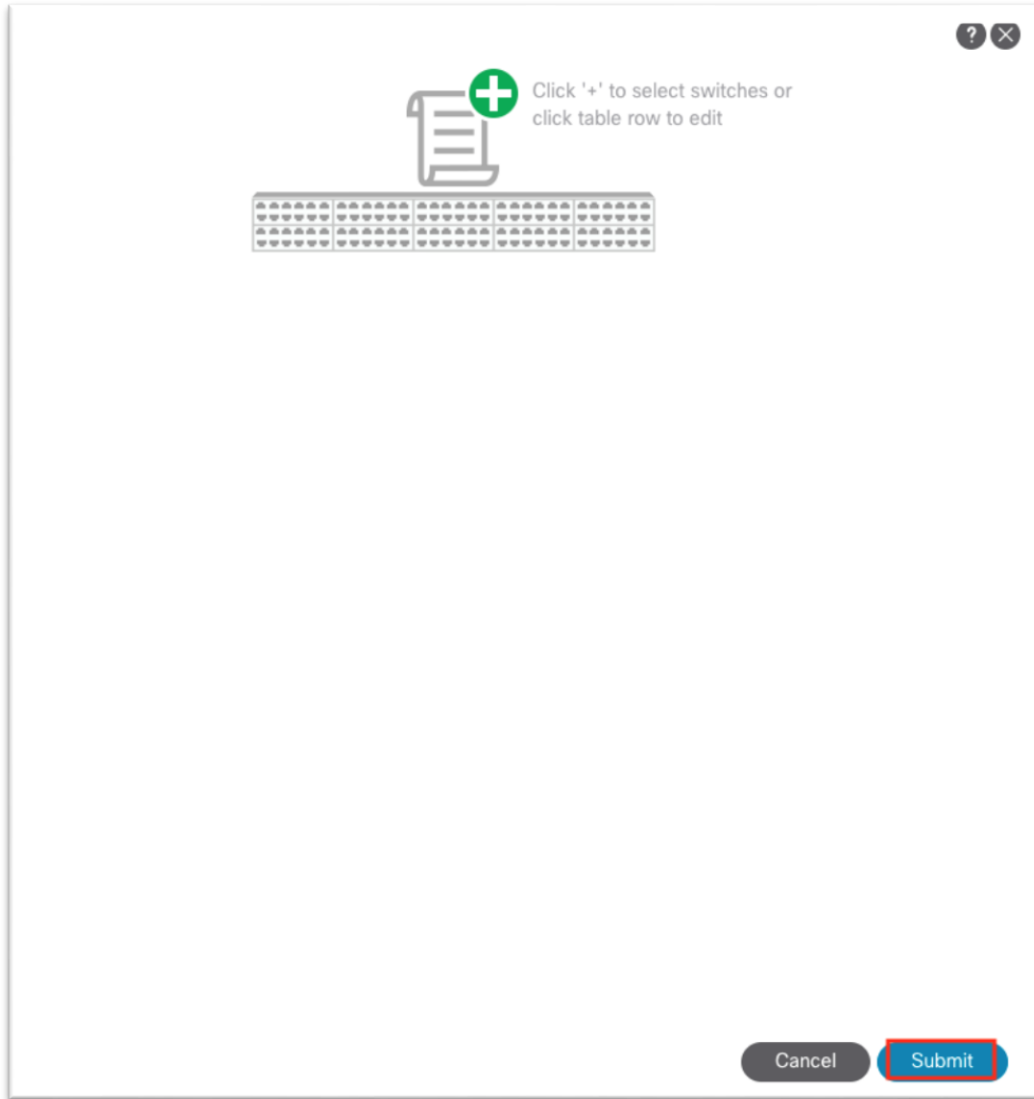
Select Switches To Configure Interfaces: **Quick** Advanced

Switches:  Switch Profile Name:

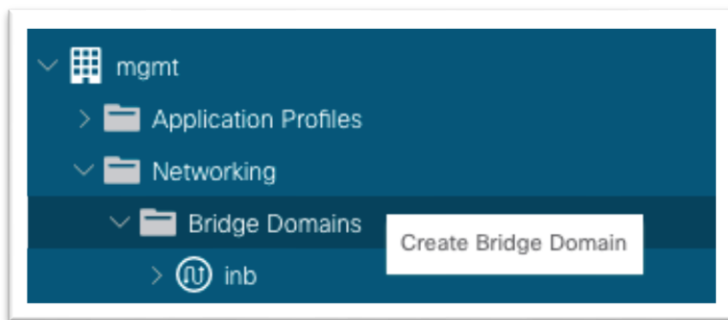
 Click '+' to configure switch interfaces



- k. Click **Submit**.

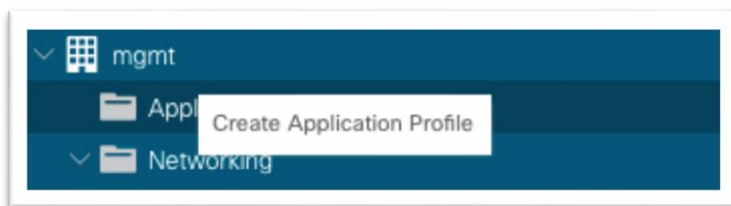


3. Navigate to **Tenants > mgmt.**
4. Expand **Networking > Bridge Domains.**
5. Right-click the **Bridge Domains** folder and choose **Create Bridge Domain.**



6. Enter a name for the bridge domain.

- a. In the **VRF** drop-down list, choose **inb**.
  - b. Click **Next**.
  - c. Click the **+** symbol in the **Subnets** area to bring up a dialog.
    - i. Enter the Cisco Nexus Dashboard Data Network gateway IP address and CIDR mask.
    - ii. Choose **Advertise Externally** as needed.
    - iii. Click **OK**.
  - d. If necessary, under **Associated L3Outs**, click the **+** and choose the in-band VRF instance L3Out.
  - e. Click **Next**.
  - f. Click **Finish**.
7. Still under the mgmt tenant, navigate to **Application Profiles** and right-click and choose **Create Application Profile**.



8. In the dialog, enter a name for the application profile.
9. Under **EPGs**, click the **+** symbol.
  - a. Enter a name for the EPG where the Cisco Nexus Dashboard data interface will belong.
  - b. Choose the bridge domain created in step 5.
  - c. Choose the physical domain that you created earlier.
  - d. Click **Update**.



**Create Application Profile** ? ✕

Name:

Alias:

Description:

Tags: + Click to add a new tag annotation

Monitoring Policy:

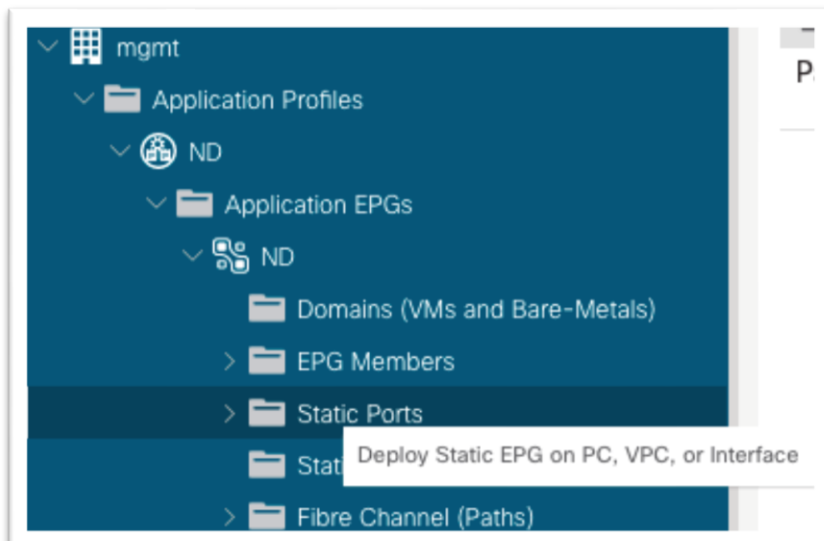
**EPGs**

Name	Alias	BD	Domain	Switching Mode	Static Path	Static Path VLAN	Provided Contract	Consumed Contract
ND		ND	nd-data					

e. Click **Submit**.

10. Expand the newly created **Application Profile** > **Application EPGs** > **EPG** and click the **Static Ports** folder.

a. Right-click the folder and select **Deploy Static EPG on PC, vPC, or Interface**.



b. In the dialog, choose **Port**.

c. In the **Node** drop-down list, choose the first leaf node where the first Cisco Nexus Dashboard Data interface is connected.

- d. In the **Path** drop-down list, choose the interface on the node where the Cisco Nexus Dashboard Data interface is connected.
- e. In the **Port Encap** field, enter the VLAN number that you created earlier when defining the VLAN pool under the access policies.
- f. For **Deployment Immediacy**, choose **Immediate**.
- g. For **Mode**, choose the appropriate mode based on how the Cisco Nexus Dashboard appliance was configured.
  - i. If the Cisco Nexus Dashboard was configured with a VLAN TAG, choose **Trunk**.
  - ii. If the Cisco Nexus Dashboard was configured without a VLAN TAG, choose **Access**.
- h. Click **Next**.
- i. Click **Finish**.
- j. Repeat this process for all Cisco Nexus Dashboard Data interfaces connected to the fabric.

Deploy Static EPG on PC, VPC, or Interface

STEP 1 > Static Link

1. Static Link 2. Configure PTP

Path Type: **Port** Direct Port Channel Virtual Port Channel

Node: f02-leaf1-ex (Node-201)

Path: eth1/46

Port Encap (or Secondary VLAN for Micro-Seg): VLAN 718

Deployment Immediacy: **Immediate** On Demand

Primary VLAN for Micro-Seg: VLAN

Mode: **Access (802.1P)** Trunk Access (Untagged)

IGMP Snoop Static Group:

MLD Snoop Static Group:

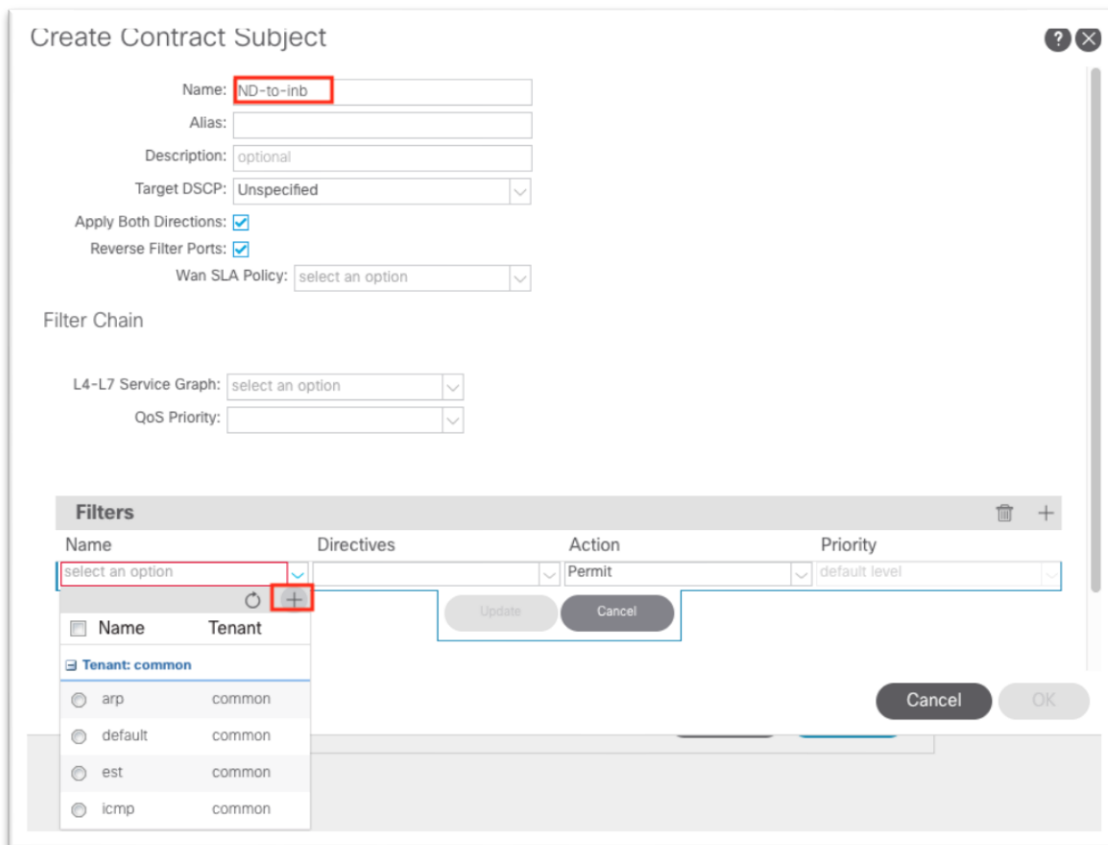
Previous Cancel **Next**

11. Still under the mgmt tenant, navigate to **Contracts** and expand the folder.
12. Right-click **Standard** and choose **Create Contract**.



13. In the dialog, name the contract. Use a name that is clear in terms of the flow. For example: ND-to-inb.

- a. Click the + to create a subject.
  - i. In the new dialog, name the subject.
  - ii. Click the + to create a new filter.
  - iii. Expand the drop-down list under **Name** and click the + to create a new filter.



- iv. In the new dialog, name the filter.
- v. Click the + under Entries.

**Create Filter** ? X

Name:

Alias:

Description:

Tags: + Click to add a new tag annotation

Entries:

Name	Alias	EtherType	ARP Flag	IP Protocol	Match Only Fragments	Stateful	Source Port / Range		Destination Port / Range		TCP Session Rules
							From	To	From	To	
<input type="text" value="any"/>	<input type="text" value="Unspecified"/>	<input type="text" value="Unspecif"/>	<input type="text" value="Unspecified"/>	<input type="text" value="Unspecif"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="Unspecif"/>	<input type="text" value="Unspecif"/>	<input type="text" value="Unspecif"/>	<input type="text" value="Unspecif"/>	<input type="text" value="Unspecified"/>

- vi. Name the entry.
  - vii. Choose the **Ether Type** from the drop-down list. For allowing all communications, leave the value as unspecified.
  - viii. Choose the IP protocol.
  - ix. Enter the destination port.
  - x. Click **Update**.
  - xi. Click **Submit** in the **Create Filter** dialog. The new filter should be selected under the **Create Contract Subject**.
- b. Click **Update**.

### Create Contract Subject

Name:

Alias:

Description:

Target DSCP:

Apply Both Directions:

Reverse Filter Ports:

Wan SLA Policy:

Filter Chain

L4-L7 Service Graph:

QoS Priority:

Name	Directives	Action	Priority
mgmt/ND-to-inb-filter	<input type="text"/>	Permit	default level

Update Cancel

Cancel OK

- c. Click **OK** to complete the subject.
- d. The subject should show up under the **Subjects** section of the **Create Contract** dialog.

### Create Contract ? ✕

Name:

Alias:

Scope:  ▼

QoS Class:  ▼

Target DSCP:  ▼

Description:

Tags: + Click to add a new tag annotation

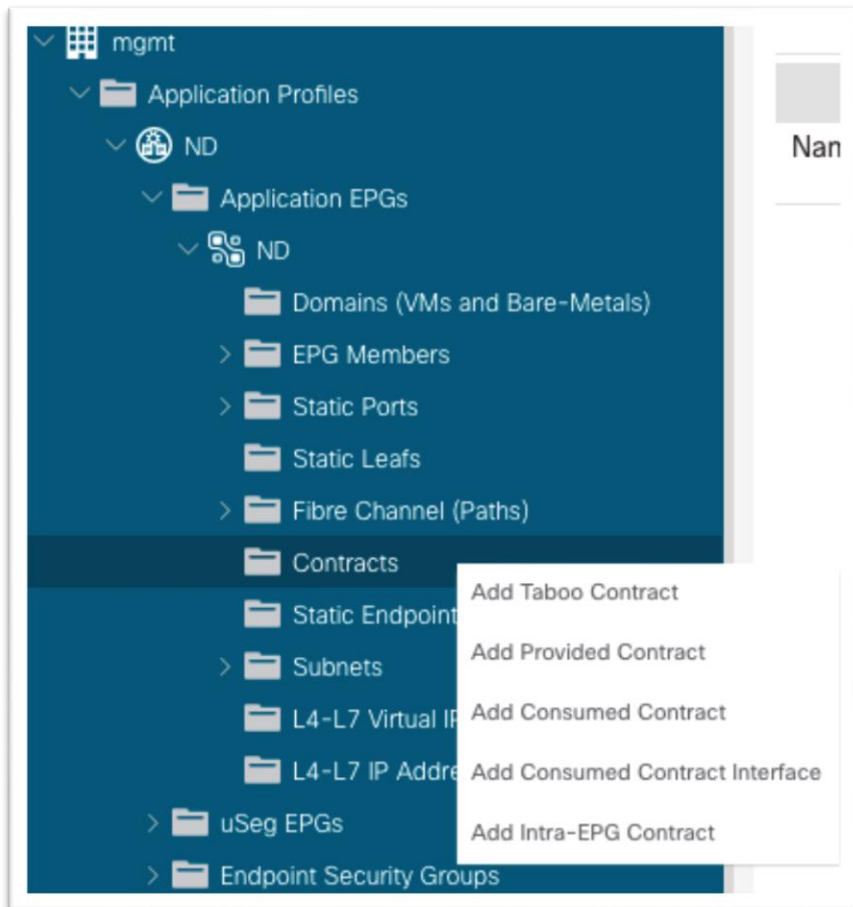
Subjects: 🗑️ +

Name	Description
ND-to-inb	

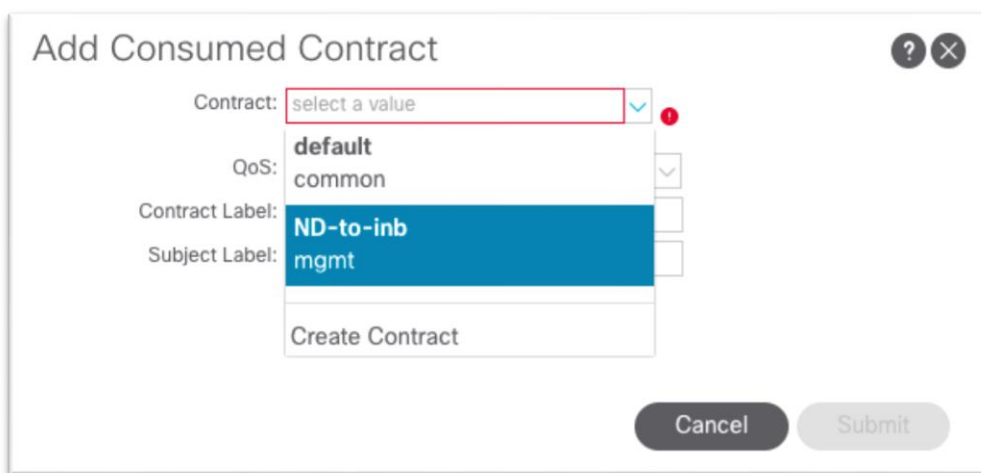
Cancel
Submit

e. Click **Submit**.

14. Still in the mgmt tenant, navigate to **Application Profiles > your-AP-name > Application EPGs > your-EPG-name**, and right-click **Contracts**, and choose **Add Consumed Contract**.



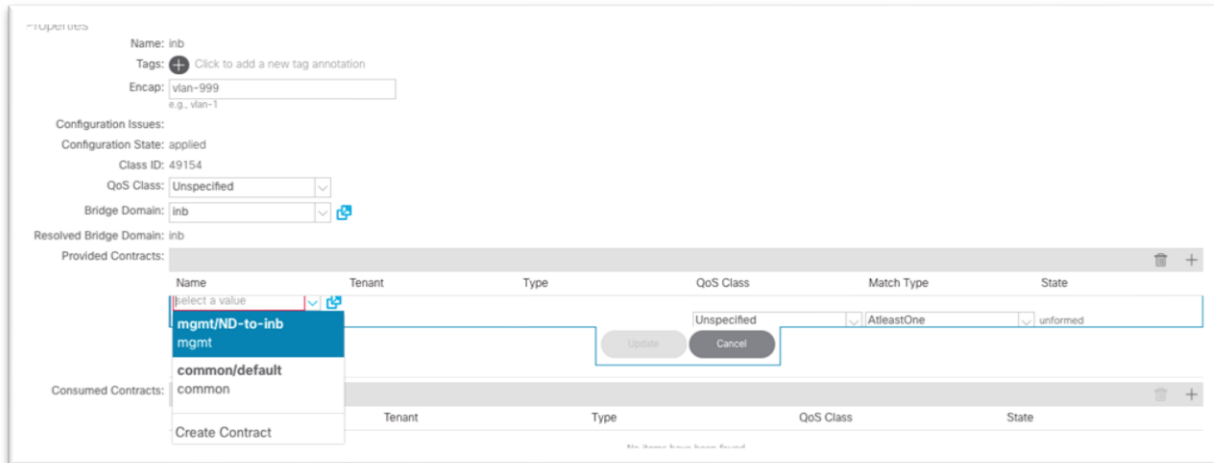
15. In the dialog, in the **Contract** drop-down list, choose the contract that you created in step 13.



a. Click **Submit**.

16. Still in the mgmt tenant, navigate to **Node Management EPGs** and choose the in-band EPG.

17. Under **Provided Contracts**, click the + and in the **Name** drop-down list, choose the contract that you created in step 13.



18. Click **Update**.

This completes the connectivity section for Cisco Nexus Dashboard being directly connected to an EPG toward in-band management.

## Connecting Cisco ACI In-band Management Network with the Cisco Nexus Dashboard Data Network - Option 1b: Directly Connected to an EPG Using a VMM Domain for virtual Cisco Nexus Dashboard

In Cisco ACI, VMM integration is a process that leverages external virtualization controller northbound APIs to manage network constructs in a programmable, automated, and highly scalable manner. Multiple hypervisor vendors are supported. See the [Virtualization Compatability Matrix](#) for more information. For more information on VMM integration, see the [Cisco ACI Virtualization Guide](#).

With Cisco Nexus Dashboard release 2.1, the virtual form factor use case is expanded into Cisco Nexus Dashboard Insights. Currently, VMware vCenter (.ova) and KVM (.qcow2) virtual machines are supported. For detailed information on virtual Cisco Nexus Dashboard and its deployment, see the [Cisco Nexus Dashboard 2.1 Deployment Guide](#). The main requirements around connectivity remain, whereby the data interface of the virtual Cisco Nexus Dashboard would need access to the inband management network of Cisco ACI. For the purpose of this document, we will assume VMM Integration is in place either to VMware vCenter or to Red Hat Virtualization.

Similar to option 1a, the assumption here is that the virtual Cisco Nexus Dashboard is directly connected using a supported hypervisor to a leaf switch or through a single intermediate switch. The virtual Cisco Nexus Dashboard should be learned as a Layer 3 endpoint in Cisco ACI and the Cisco ACI fabric should act as the gateway for the Cisco Nexus Dashboard. To reach the in-band bridge domain subnet, either deploy the Cisco Nexus Dashboard bridge domain locally inside the MGMT tenant tied to the in-band VRF instance, otherwise route leaking would be necessary to leak the Cisco Nexus Dashboard subnet into the in-band VRF instance and likewise the in-band bridge domain subnet into the Cisco Nexus Dashboard VRF instance.

By virtue of the VMM integration, there is no need to program the leaf switch interfaces manually for where the hypervisor that hosts the virtual Cisco Nexus Dashboard will be connected. VMM integration will dynamically program the VLAN on the port where the VM is detected. The only thing that is required is the correct access policies as well as associating the VMM domain to the EPG.



## Configuration Steps

Prerequisites:

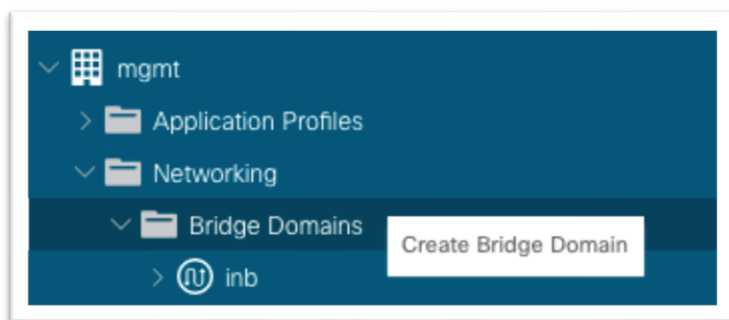
- An existing VMM domain
  - Access policies for a new hypervisor tied to an existing VMM domain
  - Existing hypervisor with configured access policies tied to the existing VMM domain

This section focuses on the tenant aspect, including:

- Tenant policies
  - Bridge domain for Cisco Nexus Dashboard Data interface and matching EPG inside an application profile.
  - Bridge domain subnet for Cisco Nexus Dashboard Data interface
  - Contract allowing communication to the in-band (node control) EPG

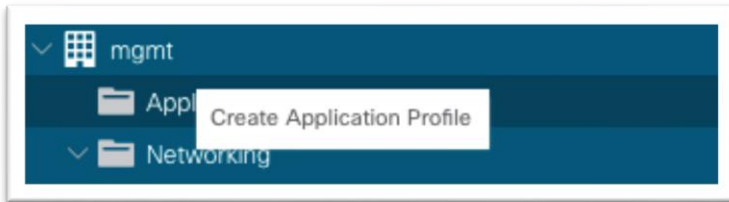
The steps include:

1. Navigate to **Tenants > mgmt.**
2. Expand **Networking > Bridge Domains.**
3. Right-click the **Bridge Domains** folder and choose **Create Bridge Domain.**



4. Enter a name for the bridge domain.
  - a. In the **VRF** drop-down list, choose **inb**.
  - b. Click **Next**.
  - c. Click the **+** symbol in the **Subnets** area to bring up a dialog.
    - i. Enter the Cisco Nexus Dashboard Data Network gateway IP address and CIDR mask.
    - ii. Choose **Advertise Externally** as needed.
    - iii. Click **OK**.
  - d. If necessary, under **Associated L3Outs**, click the **+** and choose the in-band VRF instance L3Out.
  - e. Click **Next**.
  - f. Click **Finish**.

5. Still under the mgmt tenant, navigate to **Application Profiles** and right-click and choose **Create Application Profile**.



6. In the dialog, enter a name for the application profile.
7. Under **EPGs**, click the **+** symbol.
  - a. Enter a name for the EPG where the Cisco Nexus Dashboard data interface will belong.
  - b. Choose the bridge domain created in step 5.
  - c. Choose the VMM domain.
  - d. Click **Update**.

A screenshot of the 'Create Application Profile' dialog box. It has a title bar with a question mark and a close button. The form contains:

- Name: vND
- Alias: (empty)
- Description: optional
- Tags: + Click to add a new tag annotation
- Monitoring Policy: select a value

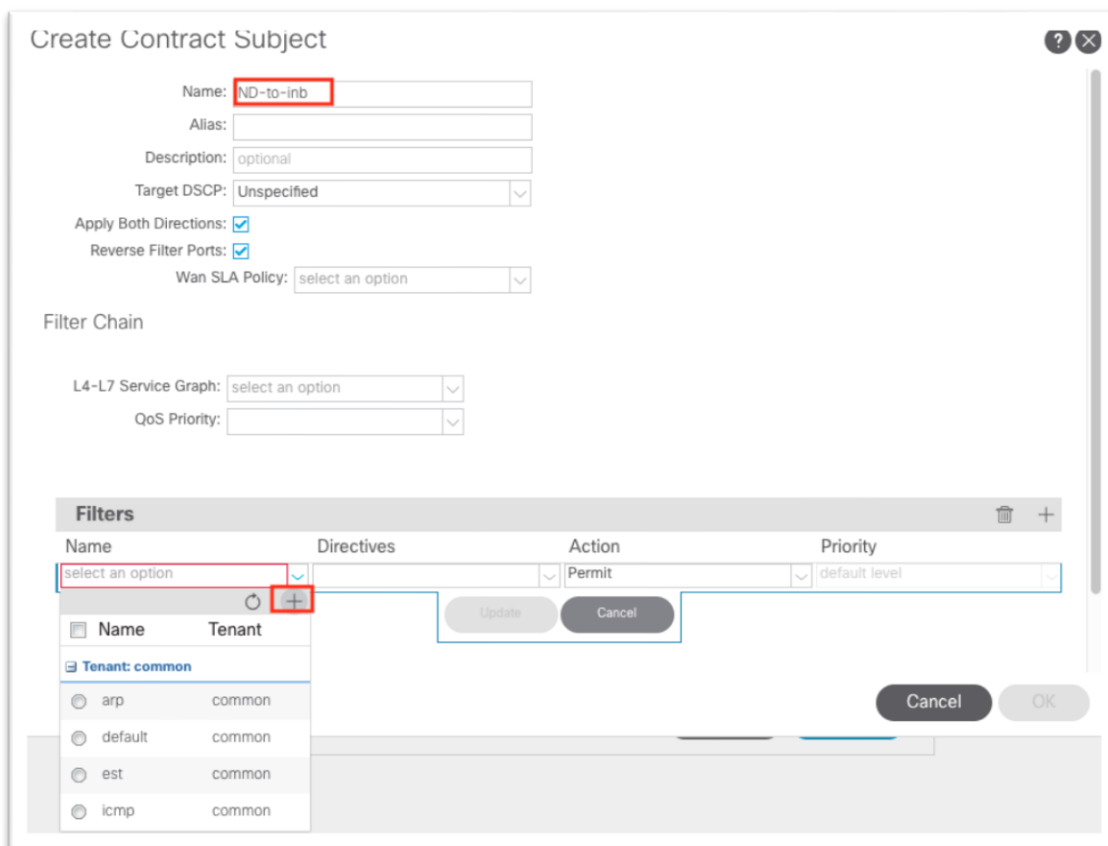
Below the form is a table titled 'EPGs' with columns: Name, Alias, BD, Domain, Switching Mode, Static Path, Static Path VLAN, Provided Contract, and Consumed Contract. The table has one row: vND-Data, (empty), vND-data, EFT\_VMM. At the bottom right are 'Cancel' and 'Submit' buttons.

- e. Click **Submit**.
8. Still under the mgmt tenant, navigate to **Contracts** and expand the folder.
  9. Right-click **Standard** and choose **Create Contract**.



10. In the dialog, name the contract. Use a name that is clear in terms of the flow. Example: ND-to-inb.

- a. Click the + to create a subject.
  - i. In the new dialog, name the subject.
  - ii. Click the + to create a new filter.
  - iii. Expand the drop-down list under **Name** and click the + to create a new filter.



- iv. In the new dialog, name the filter.
- v. Click the + under **Entries**.

**Create Filter** ? X

Name:

Alias:

Description:

Tags: + Click to add a new tag annotation

Entries: 🗑️ +

Name	Alias	EtherType	ARP Flag	IP Protocol	Match Only Fragments	Stateful	Source Port / Range		Destination Port / Range		TCP Session Rules
							From	To	From	To	
<input type="text" value="any"/>	<input type="text" value="Unspecified"/>	<input type="text" value="Unspecif"/>	<input type="text" value="Unspecified"/>	<input type="text" value="Unspecif"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="Unspecif"/>	<input type="text" value="Unspecif"/>	<input type="text" value="Unspecif"/>	<input type="text" value="Unspecif"/>	<input type="text" value="Unspecified"/>

- vi. Name the entry.
  - vii. Choose the **Ether Type** from the drop-down list. For allowing all communications, leave the value as unspecified.
  - viii. Choose the IP protocol.
  - ix. Enter the destination port.
  - x. Click **Update**.
  - xi. Click **Submit** in the **Create Filter** dialog. The new filter should be selected under the **Create Contract Subject**.
- b. Click **Update**.

### Create Contract Subject

Name:

Alias:

Description:

Target DSCP:

Apply Both Directions:

Reverse Filter Ports:

Wan SLA Policy:

Filter Chain

L4-L7 Service Graph:

QoS Priority:

Name	Directives	Action	Priority
mgmt/ND-to-inb-filter	<input type="text"/>	Permit	default level

Update Cancel

Cancel OK

- c. Click **OK** to complete the subject.
- d. The subject should show up under the **Subjects** section of the **Create Contract** dialog.

### Create Contract ? ✕

Name:

Alias:

Scope:  ▼

QoS Class:  ▼

Target DSCP:  ▼

Description:

Tags: + Click to add a new tag annotation

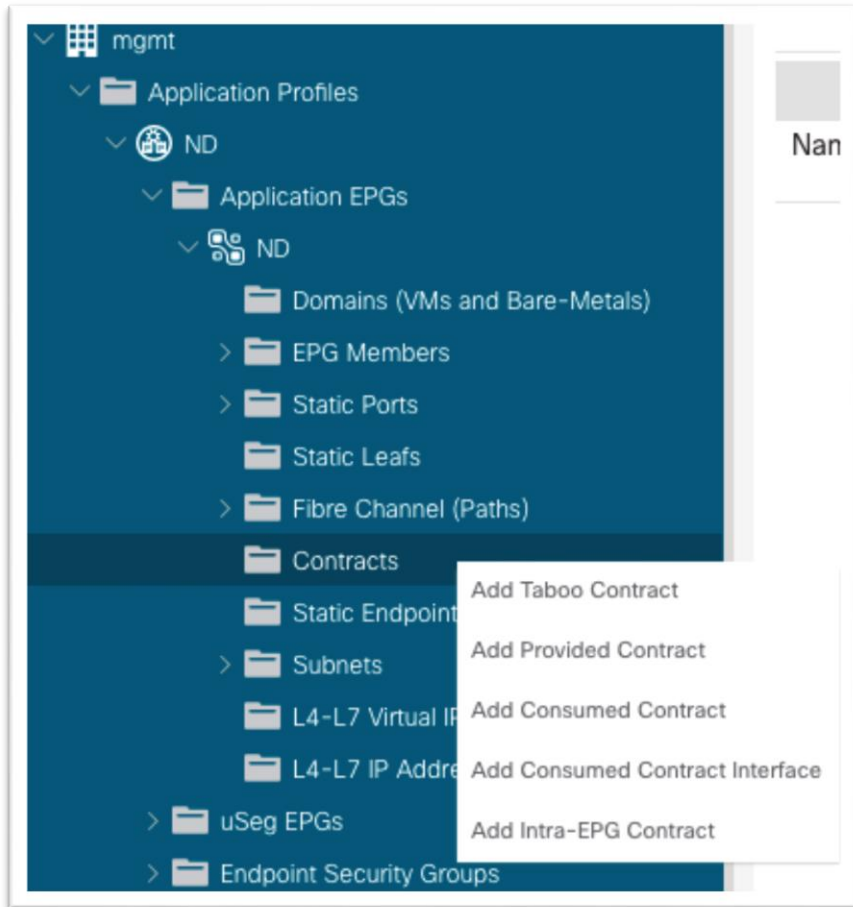
Subjects: 🗑️ +

Name	Description
ND-to-inb	

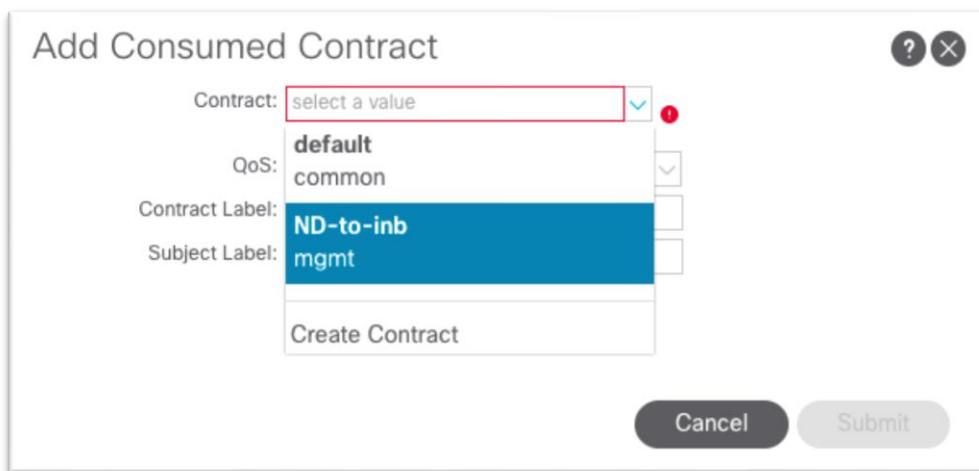
Cancel
Submit

e. Click **Submit**.

11. Still in the mgmt tenant, navigate to **Application Profiles > your-AP-name > Application EPGs > your-EPG-name**, and right-click **Contracts**, and choose **Add Consumed Contract**.



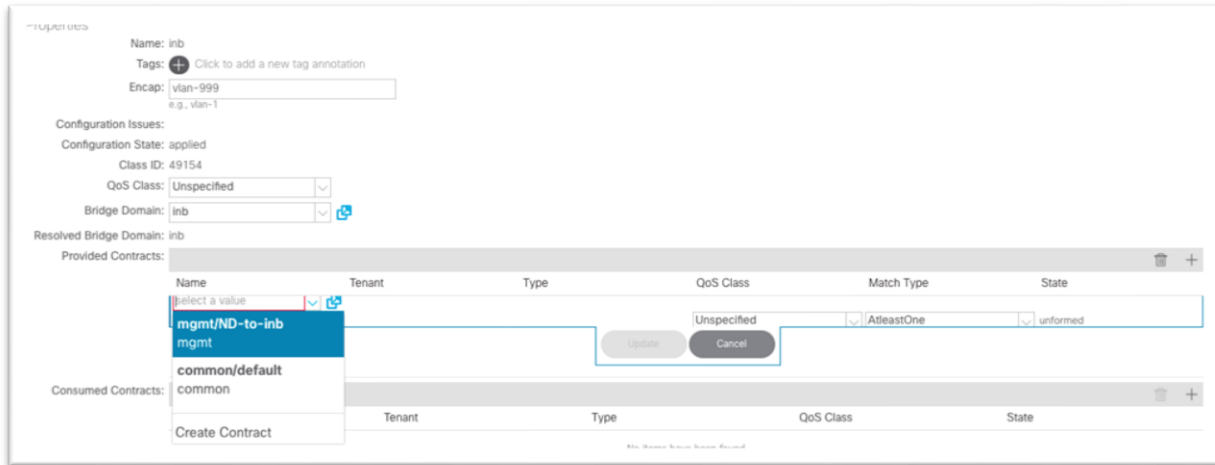
12. In the dialog, in the **Contract** drop-down list, choose the contract that you created in step 13.



a. Click **Submit**.

13. Still in the mgmt tenant, navigate to **Node Management EPGs** and choose the in-band EPG.

14. Under **Provided Contracts**, click the + and in the **Name** drop-down list, choose the contract that you created in step 13.



15. Click **Update**.

This completes the connectivity section for virtual Cisco Nexus Dashboard being directly connected to an EPG leveraging VMM Integration.

## Connecting Cisco ACI In-band Management Network with the Cisco Nexus Dashboard Data Network - Option 2: Any Infra (Using an L3Out)

In this deployment model, the Cisco Nexus Dashboard data interface is located external to Cisco ACI on any infra. The data network must have reachability to the Cisco ACI in-band management network and likewise Cisco ACI in-band must have reachability to the Cisco Nexus Dashboard data interfaces. For Cisco ACI internal VRF instances to communicate with outside networks, an L3Out is required to establish peering with an external router.

This section will go over the high-level steps to configure an L3Out for the in-band management VRF instance "inb" and advertise the in-band bridge domain subnet out as well as learn and apply the policy to external subnets such as the Cisco Nexus Dashboard data interface.

The any infra configuration can be summarized with the following major pieces:

- Access policies for L3Out
- Configuring the L3Out
- Contracts between in-band EPG and L3Out External EPG

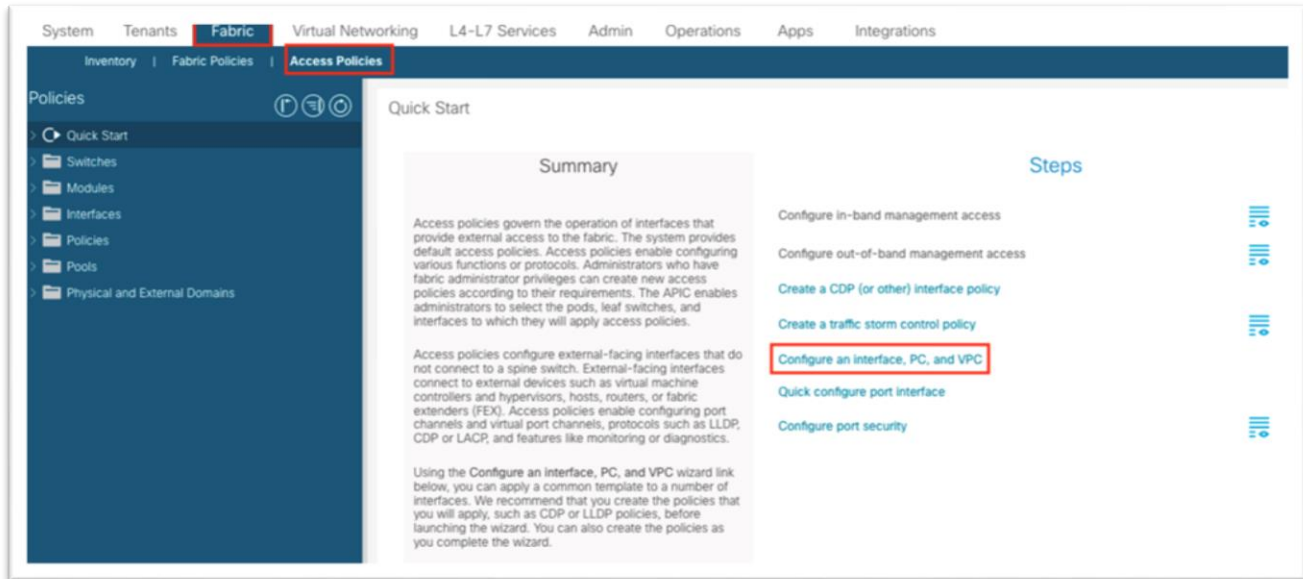
For more information, see the [Cisco APIC Layer 3 Networking Configuration Guide, Release 5.2\(x\)](#) and [Cisco ACI Fabric L3Out Guide](#) white paper.

### Configuration Steps

The steps include:

1. Navigate to **Fabric > Access Policies** and in the **Quick Start** menu, choose **Configure Interface, PC and vPC**.





2. In the dialog, click the green plus + symbol **twice** to expand the wizard.
  - a. Choose from the drop-down list the switches where the external router is connected.
  - b. Enter a name in the **Switch Profile Name** field.
  - c. Set the **Interface Type** to **Individual**.
  - d. In the **Interfaces** field, enter the ports where the external router is connected either as a comma-separated list or as a range.
  - e. Enter a name in the **Interface Selector Name** field.
  - f. Set the **Interface Policy Group** to **Create One**. Choose the appropriate interface level properties needed for the external router.
  - g. In the **Attached Device Type** drop-down list, choose **Bare Metal**.
  - h. The **Domain** and **VLAN** should both be set to **Create One**.
    - i. Enter a name in the **Domain Name** field to name the physical domain that is associated with in-band management.
    - ii. Enter a VLAN ID that will be used for static path bindings in the fabric.

Select Switches To Configure Interfaces: Quick Advanced

Switches:  Switch Profile Name:

Interface Type: Individual PC VPC FC FC PC

Interfaces:  Interface Selector Name:

Select interfaces by typing, e.g. 1/17-18.

Interface Policy Group: Create One Choose One

Link Level Policy: <input type="text" value="select a value"/>	CDP Policy: <input type="text" value="select a value"/>
MCP Policy: <input type="text" value="select a value"/>	LLDP Policy: <input type="text" value="select a value"/>
STP Interface Policy: <input type="text" value="select a value"/>	Monitoring Policy: <input type="text" value="select a value"/>
Storm Control Policy: <input type="text" value="select a value"/>	L2 Interface Policy: <input type="text" value="select a value"/>
Port Security Policy: <input type="text" value="select a value"/>	PoE Policy: <input type="text" value="select a value"/>
Ingress Data Plane Policing Policy: <input type="text" value="select a value"/>	Egress Data Plane Policing Policy: <input type="text" value="select a value"/>
Priority Flow Control Policy: <input type="text" value="select a value"/>	IPv4 NetFlow Monitor Policy: <input type="text" value="select a value"/>
Slow Drain Policy: <input type="text" value="select a value"/>	IPv6 NetFlow Monitor Policy: <input type="text" value="select a value"/>
Fibre Channel Interface Policy: <input type="text" value="select a value"/>	Layer2-Switched (CE type) NetFlow Monitor Policy: <input type="text" value="select a value"/>

---

Attached Device Type:

Domain: Create One Choose One Domain Name:

VLAN: Create One Choose One VLAN Range:

Please use comma to separate VLANs.


Cancel Save


Cancel Submit

- i. Click **Save**.
- j. Click **Save** again.

Select Switches To Configure Interfaces: Quick Advanced

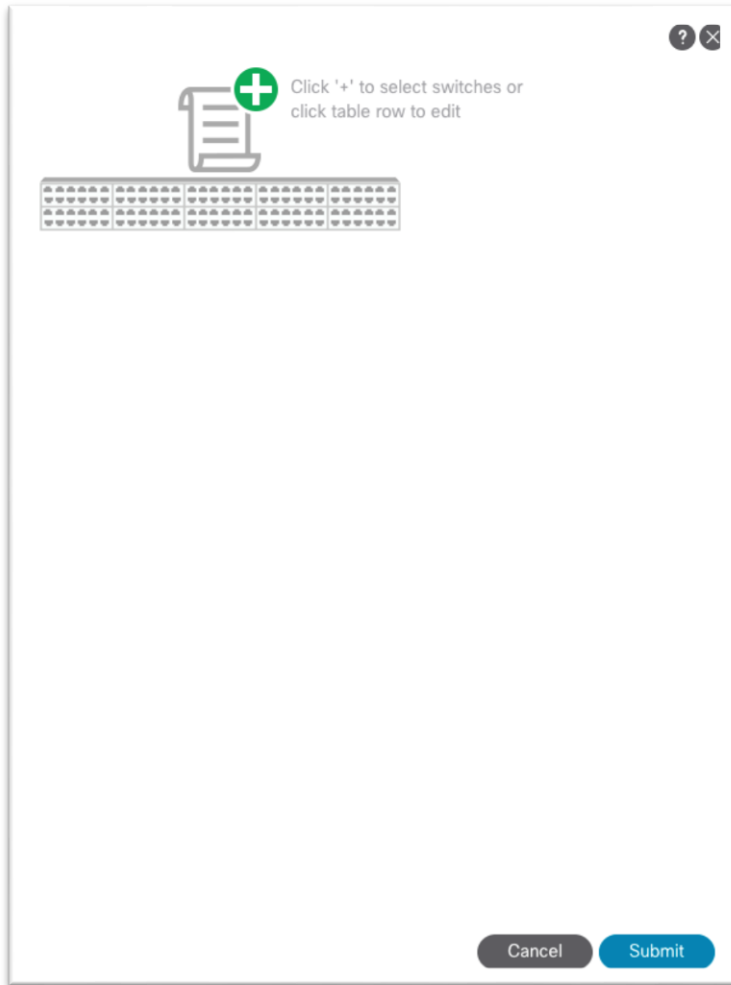
Switches:  Switch Profile Name:

 Click '+' to configure switch interfaces

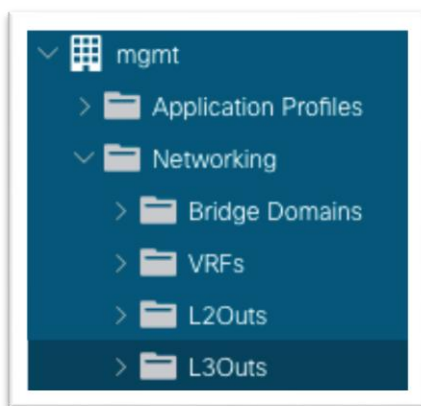


Cancel Save

- k. Click **Submit**.



3. Navigate to **Tenants > mgmt**.
4. Expand **Networking**.
5. Right-click the **L3Outs** folder and choose **Create L3Out**.



6. In the new dialog:
  - a. Enter a name for the L3Out.
  - b. Choose the VRF instance.

- c. Choose the Layer 3 domain that you created in the previous steps.
- d. Choose the routing protocol or leave the field blank for static routing.
- e. Click **Next**.

Create L3Out

1. Identity 2. Nodes And Interfaces 3. Protocols 4. External EPG

Protocol

Leaf Router

Identity

A Layer 3 Outside (L3Out) network configuration defines how the ACI fabric connects to external layer 3 networks. The L3Out supports connecting to external networks using static routing and dynamic routing protocols (BGP, OSPF, and EIGRP).

Prerequisites:

- Configure an L3 Domain and Fabric Access Policies for interfaces used in the L3Out (AAEP, VLAN pool, Interface selectors).
- Configure a BGP Route Reflector Policy for the fabric infra MP-BGP.

Name: L3out-to-ND

VRF: inb

L3 Domain: L3Out-domain

Use for GOLP:

BGP  EIGRP  OSPF

OSPF Area ID: 0

OSPF Area Control:  Send redistributed LSAs into NSSA area  Originate summary LSA  Suppress forwarding address in translated LSA

OSPF Area Type: **NSSA area** Regular area Stub area

OSPF Area Cost: 1

Previous Cancel Next

- f. Choose the **Layer 3** and **Layer 2** interface type.
- g. Choose the node, and enter a router ID and loopback if necessary.
- h. Choose the interface and enter the appropriate parameters.

Create L3Out

1. Identity 2. Nodes And Interfaces 3. Protocols 4. External EPG

Nodes and Interfaces

The L3Out configuration consists of node profiles and interface profiles. An L3Out can span across multiple nodes in the fabric. All nodes used by the L3Out can be included in a single node profile and is required for nodes that are part of a VPC pair. Interface profiles can include multiple interfaces. When configuring dual stack interfaces a separate interface profile is required for the IPv4 and IPv6 configuration, that is automatically taken care of by this wizard.

Use Defaults:

Interface Types

Layer 3:  Interface  Sub-Interface  SVI  Floating SVI

Layer 2:  Port  Direct Port Channel

Nodes

Node ID	Router ID	Loopback Address
F1-P1-Leaf-102 (Node-102)	1.1.1.102	1.1.1.102

+ Hide Interfaces

Leave empty to not configure any Loopback

Interface	Encap	MTU (bytes)	IP Address
eth1/23	VLAN	3	192.168.3.1/30

Integer Value address/mask

Previous Cancel Next

- i. Click **Next**.
- j. Use the drop-down list to choose the appropriate interface protocol policy.

Create L3Out

1. Identity 2. Nodes And Interfaces 3. Protocols 4. External EPG

Protocol Associations

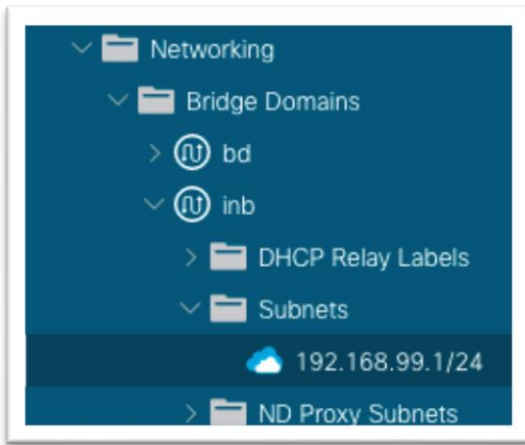
OSPF	
Node ID: 102	
Hide Policy <input type="checkbox"/>	
Interface	Policy
1/23	OSPF-point-to-point

Previous Cancel Next

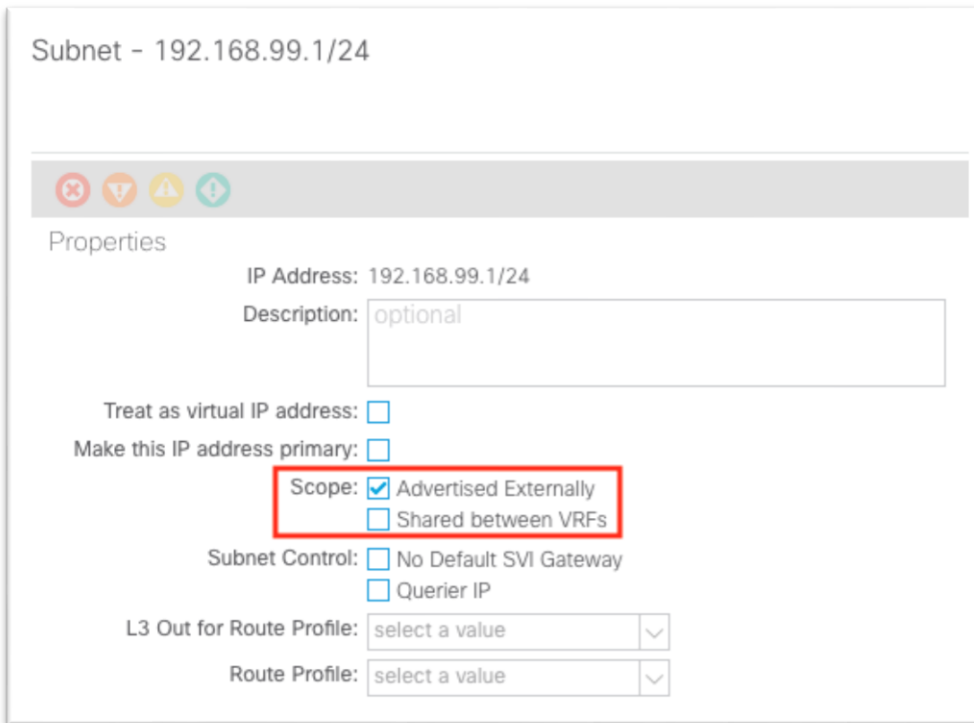
- k. Click **Next**.
- l. Enter the name for the external EPG.

m. Click **Finish**.

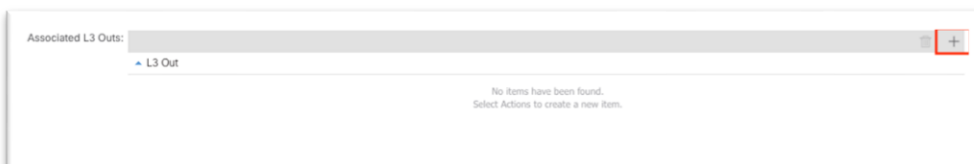
7. Still under the mgmt tenant, navigate to **Networking > Bridge Domains > inb > subnets** and click on the subnet that you defined.



8. In the work pane, ensure that there is a check in the **Advertised Externally** check box.



9. Click the parent bridge domain object called "inb," then in the **work pane** click on the **Policy tab > Layer 3 Configurations** tab and click the + symbol next to **Associated L3Outs**.



- a. Choose the L3Out created in the previous step from the drop-down list.
- b. Click **Update**.

10. Still under the mgmt tenant, navigate to **Contracts** and expand the folder.

11. Right-click **Standard** to create a new standard contract.



12. In the dialog, name the contract.

- a. Use a name that is clear in terms of the flow. For example: ND-to-inb.
- b. Click the + to create a subject.
  - i. In the new dialog, name the subject.
  - ii. Click the + to create a new filter.
  - iii. Expand the drop-down list under **Name** and click the + to create a new filter.

### Create Contract Subject

Name:

Alias:

Description: optional

Target DSCP: Unspecified

Apply Both Directions:

Reverse Filter Ports:

Wan SLA Policy: select an option

Filter Chain

L4-L7 Service Graph: select an option

QoS Priority:

Name	Directives	Action	Priority
select an option		Permit	default level

Update Cancel

Cancel OK

- iv. In the new dialog, name the filter.
- v. Click the + under Entries.

### Create Filter

Name:

Alias:

Description: optional

Tags: + Click to add a new tag annotation

Entries:

Name	Alias	EtherType	ARP Flag	IP Protocol	Match Only Fragments	Stateful	Source Port / Range		Destination Port / Range		TCP Session Rules
							From	To	From	To	
any	Unspecified		Unspecif	Unspecified	<input type="checkbox"/>	<input type="checkbox"/>	Unspecif	Unspecif	Unspecif	Unspecif	Unspecified

Update Cancel

Cancel Submit

- vi. Name the entry.



- vii. In the **EtherType** drop-down list, choose a type. To allow all communications, leave the value as **Unspecified**.
- viii. Choose the IP protocol.
- ix. Enter the destination port.
- x. Click **Update**.
- xi. Click **Submit** in the **Create Filter** dialog. The new filter should be selected under the **Create Contract Subject**.

c. Click **Update**.

**Create Contract Subject**

Name:

Alias:

Description:

Target DSCP:

Apply Both Directions:

Reverse Filter Ports:

Wan SLA Policy:

**Filter Chain**

L4-L7 Service Graph:

QoS Priority:

Filters			
Name	Directives	Action	Priority
mgmt/ND-to-inb-filter		Permit	default level

- d. Click **OK** to complete the subject.
- e. The subject should show up under the **Subjects** section of the **Create Contract** dialog.

### Create Contract ? ×

Name:

Alias:

Scope:  ▼

QoS Class:  ▼

Target DSCP:  ▼

Description:

Tags: + Click to add a new tag annotation

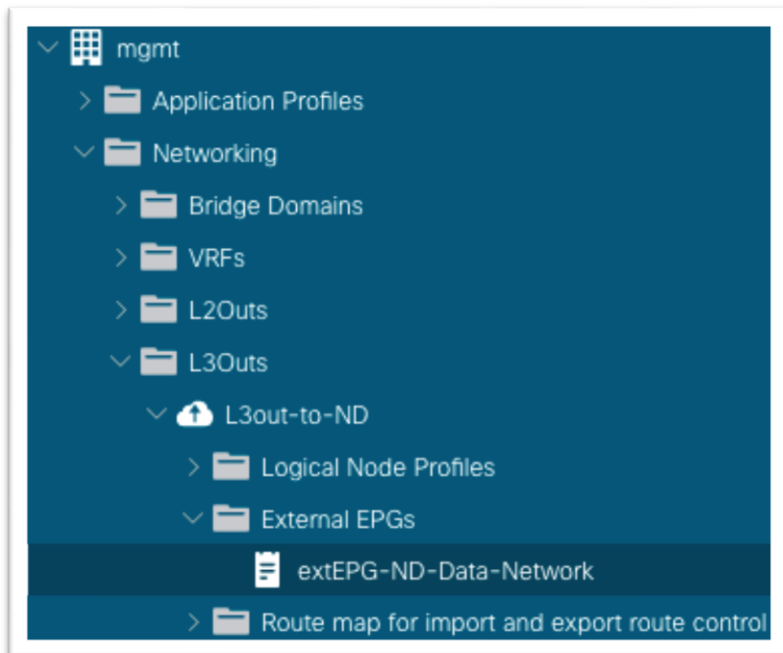
Subjects: 🗑 +

Name	Description
ND-to-inb	

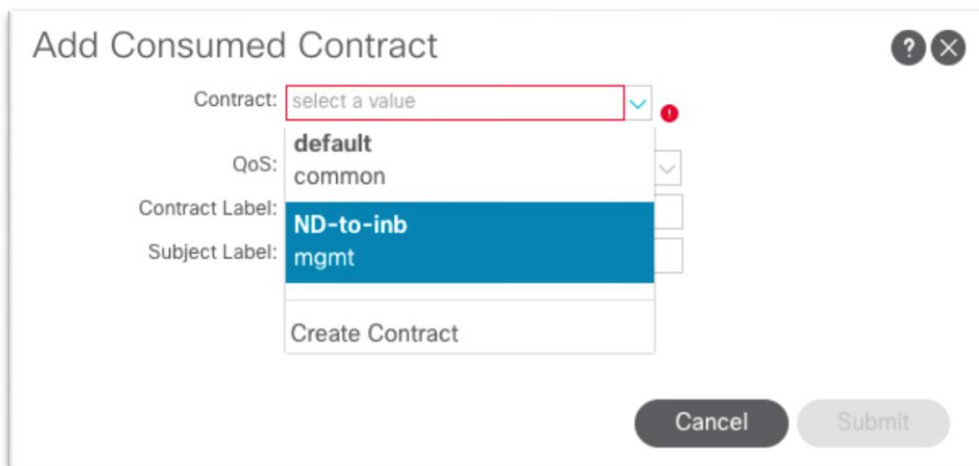
Cancel Submit

f. Click **Submit**.

13. Still in the mgmt tenant, navigate to **Networking > L3Outs > your-L3Out > External EPGs** and select the external EPG.



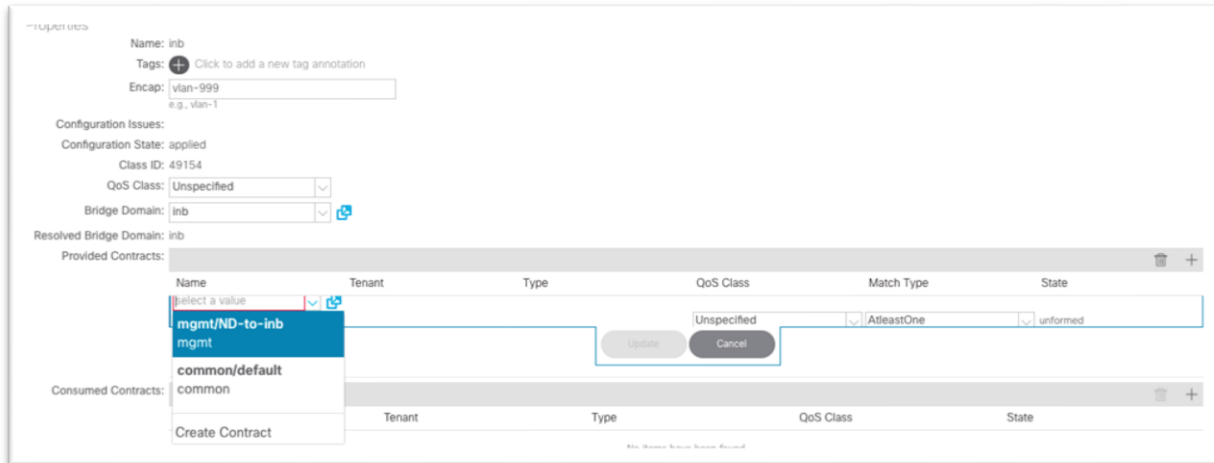
14. In the work pane, click on the **Contracts** tab, click the **Action** button, and choose **Add Consumed Contract**.



a. Choose **Submit**.

15. Still in the mgmt tenant, navigate to **Node Management EPGs** and choose the in-band EPG.

16. Under **Provided Contracts**, click the **+** and in the **Name** drop-down list, choose the contract that you created.



17. Click **Update**.

This completes the connectivity section for Cisco Nexus Dashboard on any infra toward in-band management.

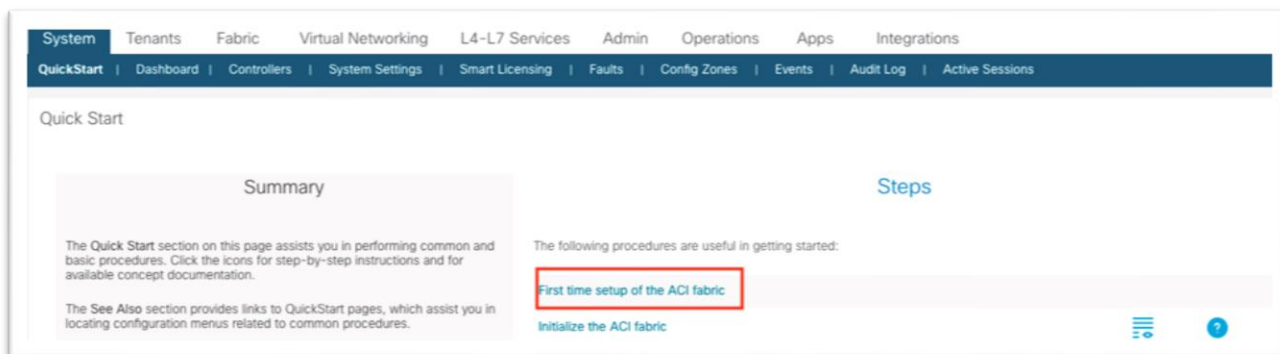
## Network Time Protocol

Network time protocol (NTP) is a core Cisco ACI service that should be enabled regardless of using Cisco Nexus Dashboard Insights or not. Having NTP enabled on the Cisco APIC and switches ensures consistency among log messages, faults, events, and internal atomic counters for debugging. This is required for Cisco Nexus Dashboard Insights to correlate information correctly and show meaningful anomalies and their relationships.

See the [Cisco APIC Basic Configuration Guide, Release 5.2\(x\) – Provisioning Core Cisco ACI Fabric Services](#) for the traditional steps to configure NTP by configuring the date/time policy under **Fabric > Fabric Policies**. The following procedure uses a new wizard to configure the same policy.

### Configuration Steps

1. In the main menu, navigate to **System > Quick Start** and choose **First time setup of the ACI Fabric**.



2. In the dialog, under **NTP**, choose **Edit Configuration** or **Review and Configure** if it has not been set up previously.
3. In the dialog:
  - a. Choose the display format preference for the Cisco APIC.

- b. Choose the time zone for the Cisco APIC.
- c. Under **NTP Servers**, click the + to add in the IP address or hostname of the NTP server to be used by this site.

**NTP**

Configure a timezone, and assign NTP servers to sync leaves, spines and APICs to a valid time source. The OOB connection will be used for NTP communication.  
**Note:** This wizard configures servers under the **default NTP Policy**.  
 If you have previously configured NTP servers, but do not see them here, please check your other NTP policies.

Display Format

local  utc

Time Zone

America/Chicago

NTP Servers

Host Name/IP Address	Preferred	Status
72.163.32.44	True	Configured

- d. Click **Save and Continue**.

4. Click **Proceed to Summary** and click **Close**.

## Precision Time Protocol

If the flow analytics in Cisco Nexus Dashboard Insights is enabled for a data center network site, and flow monitoring rules are provisioned, every Cisco Nexus 9000 series switch in the site will stream out the flow records for the monitored flows on a per second basis. A flow record has a rich set of meta data about the flow and a precision time protocol (PTP) time stamp. Upon receiving the streamed flow records from switches in the network, Cisco Nexus Dashboard Insights runs flow analytics and correlation functions to stitch the flow data from individual switches together to form end-to-end flows. For each of the flows, Cisco Nexus Dashboard Insights uses the PTP time stamps to calculate end-to-end flow latency.

For the flow latency calculation to function correctly, the network switches need to have PTP enabled and configured correctly. They need to use the same PTP grandmaster.

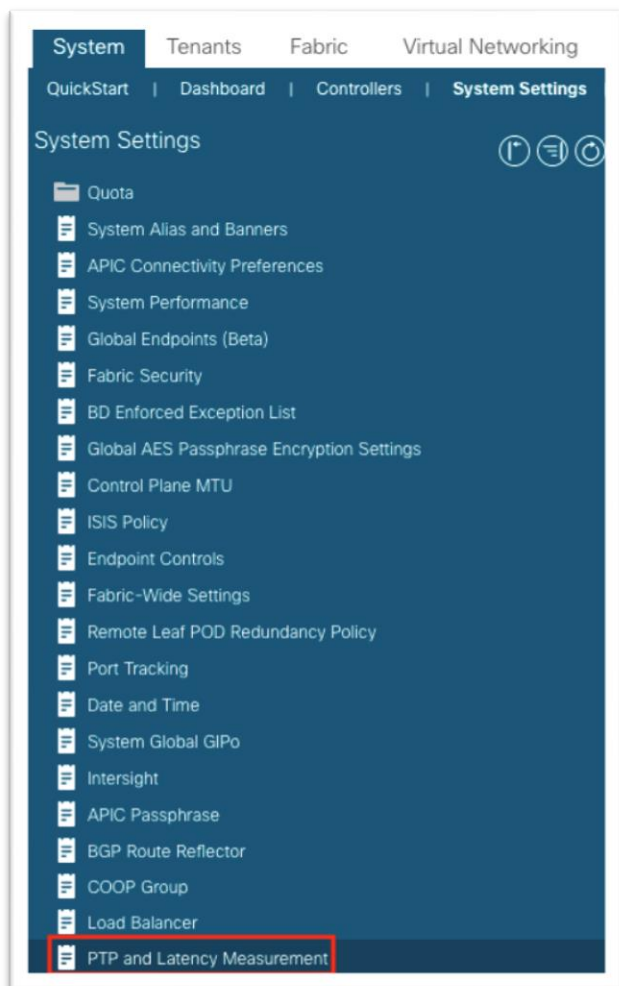
For more information, see the [Cisco APIC System Management Configuration Guide, Release 5.1\(x\) - Precision Time Protocol](#).

For a Cisco ACI fabric with only a single pod, PTP can be enabled without the need for an external grandmaster. The fabric will elect a single spine switch to act as a grandmaster and all other switches will synchronize to this grandmaster. Cisco ACI Multi-Pod fabrics require an external grandmaster, and we recommend that you have them connected to the external IPN device. This ensures an equal number of hops to reach the active grandmaster. You can connect the grandmaster on a leaf switch port as well using

an EPG or L3Out, which then can be used as grandmaster candidates in case the active grandmaster goes down.

### Single Pod Grandmaster Configuration:

1. In the main menu, navigate to **System > System Settings > PTP and Latency** (previously known as the **Precision Time Protocol** setting).



2. In the work pane, for Precision Time Protocol, choose **Enabled**.

PTP (Precision Time Protocol) Policy - Global and Fabric Interfaces

Properties

Precision Time Protocol:  Disabled  Enabled

Global Priority 1 Value:

Global Priority 2 Value:

Global Domain:

PTP Profile:  AES67-2015  Default  SMPTE-2059-2

Announce Interval (2^x sec):

Sync Interval (2^x sec):

Delay Request Interval (2^x sec):

Announce Timeout:

3. At the bottom, click **Submit**.

## Monitoring Policy (Fabric Node Control Policy)

The fabric node control policy is used to enable digital optical monitoring (DOM) and concurrently to select a feature selection priority.

The Feature Selection has three priorities, which are mutually exclusive:

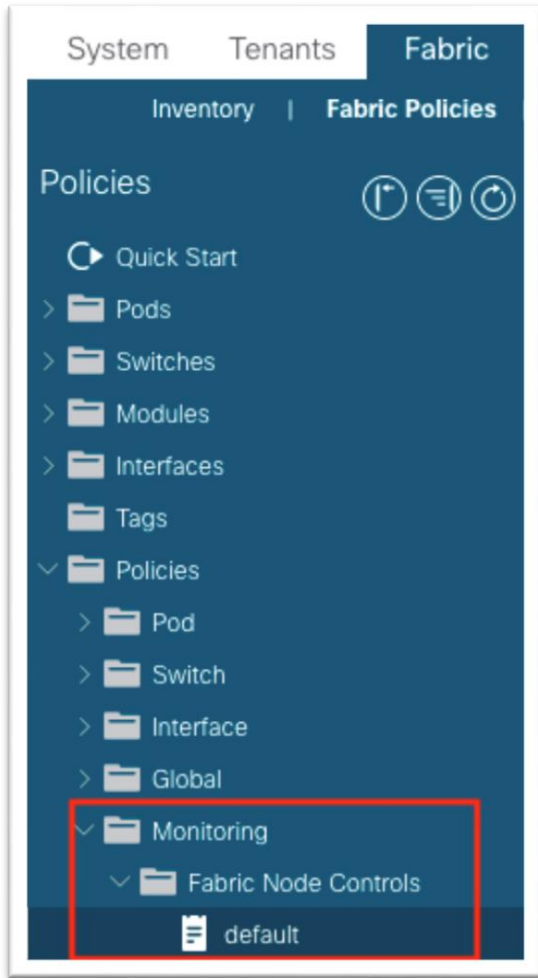
- Choose **Analytics Priority** for integration of the Cisco ACI fabric with Cisco Secure Workload (Tetration). The Cisco Secure Workload is not compatible with Nexus Dashboard flow analytics (Traffic Analytics and Flow Telemetry).
- Choose **Netflow Priority** when Cisco Nexus Dashboard Insights Traffic Analytics is enabled and concurrently other Netflow collectors are configured on the Cisco ACI fabric.
- Choose **Telemetry Priority** when the Flow Telemetry is enabled in Cisco Nexus Dashboard Insights.

If the Traffic Analytics feature is enabled for the fabric in Nexus Dashboard but no other Netflow collectors are configured in the fabric, then you can choose both **Netflow Priority** and **Telemetry Priority**.

To apply the policy, configure fabric-level switch selectors for leaf and spine switches and choose a policy group to reference this fabric node control policy. For information about the monitoring policy, see the [Cisco APIC Troubleshooting Guide, Release 4.2\(x\) - DOM](#).

### Telemetry Policy

1. Navigate to **Fabric > Fabric Policies > Policies > Monitoring > Fabric Node Controls > default**.



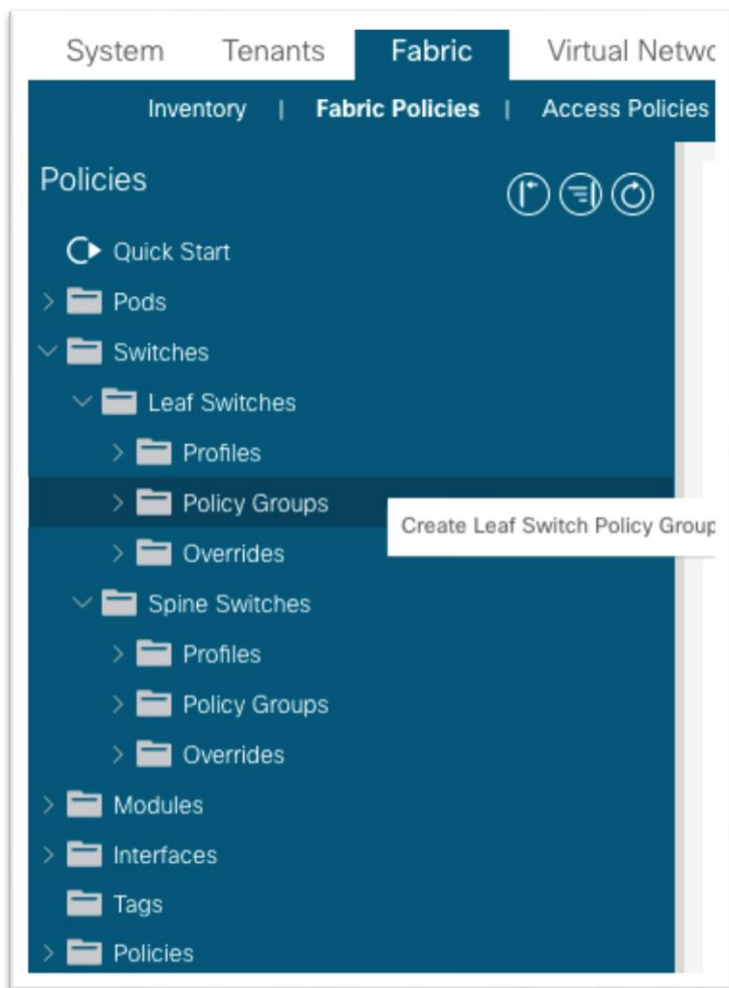
2. In the work pane, put a check in the **Enable DOM** check box.
3. For **Feature Selection**, choose **Telemetry Priority**.

A screenshot of the 'Fabric Node Control - default' configuration page. The page has a light gray header with the title 'Fabric Node Control - default'. Below the header is a gray bar. The main content area is titled 'Properties'. It contains the following fields: 'Name: default', 'Description: optional' (with a text input field), 'Enable DOM: ', and 'Feature Selection: Analytics Priority | Netflow Priority | Telemetry Priority'. The 'Enable DOM' checkbox and the 'Telemetry Priority' button are highlighted with red boxes.



After you complete the above steps, you must apply the policy through the familiar profile, selectors, and policy group associations, except this time, apply the policy for leaf switches and spines switches instead of for interfaces. Begin by creating a leaf policy group:

1. Navigate to **Fabric > Fabric Policies > Switches > Leaf Switches > Policy Groups**.
2. Right-click **Policy Groups** and choose **Create Leaf Switch Policy Group**.



3. In the dialog, name the policy group.
  - a. For node control policy, if you created a custom policy earlier, choose that policy here and click **Submit**.
  - b. Otherwise, the default will be used when nothing is selected. You can click **Submit** with a blank policy group.

### Create Leaf Switch Policy Group

Name:

Description:

Monitoring Policy:

TechSupport Export Policy:

Core Export Policy:

Inventory Policy:

Power Redundancy Policy:

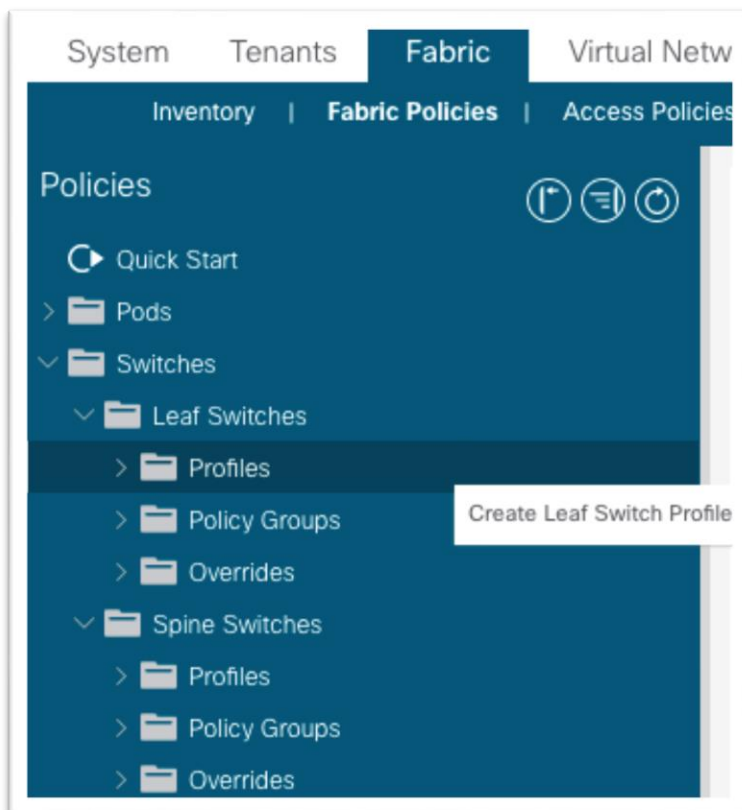
Analytics Policy:

**Node Control Policy:**

TWAMP Server Policy:

TWAMP Responder Policy:

4. Next, create a profile under **Fabric > Fabric Policies > Switches > Leaf Switches > Profiles**.



5. In the dialog, give the profile a name.
  - a. For **Switch Associations**, click the + symbol to add a row.

Create Leaf Switch Profile

Name: all

Description: optional

Switch Associations:

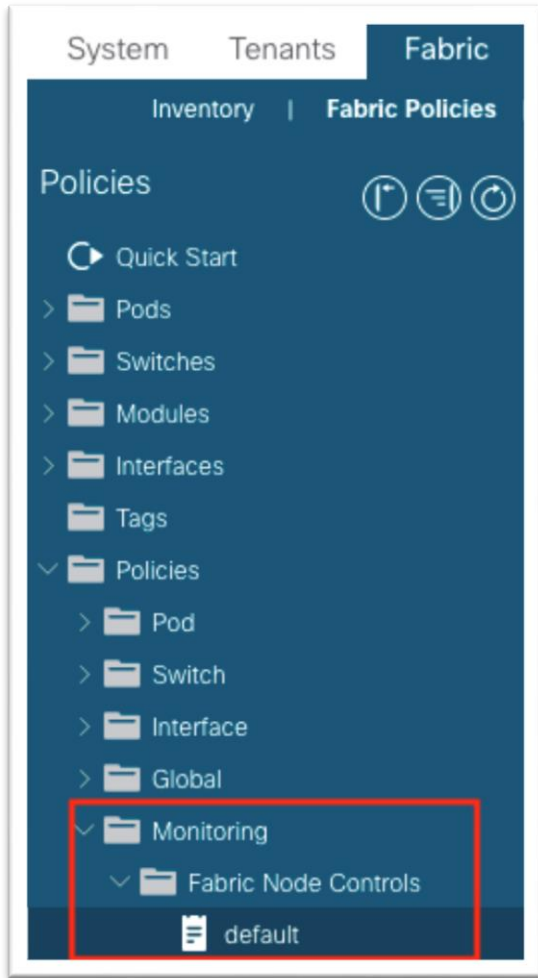
Name	Blocks	Policy Group

- i. Give the switch association a name.
- ii. Choose the switches in the **Blocks** section using the drop-down list and put a check in the check box to choose all leaf switches.
- iii. In the **Policy Group** drop-down list, choose the policy group that has DOM and Telemetry enabled.
- iv. Click **Submit**.

The policy group has now been applied to all leaf switches. The steps should be repeated for all spine switches. This includes creating the policy group and referencing the node control policy, creating a spine switch profile, and associating the policy group to the block of spine switches.

### NetFlow Policy

1. Navigate to **Fabric > Fabric Policies > Policies > Monitoring > Fabric Node Controls > default**.



2. In the work pane, put a check in the **Enable DOM** check box.
3. For **Feature Selection**, choose **Netflow Priority**.

Fabric Node Control - default

---

Properties

Name: default

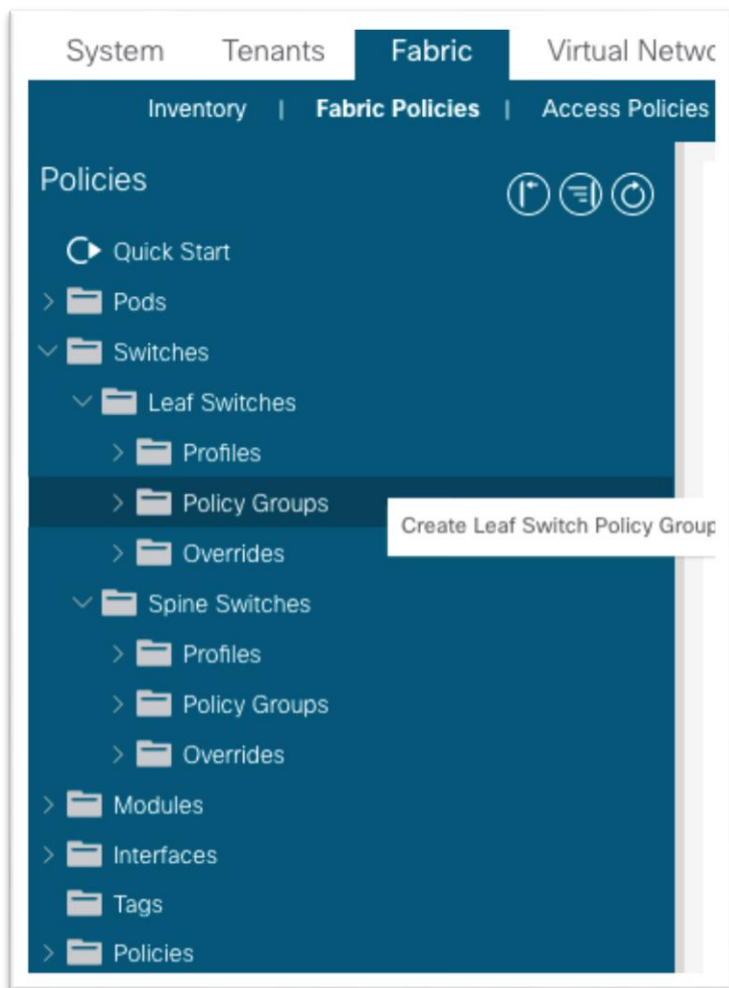
Description: optional

Enable DOM:

Feature Selection: Analytics Priority **Netflow Priority** Telemetry Priority

After you complete the above steps, must apply the policy through the familiar profile, selectors, and policy group associations, except this time, apply the policy for leaf switches and spines switches instead of for interfaces. Begin by creating a leaf policy group:

4. Navigate to **Fabric > Fabric Policies > Switches > Leaf Switches > Policy Groups**.
5. Right-click **Policy Groups** and choose **Create Leaf Switch Policy Group**.



6. In the dialog, name the policy group.
  - a. For node control policy, if you created a custom policy earlier, choose that policy here and click **Submit**.
  - b. Otherwise, the default will be used when nothing is selected. You can click **Submit** with a blank policy group.

### Create Leaf Switch Policy Group

Name:

Description:

Monitoring Policy:

TechSupport Export Policy:

Core Export Policy:

Inventory Policy:

Power Redundancy Policy:

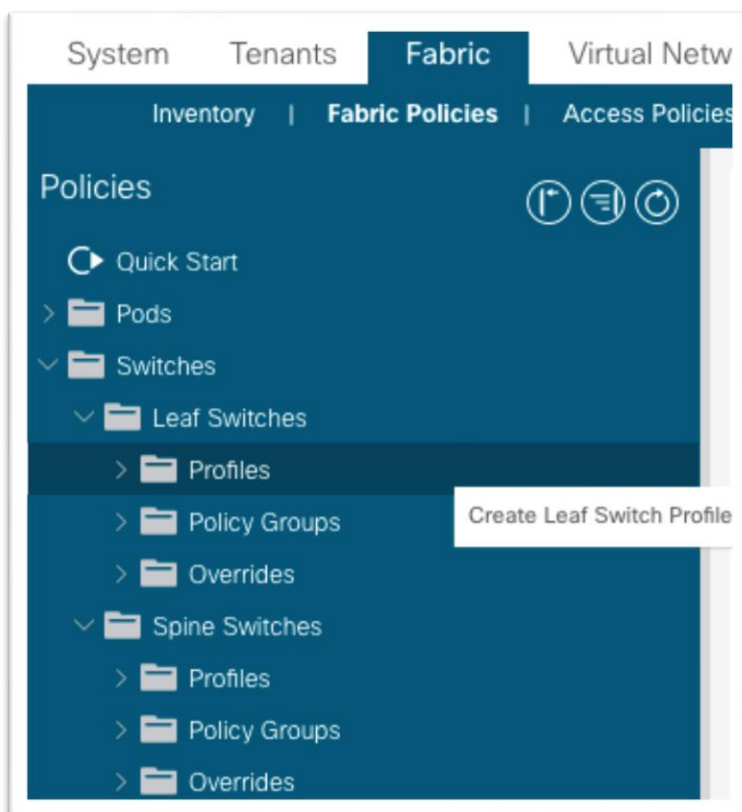
Analytics Policy:

**Node Control Policy:**

TWAMP Server Policy:

TWAMP Responder Policy:

7. Next, create a profile under **Fabric > Fabric Policies > Switches > Leaf Switches > Profiles**.



8. In the dialog, give the profile a name.

- a. For **Switch Associations**, click the + symbol to add a row.

Create Leaf Switch Profile

Name: all

Description: optional

Switch Associations:

Name	Blocks	Policy Group

- i. Give the switch association a name.
- ii. Choose the switches in the **Blocks** section using the drop-down list and put a check in the check box to choose all leaf switches.
- iii. In the **Policy Group** drop-down list, choose the policy group that has DOM and Telemetry enabled.
- iv. Click **Submit**.

The policy group has now been applied to all leaf switches. The steps should be repeated for all spine switches. This includes creating the policy group and referencing the node control policy, creating a spine switch profile, and associating the policy group to the block of spine switches.

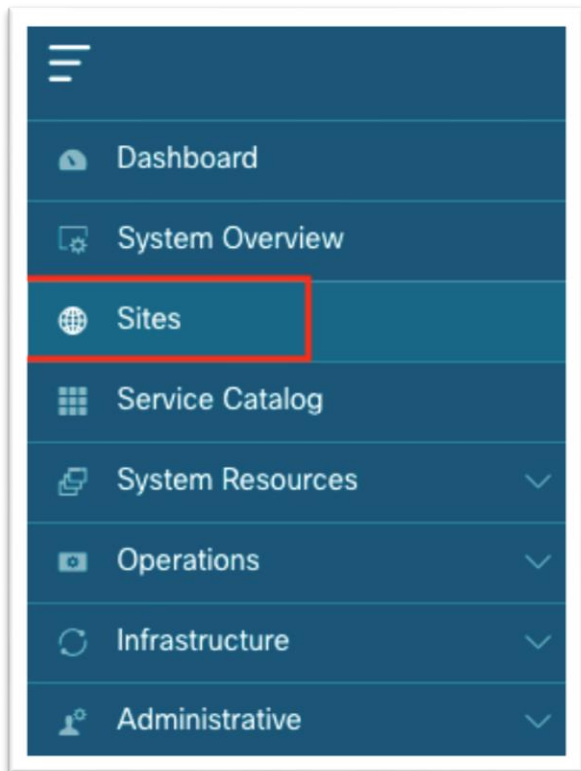
## Cisco Nexus Dashboard Configuration

### Adding a Cisco ACI Site to Cisco Nexus Dashboard

This operation is conducted in Cisco Nexus Dashboard by selecting the **Sites** option in the menu bar. You must enter the name of the node management in-band EPG that you configured previously when adding the site into Cisco Nexus Dashboard.

For more information about Cisco Nexus Dashboard and Cisco Nexus Dashboard Insights, see the [Cisco Nexus Dashboard Deployment Guide – Fabric Connectivity](#) and [Cisco Nexus Dashboard Insights User Guide – Installation and Setup](#).

1. Using a browser, open a session to the Cisco Nexus Dashboard GUI.
2. In the left-hand menu, choose **Sites**.



3. In the work pane, choose **Actions > Add Site**.



4. In the new screen, ensure Cisco ACI is selected as the site type.
- Fill in the name for this site. This name will carry over to all other Services, such as Cisco Nexus Dashboard Orchestrator or Cisco Nexus Insights.
  - Enter the in-band IP address of the Cisco APIC.
  - Enter a username for authentication to the Cisco APIC.
  - Enter the password for the specified username. This password is only used once for the initial connection. Afterward, a certificate-based authentication is used between Cisco APIC and Cisco Nexus Dashboard for all subsequent operations.
  - Specify the login domain for username.
  - Enter the node management in-band EPG name.
  - Drop the pin on the map.



h. Click **Add** at the bottom right corner.

The screenshot shows the 'Add Site' dialog box. At the top, there's a 'Site Type' section with two radio buttons: 'ACI' (selected) and 'DCNM'. Below this is a form with the following fields: 'Site Name' (containing 'site1'), 'Host Name/ IP Address', 'User Name' (containing 'dpita'), 'Password' (masked with dots), 'Login Domain', and 'In-Band EPG' (containing 'default'). Below the form is a world map with a red location pin icon on the right side. At the bottom right, there are 'Cancel' and 'Add' buttons, with the 'Add' button highlighted in red.

### (Optional) Configuring External Service Pools - Required for NetFlow

The external service pools are used to configure persistent IP addresses to be used for certain services. These persistent IP addresses are retained even if the backend service is relocated to a different Cisco Nexus Dashboard Node. For more information, see the Cisco Nexus Dashboard User Guide.

The external service pools are required for NetFlow and are used to when programing the flow exporter under the NetFlow monitoring policy.

Note: If Cisco Nexus Dashboard Insights is already running before the external service pools are created, Cisco Nexus Dashboard Insights must be disabled and re-enabled for the changes to take effect.

## Edit Flow - EFT-Lab



Collector services must be running to enable this feature. Disable the app, ensure there are 6 available IPs for the NI collector services, and re-enable the app.

### Flow Collection Modes

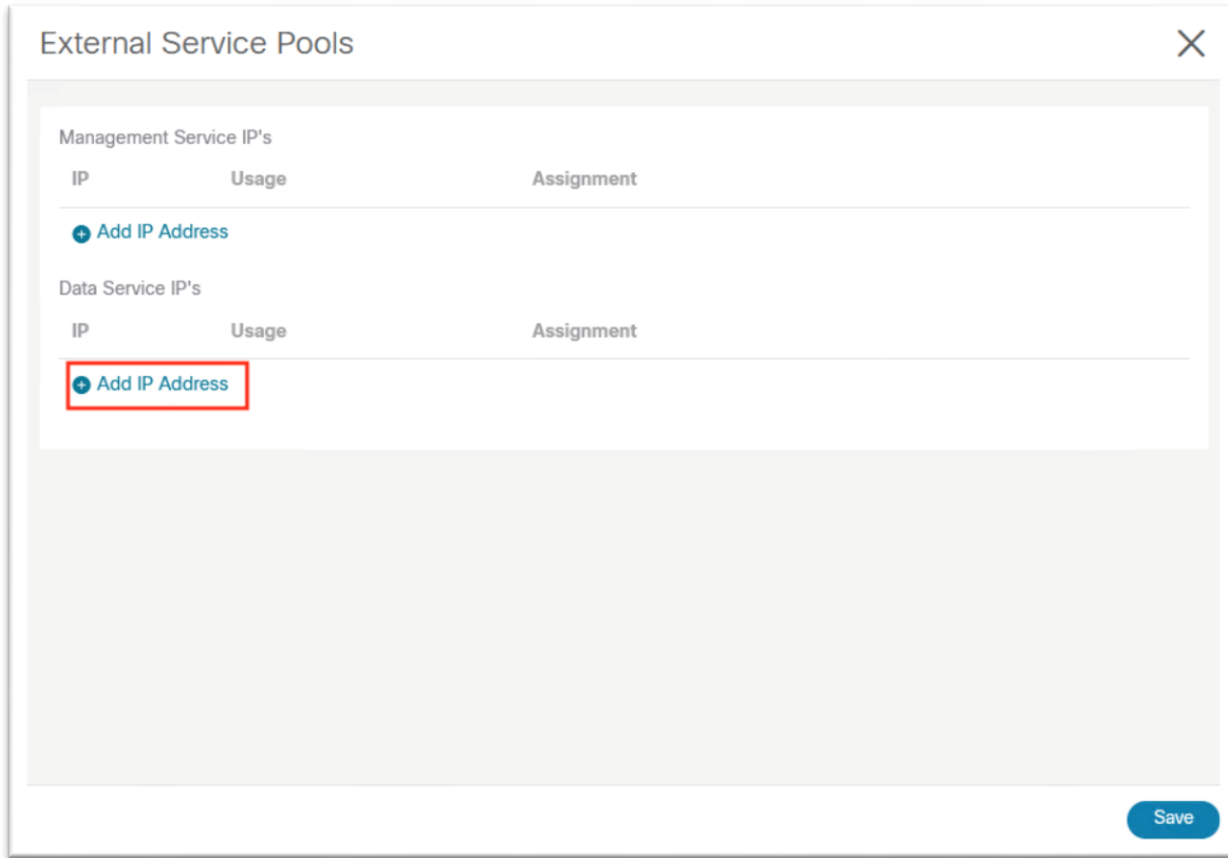
- Flow Telemetry
- Netflow
- sFlow

This section provides an overview of the steps to configure the external service pools in Cisco Nexus Dashboard. Detailed steps are provided later in this document.

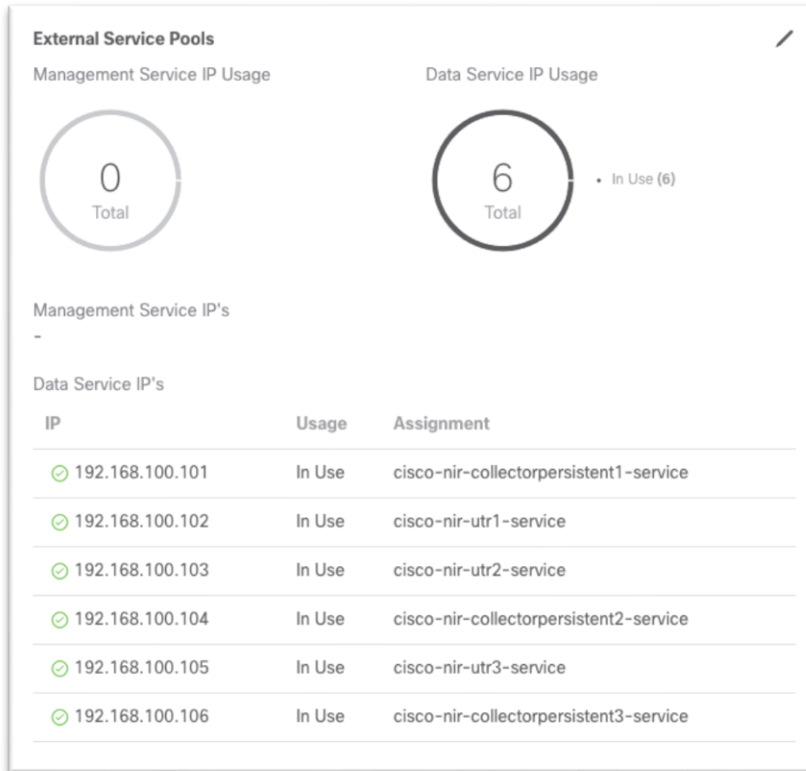
1. Using a browser, open a session to the Cisco Nexus Dashboard GUI.
2. In the left-hand menu, Choose **Infrastructure > Cluster Configuration**.
3. Under the External Service Pool tile, click the pencil icon to edit the external service pools.

The screenshot displays the Admin Console interface for a cluster named 'vnd-demo-app'. The left sidebar contains navigation options: Overview, Sites, Services, System Resources, Operations, Infrastructure (highlighted with a red box), Cluster Configuration, Resource Utilization, Intersight, App Infra Services, and Administrative. The main content area is titled 'Cluster Configuration' and has two tabs: 'General' (selected) and 'Multi-Cluster Connectivity'. The 'General' tab is divided into four sections: 'Cluster Details' (Name: vnd-demo-app, App Subnet: 172.17.0.0/16), 'Proxy Configuration' (Servers: -, Ignore Hosts: -), 'Routes' (Management Network Routes: -, Data Network Routes: -), and 'External Service Pools'. The 'External Service Pools' section features two gauges for 'Management Service IP Usage' and 'Data Service IP Usage', both showing '0 Total'. Below these gauges are labels for 'Management Service IP's' and 'Data Service IP's', both showing '-'. A red box highlights the 'Add IP Address' button in the 'Data Service IP's' section.

4. In the pop-up, under Data Service IP's, click **Add IP Address**.



5. In the text box, input the IP address and click the green checkmark to save the entry.
6. Click **Add IP Address** once again and repeat the process until you have configured six data service IP addresses. These IP addresses will be randomly claimed by services.



## Cisco Nexus Dashboard Insights Setup

Cisco Nexus Dashboard Insights setup is used to enable sites that are registered on Cisco Nexus Dashboard.

Enable the following key features to receive the greatest benefit from Cisco Nexus Dashboard Insights:

- **Software Analytics:** Used to stream switch and Cisco APIC software analytics to Cisco Nexus Dashboard Insights for further processing, correlation, and anomaly detection. Set this to **Enabled**.
- **Flow Analytics:** Used to configure rules and have switches export flow metadata to Cisco Nexus Dashboard Insights. Set this to **Enabled**.
- **Microburst Sensitivity:** Based on a threshold percentage, this setting can be set to low, medium, or high.

With the Cisco Nexus Dashboard Insights 6.0 release, the following new features have been added:

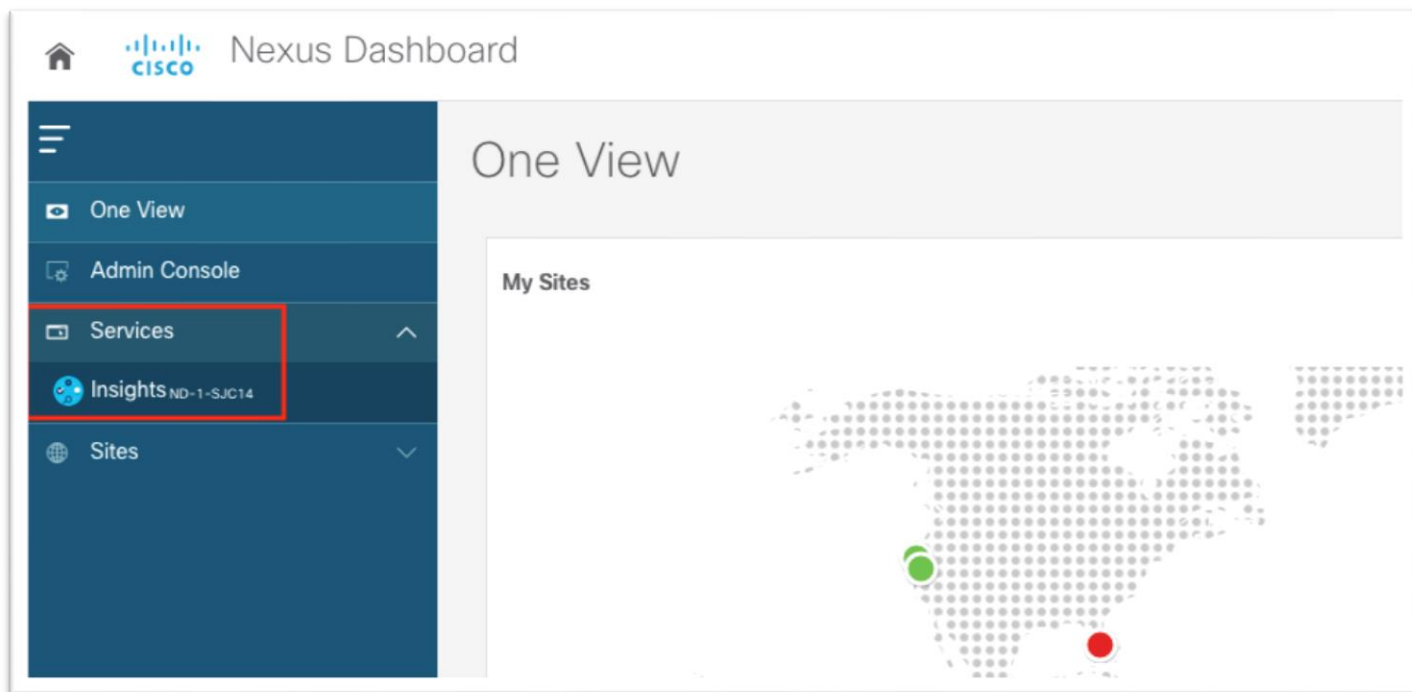
- Multiple sites can now be grouped into a site group for a holistic view of related sites.
- Bug Scan can be enabled to run periodically to check the fabric for known defects downloaded from the Cisco Cloud.
- Assurance Analysis: Used to take a detailed snapshot of the network fabric periodically including intent, policy, and hardware states. These snapshots can then be used for delta analysis, pre-change analysis, and to query the model using natural language queries in the Explore function.
- Alert rules can be configured to provide more granular control of anomalies, setting the initial state to acknowledge or to customize the recommendation.

- Compliance requirements can be enabled to provide communication or configuration checks on the snapshots to ensure business requirements and operational requirements are in compliance with known standards.

## Configuration Steps for Cisco Nexus Dashboard Insights 6.x Site Group:

This section discusses the high level steps to enable a site in Cisco Nexus Dashboard Insights release 6.0. Detailed steps on creating a site group or adding a site into an existing site group are out of the scope of this document. For more information about setting up Cisco Nexus Dashboard Insights, see the [Cisco Nexus Dashboard Insights 6.x ACI User Guide - Installation and Setup](#) and if necessary, the [Cisco Nexus Dashboard Insights 6.x Deployment Guide](#).

1. Using a browser, open a session to the Cisco Nexus Dashboard GUI.
2. In the left-hand menu, choose **Services**.
3. Choose **Insights** from the menu.



After the Cisco Nexus Dashboard Insights service launches, proceed to either create a new site group or configure a site group already in existence by editing the existing site group and adding a member. The following steps are equivalent for both new and existing site groups.

1. Select Member opens a pop-up that shows the available sites. Select an available site and click **Select**.

## Select a Site ✕

SF

Site

SF

Critical	Major	Minor	Warning
0	0	0	0

**General Information** ^

SW ANALYTICS

Unknown

FLOW COLLECTION

Unknown

**Site Overview** ^

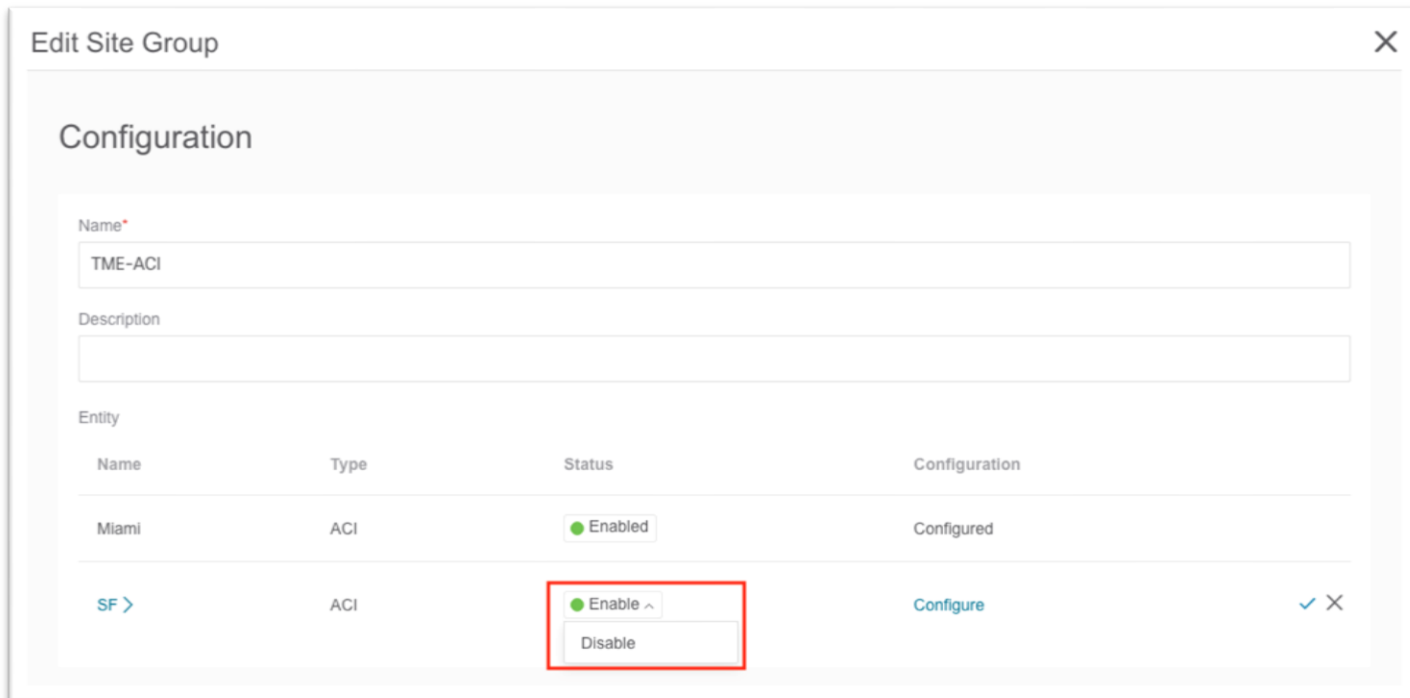
Anomaly Trend

No anomalies found

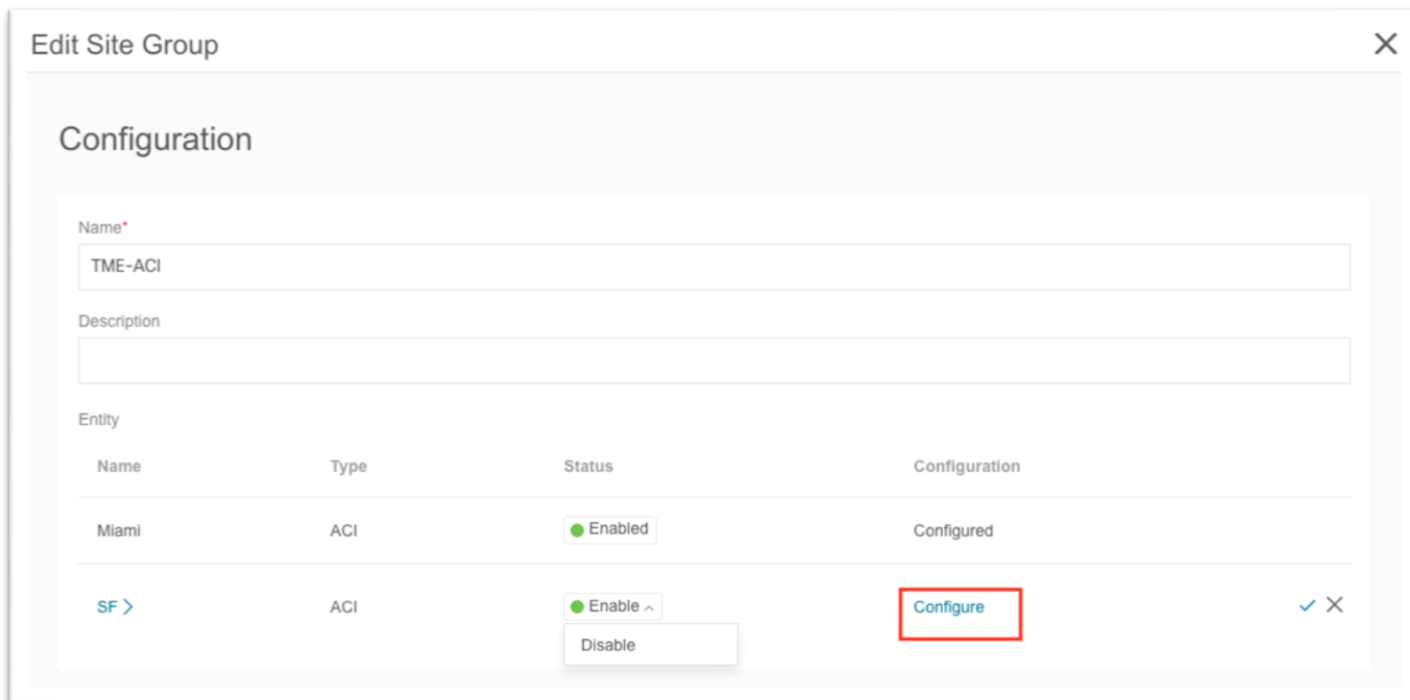
---

Select

2. Set the **Status** to **Enabled**.

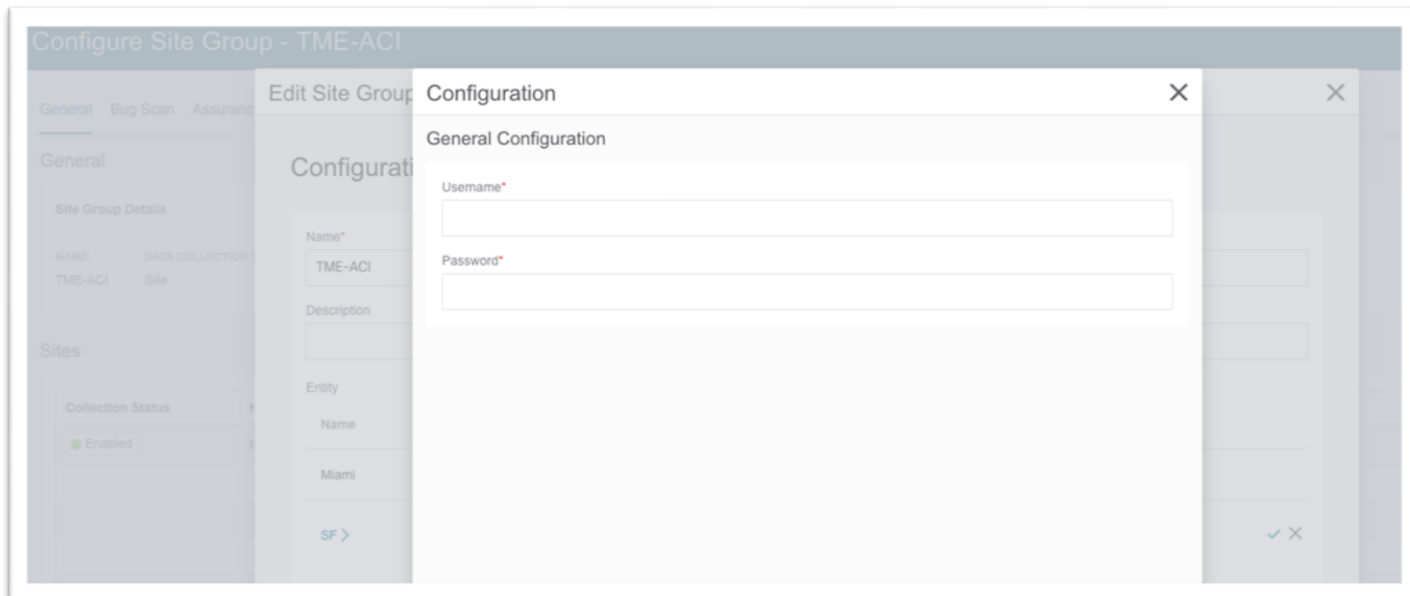


3. In the **Configuration** column, click **Configure**. This opens a new pop-up.



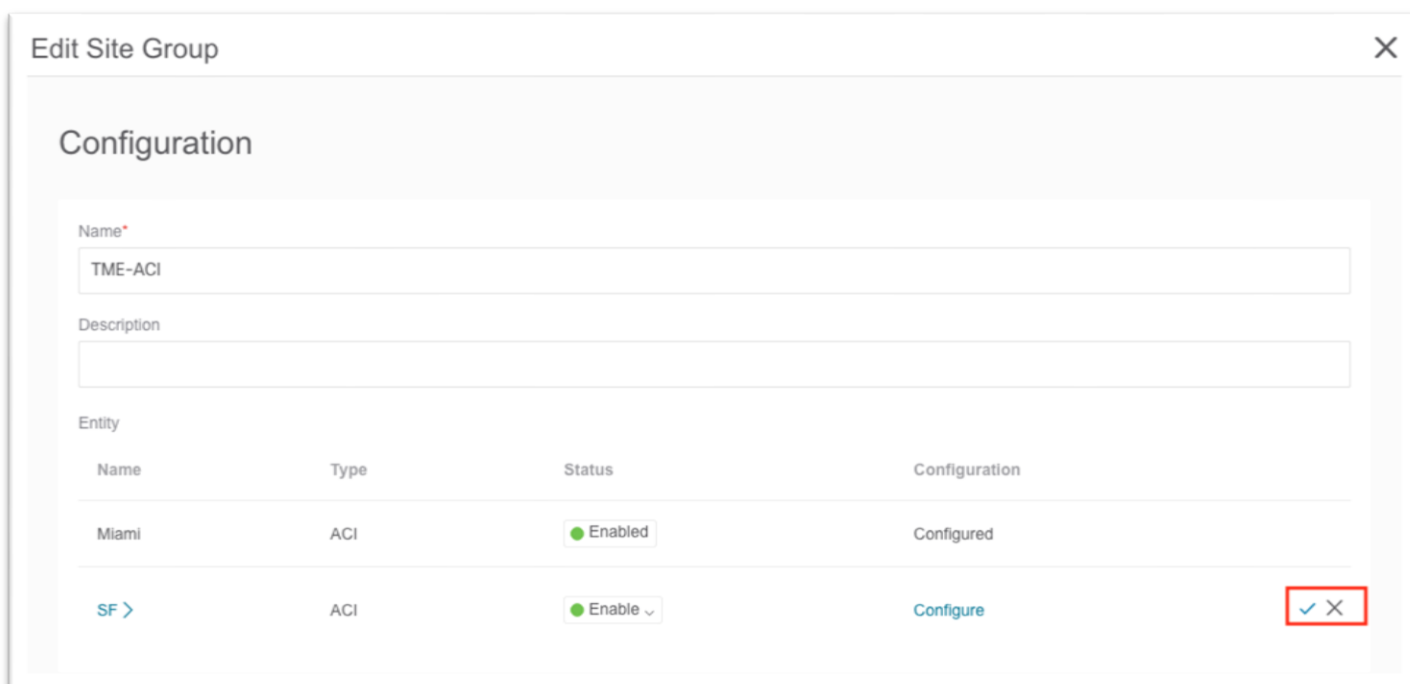
- a. In this pop-up input the username and password that will be used for assurance analysis. These credentials should have admin-level privilege.





b. Click **Save**.

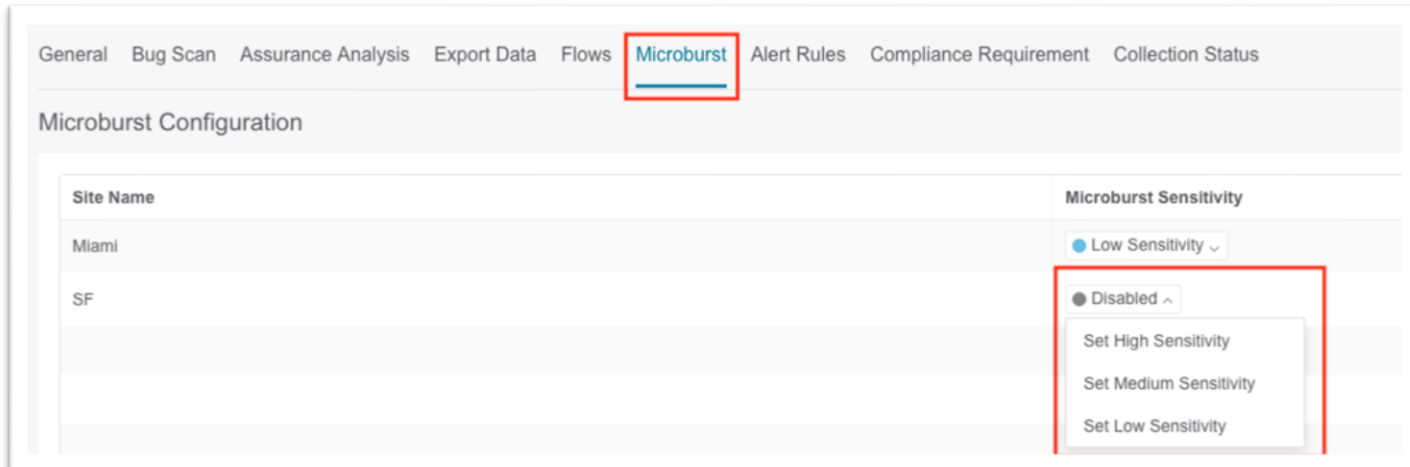
4. Click the checkmark to save.



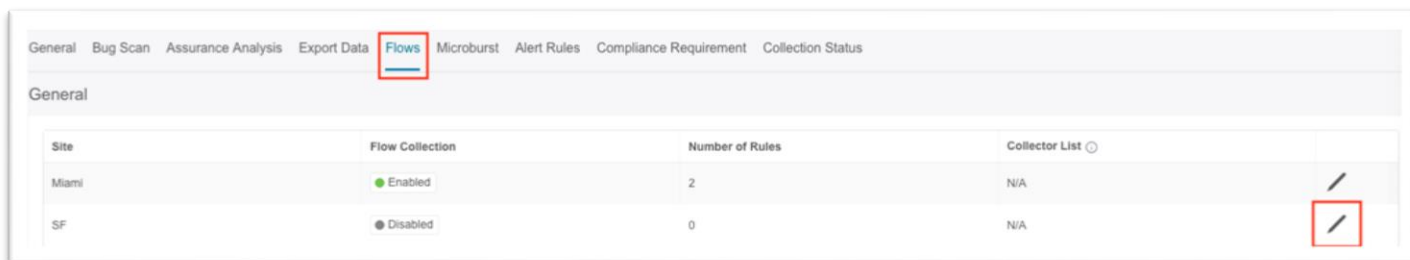
5. Click **Save** at the bottom.

a. After the site is added successfully, the **Collection Status** column value changes from "Adding" to "Enabled."

6. Click the **Microburst** tab along the top menu, then click the sensitivity drop-down list and choose the desired microburst sensitivity for the site.



7. Click on the **Flows** tab in the top menu, then click on the pencil icon to edit the new site.



- In the pop-up, choose the toggle for the desired flow collection mode.
- Create flow telemetry rules, if needed.

## Edit Flow - SF

### Flow Collection Modes

Flow Telemetry

Netflow

sFlow

### Flow Telemetry Rules ⓘ

Filters

Name



Tenant

VRF

+ Add

c. Click **Save** at the bottom.

8. Click on the **Assurance Analysis** tab in the top menu, then click on the pencil icon to edit the new site.

Site	Status	Last Run Date	State	Start Time	Frequency	End On		Run Now
SF	Completed	Aug 31 2021 02:24:42.000 PM	Disabled	Aug 31st 2021, 2:39 PM	Repeat Every 20 Minutes	Never		Run Now
Miami	In Progress	-	Enabled	Aug 26th 2021, 2:43 PM	Repeat Every 25 Minutes	Never		Run Now

a. In the pop-up, set the state to **Enabled**.

b. If necessary, choose a start time in the future in case another site is currently running an assurance analysis.

c. For repeat time, ensure enough time is allocated for a large fabric. See the User Guide for more information.

d. Click **Save** at the bottom.

### Configuration

State

Enabled Disabled

Start Time

09/01/2021 9:36 AM

Repeat Every

20 Minutes

End On

Never

Timeout

2 Hours

Save

9. Click the **Bug Scan** tab in the top menu, then click on the pencil icon to edit the new site.

General Bug Scan Assurance Analysis Export Data Flows Microburst Alert Rules Compliance Requirement Collection Status

General

Site	Status	Last Run Date	State	Start Time	Frequency	End On		
SF	Unavailable	Never	Disabled	Aug 31st 2021, 2:39 PM	Repeat Every 1 week	Never	/	Scan Now
Miami	Aborted	Sep 01 2021 08:00:00.270 AM	Enabled	Aug 30th 2021, 2:00 AM	Repeat Every 1 week	Never	/	Scan Now

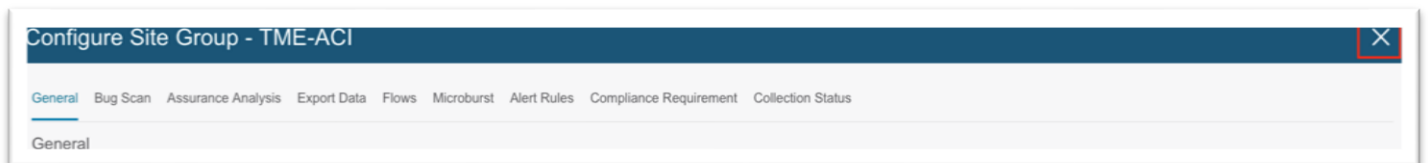
- In the pop-up, set the state to **Enabled**.
- Click **Save** at the bottom.

The image shows a 'Configuration' dialog box with a title bar containing an 'X' icon. The dialog is divided into several sections:

- State:** A toggle switch with 'Enabled' selected and 'Disabled' unselected. This section is highlighted with a red rectangular box.
- Start Time:** A text input field containing '09/01/2021 9:41 AM'.
- Repeat Every:** A text input field containing '1' and a dropdown menu currently set to 'Weeks'.
- End On:** A dropdown menu currently set to 'Never'.

A blue 'Save' button is located at the bottom right of the dialog.

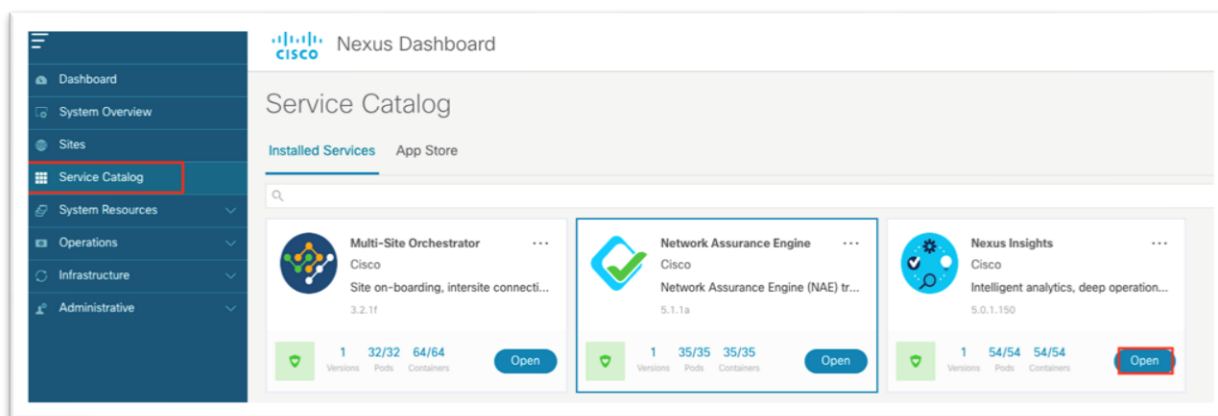
10. After you have enabled all desired settings, click on the X in the blue title bar to return to the Site Group Overview page.



## Configuration Steps for a Cisco Nexus Insights Release 5.x Site

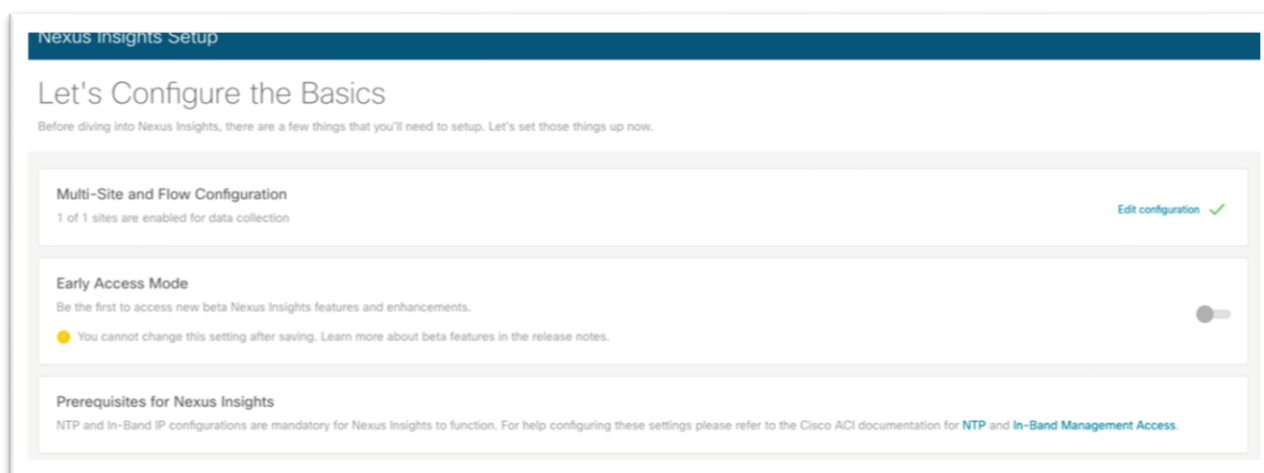
For more information about setting up Cisco Nexus Dashboard Insights, see the [Cisco Nexus Insights 5.x ACI User Guide - Installation and Setup](#).

1. Using a browser, open a session to the Cisco Nexus Dashboard GUI.
2. In the left-hand menu, choose **Service Catalog**.
3. Click **Open** for Cisco Nexus Insights.

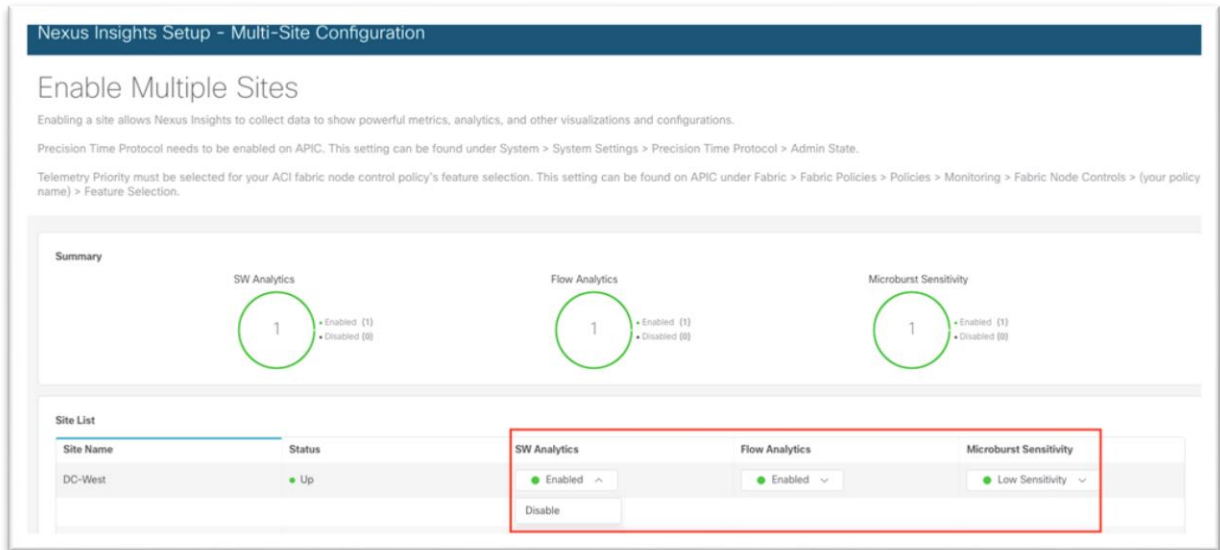


This will open a new tab in your browser. If this is your first time setting up Cisco Nexus Insights, a setup wizard will appear.

4. In the **Multi-Site and Flow Configuration** section, click **Edit configuration**.

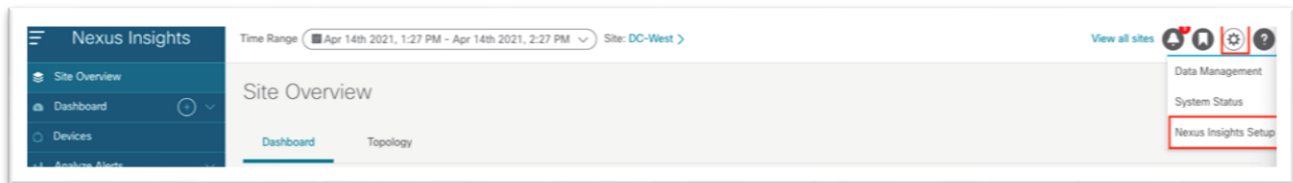


5. Using the drop-down lists under the **SW Analytics** and **Flow Analytics** columns, choose **Enabled** where appropriate. Under the **Microburst Sensitivity** column, choose the desired sensitivity.



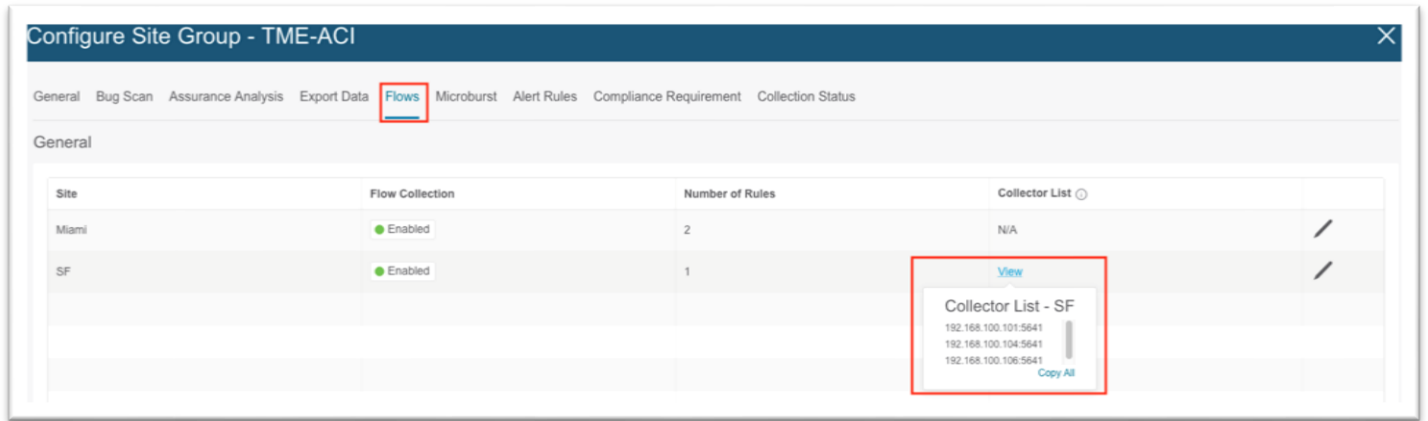
6. Click **Done** at the bottom right corner to exit the **Enable Multiple Sites** screen.
7. Click **Done** once more to exit the **Insights Setup** screen.

At this point, it will take about 5-15 minutes for data to start populating into the Cisco Nexus Dashboard Insights service before any information can be displayed. You can add any future sites into Cisco Nexus Dashboard as described in the previous chapter. In Cisco Nexus Insights, in the top right toolbar, you can also click the **Gear/Settings** icon and choose **Nexus Insights Setup**.



## Cisco ACI NetFlow Configuration

If NetFlow is required, ensure the Cisco Nexus Dashboard External Service Pools persistent IP addresses are assigned on the data network and ensure the site in the site group flow collection mode is set to **NetFlow**. If it is, the NetFlow Exporter IP addresses will be shown under the **Collector List** column as shown below:



The high level workflow for NetFlow is consistent across tenant NetFlow and access policy NetFlow. The workflow consists of a NetFlow record policy that defines what to collect and matching what fields in the headers and a NetFlow Exporter that defines the source and destination IP address, NetFlow version, and EPG where the destination can be reached. Finally, the NetFlow record policy and NetFlow exporter is referenced by the NetFlow monitor policy, which is then applied to a bridge domain or interface policy group.

Specifically for Cisco Nexus Dashboard Insights, the destination port to be used in the NetFlow Exporter is 5641.

Specific configuration steps are out of the scope of this document. For more information on NetFlow and Cisco ACI, see the [Cisco APIC and NetFlow](#) technote.

Below are examples of each of the required policies:



## NetFlow Records Policy

Use the drop-down list to choose the necessary options.

**Create Flow Record**

Name: netflow-records

Description: optional

Collect Parameters:

- Source Interface
- Bytes counter
- Pkts counter
- Pkt disposition
- TCP flags
- First pkt timestamp
- Recent pkt timestamp

Match Parameters:

- Destination IPv4
- Destination Port
- IP Protocol
- Source IPv4
- Source IPv6
- Destination IPv4/6
- Destination IPv4
- Destination IPv6
- Destination MAC
- Destination Port
- Ethertype
- IP Protocol
- Source IPv4/6
- Source IPv4
- Source IPv6

Cancel Submit

## NetFlow Exporters Policy

We recommend that you use Source Type = Inband Management IP. With this option, there is no need to input any IP address manually in the **Source IP Address** field. Ensure that destination port 5641 and Version 9 is used. Also, NetFlow in Cisco ACI requires that the exporter IP address be in a user VRF instance or common/default VRF instance. The L3out can be in the mgmt tenant.

### Create External Collector Reachability

Name:

Description:

Source Type:

Source IP Address:

IP Address with mask up to 20 for ipv4 and mask up to 116 for ipv6

Destination Port:

Destination IP Address:

QoS DSCP Value:

NetFlow Exporter Version Format:

EPG Type:  App EPG  L3 EPG

Associated L3 EPG:

Tenant L3 Epg VRF

## NetFlow Monitor Policy

The NetFlow monitor policy simply ties the record policy and monitoring policy together to be used by the desired object, such as a bridge domain or interface policy group.

### Create NetFlow Monitor

Name:

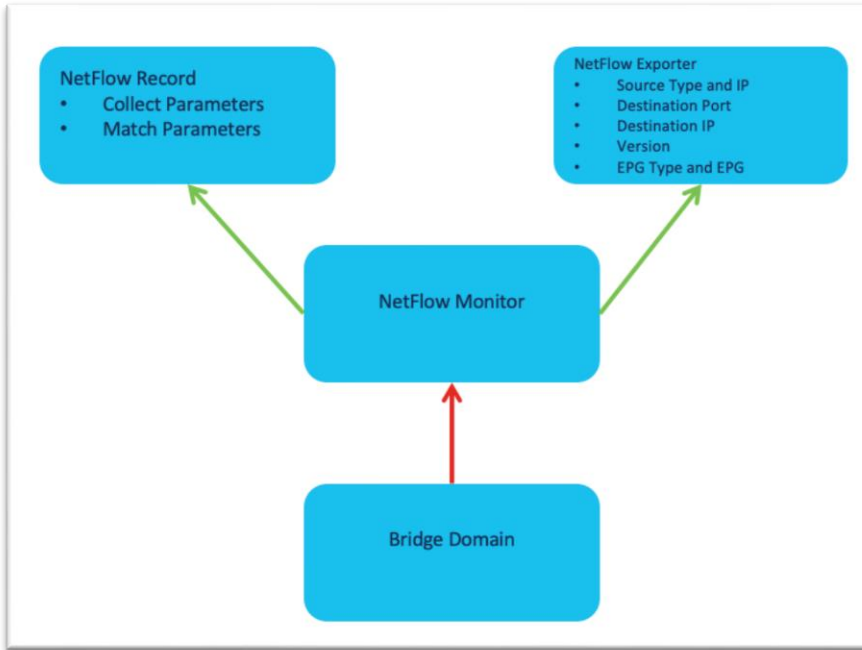
Description:

Associated Flow Record:

Associated Flow Exporters:

- NetFlow Exporter

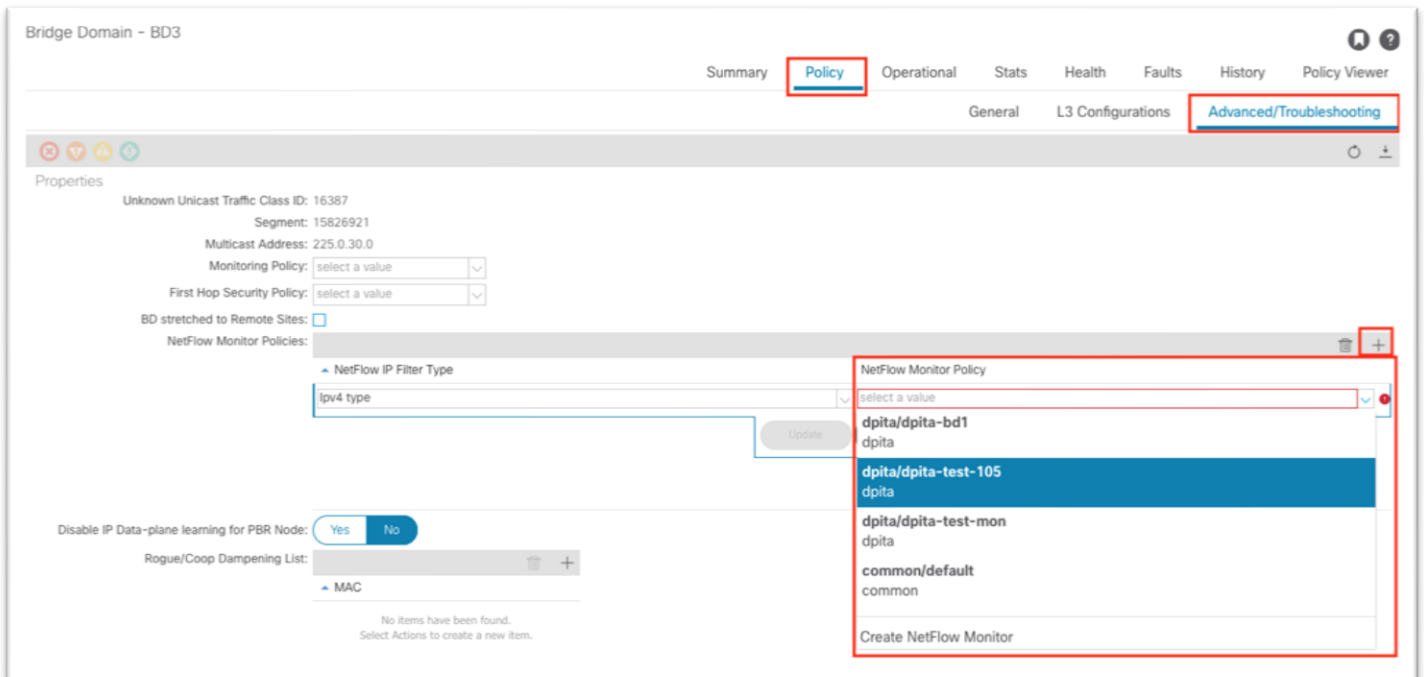
## Tenant Level NetFlow



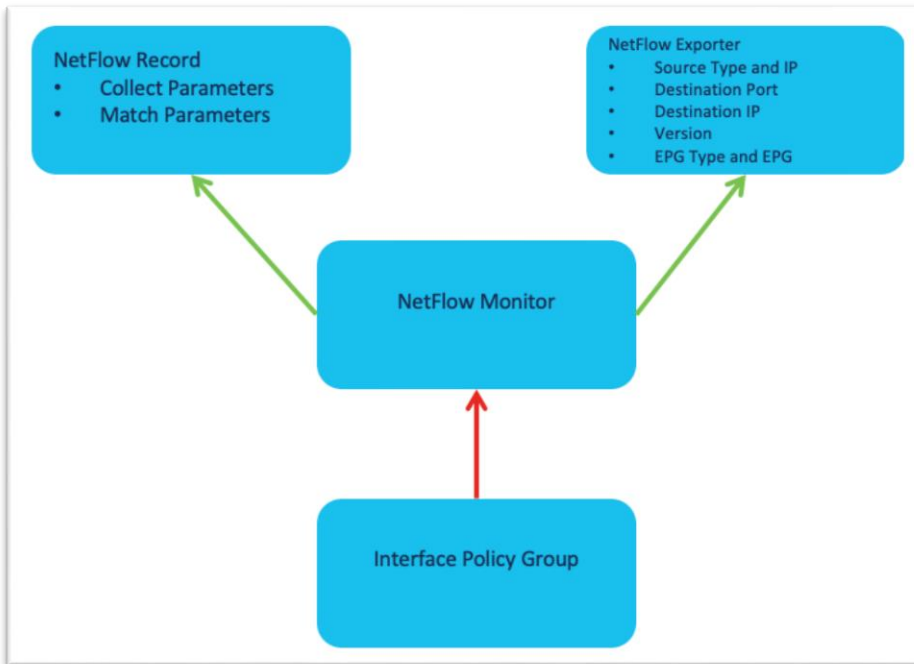
This configuration can be found under **Tenant > Policies > NetFlow**.

As shown, the NetFlow monitor is then attached to the bridge domain under **Policy > Advanced/Troubleshooting**.

The following screenshot shows how to apply a NetFlow monitor policy on an existing bridge domain in Cisco APIC release 5.2:



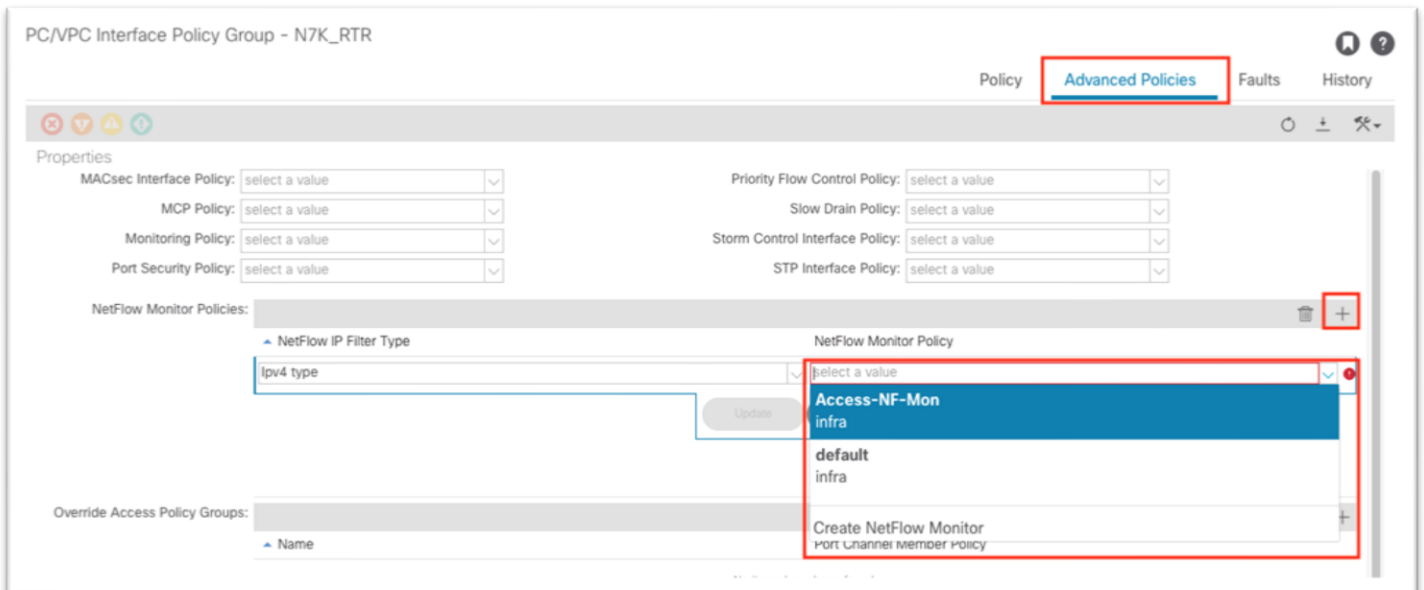
## Access Policy NetFlow



This configuration can be found under **Fabric > Access Policies > Policies > Interface > NetFlow**.

As shown, the NetFlow monitor is then attached to the interface policy group.

The following screenshot shows how to apply a NetFlow monitor policy on an existing vPC interface policy group in Cisco APIC release 5.2:



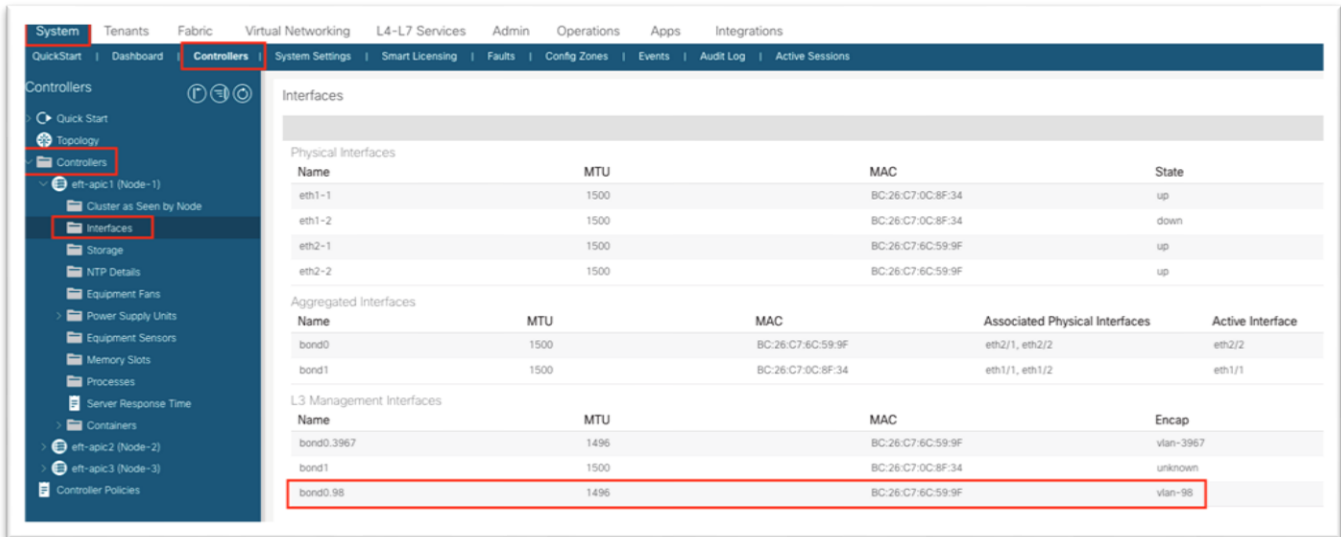
## Basic Verification

### In-band Verification

As with any configuration in Cisco ACI, the first thing to do is check for faults. In this case, check the mgmt tenant or the system level for faults.

## Cisco APIC Verification

From the Cisco APIC GUI, navigate to **System > Controllers > Controllers > Interfaces** and ensure there is a new entry under **L3 Management Interfaces**. There should be a new bond0 with the VLAN configured in the VLAN pool and in the node management EPG.



From the Cisco APIC CLI, run `ifconfig bond0.98` and verify the IP address on the in-band interface:

```
eft-apic3# ifconfig bond0.98
bond0.98: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1496
    inet 192.168.98.153 netmask 255.255.255.0 broadcast 192.168.98.255
    inet6 fe80::be26:c7ff:fe6c:5d9f prefixlen 64 scopeid 0x20<link>
    ether bc:26:c7:6c:5d:9f txqueuelen 1000 (Ethernet)
    RX packets 311049 bytes 67220546 (64.1 MiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 391273 bytes 2151564060 (2.0 GiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

From the APIC CLI, attempt to ping the In-Band bridge domain subnet. `ping 192.168.98.1 -I 192.168.98.153`

```
eft-apic3# ping 192.168.98.1 -I 192.168.98.153
PING 192.168.98.1 (192.168.98.1) from 192.168.98.153 : 56(84) bytes of data.
64 bytes from 192.168.98.1: icmp_seq=1 ttl=64 time=0.138 ms
64 bytes from 192.168.98.1: icmp_seq=2 ttl=64 time=0.183 ms
64 bytes from 192.168.98.1: icmp_seq=3 ttl=64 time=0.142 ms
64 bytes from 192.168.98.1: icmp_seq=4 ttl=64 time=0.133 ms
```

## Switch Verification

From the Cisco APIC, you can run the `show switch` command to check in-band IP configuration quickly:

```
eft-apic3# show sw
```

ID	Pod	Address	In-Band IPv4	OOB IPv4	Version	Flags	Name
111	1	10.0.104.66	192.168.98.171	10.18.188.165	n9000-15.1(4c)	asiv	Spine111
112	1	10.0.104.65	192.168.98.172	10.18.188.166	n9000-15.1(4c)	asiv	Spine112
301	1	10.0.104.64	192.168.98.161	10.18.188.161	n9000-15.1(4c)	aliv	Leaf301
302	1	10.0.104.67	192.168.98.162	10.18.188.162	n9000-15.1(4c)	aliv	Leaf302
401	1	10.0.104.68	192.168.98.163	10.18.188.163	n9000-15.1(4c)	aliv	Leaf401
402	1	10.0.104.69	192.168.98.164	10.18.188.164	n9000-15.1(4c)	aliv	Leaf402

Flags - a:Active | l/s:Leaf/Spine | v:Valid Certificate | i:In-Service

```
eft-apic3#
```

For connectivity, connect to a leaf switch either through the Cisco APIC or out-of-band management, run the `show ip int brief vrf mgmt:inb` command:

```
Leaf301# show ip int brie vrf mgmt:inb
IP Interface Status for VRF "mgmt:inb"(6)
Interface          Address          Interface Status
vlan11             192.168.99.1/24  protocol-up/link-up/admin-up
vlan14             192.168.98.161/24 protocol-up/link-up/admin-up
```

With that output, we can determine that VLAN14 on this leaf switch is the SVI for the in-band bridge domain. Running the `show ip int VLAN14` command shows the gateway as secondary, and the primary is the static node address for the switch itself:

```
Leaf301# show ip int vlan14
IP Interface Status for VRF "mgmt:inb"
vlan14, Interface status: protocol-up/link-up/admin-up, iod: 69, mode: pervasive
  IP address: 192.168.98.161, IP subnet: 192.168.98.0/24
  IP address: 192.168.98.1, IP subnet: 192.168.98.0/24 secondary
  IP broadcast address: 255.255.255.255
  IP primary address route-preference: 0, tag: 0
```

```
Leaf301#
```

Finally, test connectivity with iping. Send a ping to the Cisco APIC in-band address:

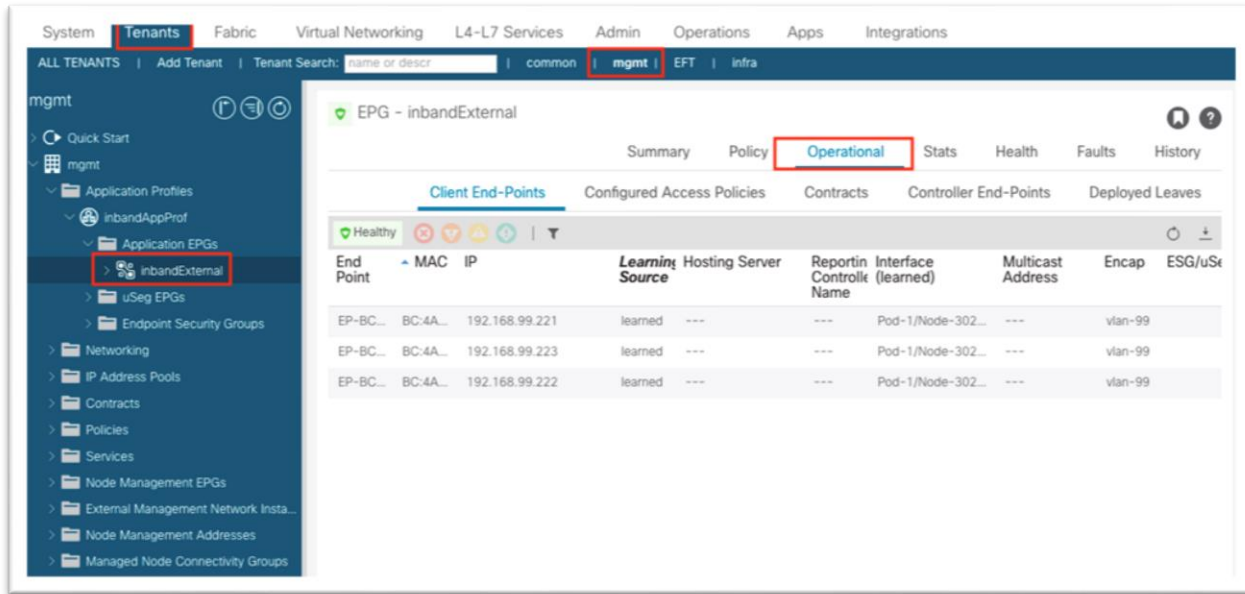
```
Leaf301# iping -V mgmt:inb 192.168.98.153 -S 192.168.98.161
PING 192.168.98.153 (192.168.98.153) from 192.168.98.161: 56 data bytes
64 bytes from 192.168.98.153: icmp_seq=0 ttl=63 time=0.321 ms
64 bytes from 192.168.98.153: icmp_seq=1 ttl=63 time=0.298 ms
64 bytes from 192.168.98.153: icmp_seq=2 ttl=63 time=0.282 ms
64 bytes from 192.168.98.153: icmp_seq=3 ttl=63 time=0.217 ms
64 bytes from 192.168.98.153: icmp_seq=4 ttl=63 time=0.192 ms

--- 192.168.98.153 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.192/0.262/0.321 ms
```

## Connectivity to Cisco Nexus Dashboard Data Interface Verification

This test can be performed from the Cisco APIC or from the leaf switch. To start, looking at the EPG where Cisco Nexus Dashboard is configured is an easy way to confirm whether Cisco ACI has learned the Cisco Nexus Dashboard at all.

Navigate to **Tenants > mgmt > Application Profiles > [name] > Application EPGs > [name] > Operational** to view the endpoints.



From the Cisco APIC CLI, issue a ping to each of the IP addresses listed.

```
eft-opic3# ping 192.168.99.221 -I 192.168.98.153
PING 192.168.99.221 (192.168.99.221) from 192.168.98.153 : 56(84) bytes of data.
64 bytes from 192.168.99.221: icmp_seq=1 ttl=63 time=0.133 ms
64 bytes from 192.168.99.221: icmp_seq=2 ttl=63 time=0.062 ms
64 bytes from 192.168.99.221: icmp_seq=3 ttl=63 time=0.076 ms
64 bytes from 192.168.99.221: icmp_seq=4 ttl=63 time=0.073 ms
64 bytes from 192.168.99.221: icmp_seq=5 ttl=63 time=0.075 ms
```

If the ping fails, ensure there is a contract in place between the in-band EPG and the Cisco Nexus Dashboard EPG.

```
Leaf301# contract_parser.py | grep mgmt:inb
[9:4108] [vrf:mgmt:inb] permit any tn-mgmt/mgmt-default/inb-In-BandInternal(16386) tn-mgmt/ap-In-BandAppProf/epg-In-BandExternal(49154) [contract:uni/tn-mgmt/brc-In-BandPermit] [hit=57073074,+42]
[9:4109] [vrf:mgmt:inb] permit any tn-mgmt/ap-In-BandAppProf/epg-In-BandExternal(49154) tn-mgmt/mgmt-default/inb-In-BandInternal(16386) [contract:uni/tn-mgmt/brc-In-BandPermit] [hit=0]
[16:4105] [vrf:mgmt:inb] permit any epg:any tn-mgmt/bd-inb-external(16387) [contract:implicit] [hit=6]
[16:4106] [vrf:mgmt:inb] permit any epg:any tn-mgmt/bd-inb(32771) [contract:implicit] [hit=0]
[16:4103] [vrf:mgmt:inb] permit arp epg:any epg:any [contract:implicit] [hit=0]
[21:4102] [vrf:mgmt:inb] deny,log any epg:any epg:any [contract:implicit] [hit=0]
[22:4104] [vrf:mgmt:inb] deny,log any epg:any pfx-0.0.0.0/0(15) [contract:implicit] [hit=0]
Leaf301# show zoning-rule scope 2949121
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
|Rule ID|SrcEPG|DstEPG|FilterID| Dir | operSt| Scope | Name | Action | Priority |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| 4102 | 0 | 0 | implicit| uni-dir | enabled| 2949121| | deny,log | any_any_any(21) | |
| 4103 | 0 | 0 | implarp | uni-dir | enabled| 2949121| | permit | any_any_filter(17) |
| 4104 | 0 | 15 | implicit| uni-dir | enabled| 2949121| | deny,log | any_vrf_any_deny(22) |
| 4105 | 0 | 16387 | implicit| uni-dir | enabled| 2949121| | permit | any_dest_any(16) |
| 4106 | 0 | 32771 | implicit| uni-dir | enabled| 2949121| | permit | any_dest_any(16) |
| 4108 | 16386 | 49154 | default | uni-dir- | enabled| 2949121| mgmt: | permit | src_dst_any(9) |
| | | | ignore | | | | | In-BandPermit | | |
| 4109 | 49154 | 16386 | default | bi-dir | enabled| 2949121| mgmt: | permit | src_dst_any(9) |
| | | | | | | | | In-BandPermit | | |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
Leaf301#
```

## Network Time Protocol Verification

### Cisco APIC Network Time Protocol Verification

From the NX-OS-style CLI, run the `show ntp` command to display the Cisco APICs' configuration and status:

```
eft-apic3# show ntp
nodeid    remote          refid    st    t  when    poll    reach    auth    delay    offset    jitter
-----  -  -----  -  -  -  -  -  -  -  -  -  -
3         *  72.163.32.44  .GNSS.  1    u   38     64     377     none   42.783   0.097   0.860
1         *  72.163.32.44  .GNSS.  1    u    6     64     377     none   41.518   0.001   0.151
2         *  72.163.32.44  .GNSS.  1    u   33     64     377     none   40.503  -0.066   0.678
eft-apic3#
```

### Switch Network Time Protocol Verification

The standard NX-OS commands apply, as well as some Linux commands:

- `show clock`
- `show ntp peers`
- `show ntp peer-status`
- `show ntp statistics peer ipaddr <ip>`
- `date`
- `cat /etc/timezone`

```
Leaf301# show clock
08:30:48.620137 CDT Thu Apr 15 2021
Leaf301#
Leaf301# show ntp peers
-----
Peer IP Address          Serv/Peer Prefer KeyId  Vrf
-----
72.163.32.44            Server  yes   None  management
Leaf301# show ntp peer-status
Total peers : 1
* - selected for sync, + - peer mode(active),
- - peer mode(passive), = - polled in client mode
remote          local          st poll reach delay vrf
-----
*72.163.32.44  0.0.0.0       1  64  237  0.044 management
Leaf301# show ntp statistics peer ipaddr 72.163.32.44
remote host:          72.163.32.44
local interface:      Unresolved
time last received:  0s
time until next send: 2s
reachability change: 349419s
packets sent:        28051
packets received:    27957
bad authentication:  0
bogus origin:        59
duplicate:           0
bad dispersion:      59
bad reference time:  0
candidate order:     6
Leaf301#
Leaf301# date
Thu Apr 15 08:31:12 CDT 2021
```



```
Leaf301# cat /etc/timezone
America/Chicago
```

## Precision Time Protocol Verification

The standard NX-OS commands apply:

- show ptp parent
- show ptp counters all
- show ptp clock

With single-pod Cisco ACI, all switches should have the same parent clock:

```
Leaf301# show ptp parent
```

```
PTP PARENT PROPERTIES
```

```
Parent Clock:
```

```
Parent Clock Identity: b0:8b:cf:ff:fe:76:50:8d
```

```
Parent Port Number: 20
```

```
Observed Parent Offset (log variance): N/A
```

```
Observed Parent Clock Phase Change Rate: N/A
```

```
Parent IP: 10.0.104.66
```

```
Grandmaster Clock:
```

```
Grandmaster Clock Identity: b0:8b:cf:ff:fe:76:50:8d
```

```
Grandmaster Clock Quality:
```

```
Class: 248
```

```
Accuracy: 254
```

```
Offset (log variance): 65535
```

```
Priority1: 254
```

```
Priority2: 255
```

```
Leaf301# show ptp counters all
```

```
PTP Packet Counters of Interface Eth1/53:
```

Packet Type	TX	RX
Announce	2	4177888
Sync	15	66447366
FollowUp	15	66439780
Delay Request	33353837	0
Delay Response	0	33353631
PDelay Request	0	0
PDelay Response	0	0
PDelay Followup	0	0
Management	0	0

```
PTP Packet Counters of Interface Eth1/54:
```

Packet Type	TX	RX
Announce	4178103	2
Sync	66486827	15
FollowUp	66481600	15
Delay Request	0	33348274
Delay Response	33348274	0
PDelay Request	0	0
PDelay Response	0	0
PDelay Followup	0	0
Management	0	0

```
Leaf301# show ptp clock
```

```
PTP Device Type : boundary-clock
PTP Device Encapsulation : layer-3
PTP Source IP Address : 10.0.104.64
Clock Identity : 00:3a:9c:ff:fe:19:e8:ff
Clock Domain: 0
Slave Clock Operation : Two-step
Master Clock Operation : Two-step
Slave-Only Clock Mode : Disabled
Number of PTP ports: 2
Configured Priority1 : 255
Priority1 : 255
Priority2 : 255
Clock Quality:
  Class : 248
  Accuracy : 254
  Offset (log variance) : 65535
Offset From Master : -12
Mean Path Delay : 160
Steps removed : 1
Correction range : 100000
MPD range : 1000000000
Local clock time : Wed Aug 4 09:32:31 2021
Hardware frequency correction : NA
```

## Fabric Node Control Verification

The basic verification on the switch to ensure the node control policy was correctly applied is `show analytics hw-profile`, and it should output "Telemetry" as the feature priority:

```
Leaf301# show analytics hw-profile
```

```
Feature Prio: Telemetry
```

After Cisco Nexus Dashboard Insights has been configured and enabled for the site, running `show analytics exporter` will show the data interface IP addresses of the Cisco Nexus Dashboard as export destinations:

```
Leaf301# show analytics exporter
Flow exporter 192.168.99.221:
  Destination: 192.168.99.221
  VRF: mgmt:inb (1)
  Destination UDP Port 5640
  Source: 192.168.98.161
  DSCP 44
  Export Version 255
Flow exporter 192.168.99.222:
  Destination: 192.168.99.222
  VRF: mgmt:inb (1)
  Destination UDP Port 5640
  Source: 192.168.98.161
  DSCP 44
  Export Version 255
Flow exporter 192.168.99.223:
  Destination: 192.168.99.223
  VRF: mgmt:inb (1)
  Destination UDP Port 5640
  Source: 192.168.98.161
  DSCP 44
  Export Version 255
```

```
Feature Prio: Telemetry
```

## NetFlow Verification

The basic verification on the switch to ensure the flow exporters are configured correctly, flows are being collected in the cache, and if NetFlow packets is being generated and exported by the CPU:

- show flow exporter
- show flow monitor
- show flow cache
- tcpdump -i kpm\_inb port 5641

```
F1-Pl-Leaf-104# show flow exporter
Flow exporter dpita:dpita-flow-exp:
  Destination: 192.168.100.104
  VRF: common:default (1)
  Destination UDP Port 5641
  Source: 192.168.99.104
  DSCP 44
  Export Version 9
    Sequence number 262
    Data template timeout 0 seconds
  Exporter Statistics
    Number of Flow Records Exported 974
    Number of Templates Exported 171
    Number of Export Packets Sent 262
    Number of Export Bytes Sent 56740
    Number of Destination Unreachable Events 0
    Number of No Buffer Events 0
    Number of Packets Dropped (No Route to Host) 0
    Number of Packets Dropped (other) 0
    Number of Packets Dropped (Output Drops) 0
    Time statistics were last cleared: Never
Flow exporter dpita:dpita-test-exp2:
  Destination: 192.168.100.105
  VRF: common:default (1)
  Destination UDP Port 5641
  Source: 192.168.99.104
  DSCP 44
  Export Version 9
    Sequence number 262
    Data template timeout 0 seconds
  Exporter Statistics
    Number of Flow Records Exported 974
    Number of Templates Exported 171
    Number of Export Packets Sent 262
    Number of Export Bytes Sent 56740
    Number of Destination Unreachable Events 0
    Number of No Buffer Events 0
    Number of Packets Dropped (No Route to Host) 0
    Number of Packets Dropped (other) 0
    Number of Packets Dropped (Output Drops) 0
    Time statistics were last cleared: Never

Feature Prio: NetFlow

F1-Pl-Leaf-104# show flow monitor
Flow Monitor default:
  Use count: 0
  Flow Record: default
Flow Monitor dpita:dpita-test-mon:
  Use count: 1
  Flow Record: dpita:dpita-test-record
  Bucket Id: 1
  Flow Exporter: dpita:dpita-flow-exp
Flow Monitor dpita:dpita-test-105:
  Use count: 1
  Flow Record: dpita:dpita-test-record
  Bucket Id: 1
  Flow Exporter: dpita:dpita-test-exp2

Feature Prio: NetFlow
```

```
F1-P1-Leaf-104# show flow cache
IPV4 Entries
SIP  DIP  BD ID  S-Port D-Port Protocol Byte Count Packet Count TCP FLAGS  if_id  flowStart  flowEnd
192.168.1.100  192.168.4.100  537  0  0  1  86814  63  0x0  0x16000000  1217618386  1217638714
```

```
F1-P1-Leaf-104# tcpdump -i kpm_inb port 5641
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on kpm_inb, link-type EN10MB (Ethernet), capture size 262144 bytes
11:47:40.116456 IP 192.168.99.104.52255 > 192.168.100.104.5641: UDP, length 220
11:47:40.116588 IP 192.168.99.104.39779 > 192.168.100.106.5641: UDP, length 220
```

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