

# Configure In-Band Management in ACI

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## Introduction

This document describes the configuration of In-Band (INB) management in Application Centric Infrastructure (ACI).

## Prerequisites

### Requirements

Cisco recommends that you have knowledge of these topics:

- \* Understanding of ACI Access Policies
- \* Understanding of ACI Contracts
- \* Understanding of L3out External Network Instance Profile (External EPG) Configuration

Fabric discovery needs to be completed before configuring INB in ACI.

## Components Used

The information in this document is based on these software and hardware versions:

- Application Policy Infrastructure Controller (APIC)
- Browser
- ACI running 5.2 (8e)

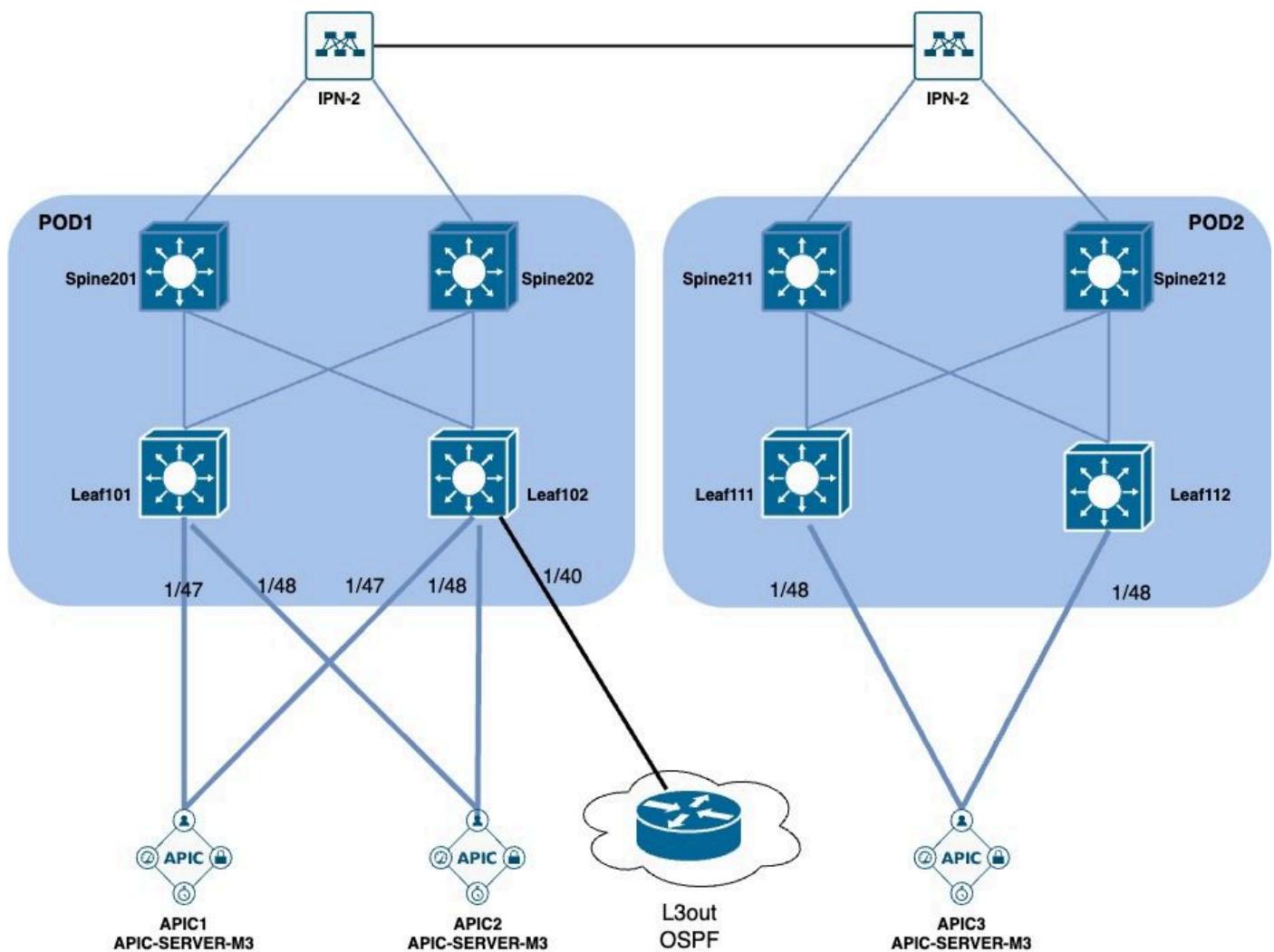
The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

## Configure

Configuration is divided into three major steps:

1. Configure the VLAN of INB on the port connecting Leaf and APIC.
2. Associate INB EPG in management tenant and assign INB address to all devices.
3. Leak INB address via L3out or Tenant VRF.

## Network Diagram



### 1. Configure the VLAN of INB in the Leaf Interface

## 1.1. Create a VLAN Pool

Navigate to the APIC web GUI path; Fabric > Access Policies > Pools > VLAN.

The screenshot shows the APIC web GUI navigation bar with tabs: System, Tenants, Fabric (highlighted with a red box), and Virtual Networking. Below the tabs, there are links for Inventory, Fabric Policies, and Access Policies (also highlighted with a red box). The main content area is titled "Policies". A sidebar on the left lists categories: Quick Start, Interface Configuration, Switch Configuration, Switches, Modules, Interfaces, Policies, Physical and External Domains, Pools (highlighted with a red box), VLAN (highlighted with a red box), Multicast Address, VSAN, VSAN Attributes, and VXLAN. A tooltip "Create VLAN Pool" is shown over the VLAN link.

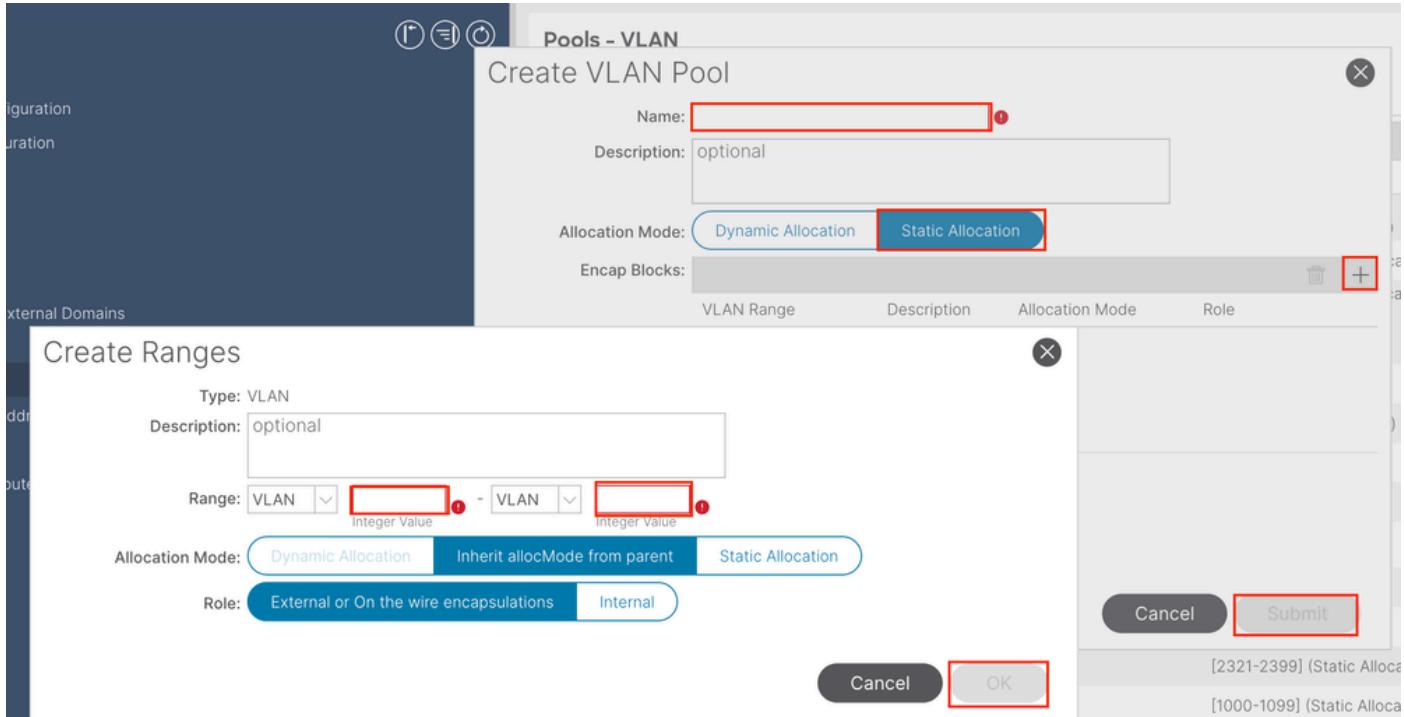
System    Tenants    **Fabric**    Virtual Networking

Inventory | Fabric Policies | **Access Policies**

## Policies

- ▶ Quick Start
- ☰ Interface Configuration
- ☰ Switch Configuration
- > ☰ Switches
- > ☰ Modules
- > ☰ Interfaces
- > ☰ Policies
- > ☰ Physical and External Domains
- > ☰ Pools
- > ☰ VLAN
- > ☰ Multicast Address
- > ☰ VSAN
- > ☰ VSAN Attributes
- > ☰ VXLAN

Create VLAN Pool



Name - The name of the VLAN Pool. This name can be between 1 and 64 alphanumeric characters.

Description - The description of the VLAN pool. The description can be 0 to 128 alphanumeric characters.

Allocation Mode - The allocation method of this VLAN Pool must be static for INB.

Encap Blocks - The range of assigned VLANs Pool.

Range - The start VLAN ID and the end VLAN ID of the VLAN Pool. The start ID must be less than or equal to the end ID.

## 1.2. Create Physical Domain

Navigate to the APIC web GUI path; Fabric > Access Policies > Physical and External Domains > Physical Domains.

[System](#)[Tenants](#)[Fabric](#)[Virtual Network](#)[Inventory](#)[Fabric Policies](#)[Access Policies](#)

## Policies



► Quick Start

Interface Configuration

Switch Configuration

> Switches

> Modules

> Interfaces

> Policies

▽ Physical and External Domains

> External Bridged Domains

> Fibre Channel Domains

> L3 Domains

> Physical Domains

> Pools

Create Physical Domain

## Create Physical Domain



Name:  \*

Associated Attachable Entity Profile:  select a value \*

VLAN Pool:  select an option \*

Security Domains: \*

Select	Name	Description
--------	------	-------------



Cancel

Submit

Name - The name of the Physical Domain. This name can be between 1 and 64 alphanumeric characters.

VLAN Pool - Choose the **VLAN Pool** created in Step 1.1.

### 1.3. Create Attachable Access Entity Profiles

Navigate to the APIC web GUI path; Fabric > Access Policies > Policies > Global > Attachable Access Entity Profile.

[System](#)[Tenants](#)[Fabric](#)[Virtual Network](#)[Inventory](#)[Fabric Policies](#)[Access Policies](#)

## Policies

[Quick Start](#)[Interface Configuration](#)[Switch Configuration](#)[Switches](#)[Modules](#)[Interfaces](#)[Policies](#)[Switch](#)[Interface](#)[Global](#)[PTP User Profile](#)[DHCP Relay](#)[Attachable Access Entity Profiles](#)[Error Dis.](#)[Create Attachable Access Entity Profile](#)[MCP Instance Policy default](#)[QOS Class](#)[Monitoring](#)[Troubleshooting](#)

Create Attachable Access Entity Profile

**STEP 1 > Profile**

Name:  (red box)

Description: optional

Enable Infrastructure VLAN:

Association to Interfaces:  (red box)

Domains (VMM, Physical or External) To Be Associated To Interfaces:

- Domain Profile: select an option (red box)
- Encapsulation: (red box)

EPG DEPLOYMENT (All Selected EPGs will be deployed on all the interfaces associated.)

Application EPGs	Encap	Primary Encap	Mode
------------------	-------	---------------	------

Previous Cancel **Finish** (red box)

Name - The name of the Attachable Access Entity Profile. This name can be between 1 and 64 alphanumeric characters.

Association to Interfaces - Uncheck. In the final step, manually assign to the interface of Leaf in Step 1.6.

Domains (VMM, Physical or External) to be Associated to Interfaces - Choose the Physical Domain created in Step 1.2.

#### 1.4. Create Leaf Access Port Policy Group

Navigate to the APIC web GUI path; Fabric > Access Policies > Interfaces > Leaf Interfaces > Policy Groups > Leaf Access Port Policy Group.

[System](#)[Tenants](#)[Fabric](#)[Virtual Network](#)[Inventory](#)[Fabric Policies](#)[Access Policies](#)

## Policies

[Quick Start](#)[Interface Configuration](#)[Switch Configuration](#)[Switches](#)[Modules](#)[Interfaces](#)[Leaf Interfaces](#)[Profiles](#)[Policy Groups](#)[Leaf Acc](#)[Create Leaf Access Port Policy Group](#)[PC Interface](#)[VPC Interface](#)[PC/VPC Override](#)[Leaf Breakout Port Group](#)[FC Interface](#)[FC PC Interface](#)[Overrides](#)[Spine Interfaces](#)

## Create Leaf Access Port Policy Group



Name:	<input type="text"/>
Description:	optional
Attached Entity Profile:	<input type="text"/> select an option
CDP Policy:	<input type="text"/> select a value
Link Level Policy:	<input type="text"/> select a value
LLDP Policy:	<input type="text"/> system-lldp-enabled

### Advanced Settings

802.1x Port Authentication:	<input type="text"/> select a value
Transceiver policy:	<input type="text"/> select a value
CoPP Policy:	<input type="text"/> select a value
DWDM:	<input type="text"/> select a value
Egress Data Plane Policing:	<input type="text"/> select a value
Fibre Channel Interface:	<input type="text"/> select a value
Ingress Data Plane Policing:	<input type="text"/> select a value
L2 Interface:	<input type="text"/> select a value
Link Flap Policy:	<input type="text"/> select a value
Link Level Flow Control Policy:	<input type="text"/> select a value
MACsec:	<input type="text"/> select a value
MCP:	<input type="text"/> select a value
Monitoring Policy:	<input type="text"/> select a value
PoE Interface:	<input type="text"/> select a value
Port Security:	<input type="text"/> select a value
Priority Flow Control:	<input type="text"/> select a value
Slow Drain:	<input type="text"/> select a value
Storm Control Interface:	<input type="text"/> select a value
STP Interface Policy:	<input type="text"/> select a value
SyncE Interface Policy:	<input type="text"/> select a value

NetFlow Monitor Policies:

NetFlow IP Filter Type

NetFlow Monitor Policy



Cancel

Submit

Name - The name of the Leaf Access Port Policy Group. This name can be between 1 and 64 alphanumeric characters.

Attached Entity Profile - Choose the **Attached Entity Profile** created in Step 1.3.

Link Layer Discovery Protocol (LLDP) Policy - You must choose **Enable Policy**.

## 1.5. Create Leaf Access Port Policy Group

Navigate to the APIC web GUI path; Fabric > Access Policies > Interfaces > Leaf Interfaces > Profiles.

[System](#)[Tenants](#)[Fabric](#)[Virtual Network](#)[Inventory](#)[Fabric Policies](#)[Access Policies](#)

## Policies

[Quick Start](#)[Interface Configuration](#)[Switch Configuration](#)[Switches](#)[Modules](#)[Interfaces](#)[Leaf Interfaces](#)[Profiles](#)

Create Leaf Interface Profile

[Policy Groups](#)

Create FEX Profile

[Overrides](#)[Spine Interfaces](#)[Policies](#)[Physical and External Domains](#)[Pools](#)

**Leaf Interfaces - Profiles**

Create Leaf Interface Profile

Name:  ⓘ

Description: optional

Interface Selectors:

**Create Access Port Selector**

Name:  ⓘ

Description: optional

Interface IDs:  ⓘ  
valid values: All or Ranges. For Example: 1/13, 1/15 or 2/22-2/24, 2/16-3/16, or 1/21-23/1-4, 1/24/1-2

Connected To Fex:

Interface Policy Group:

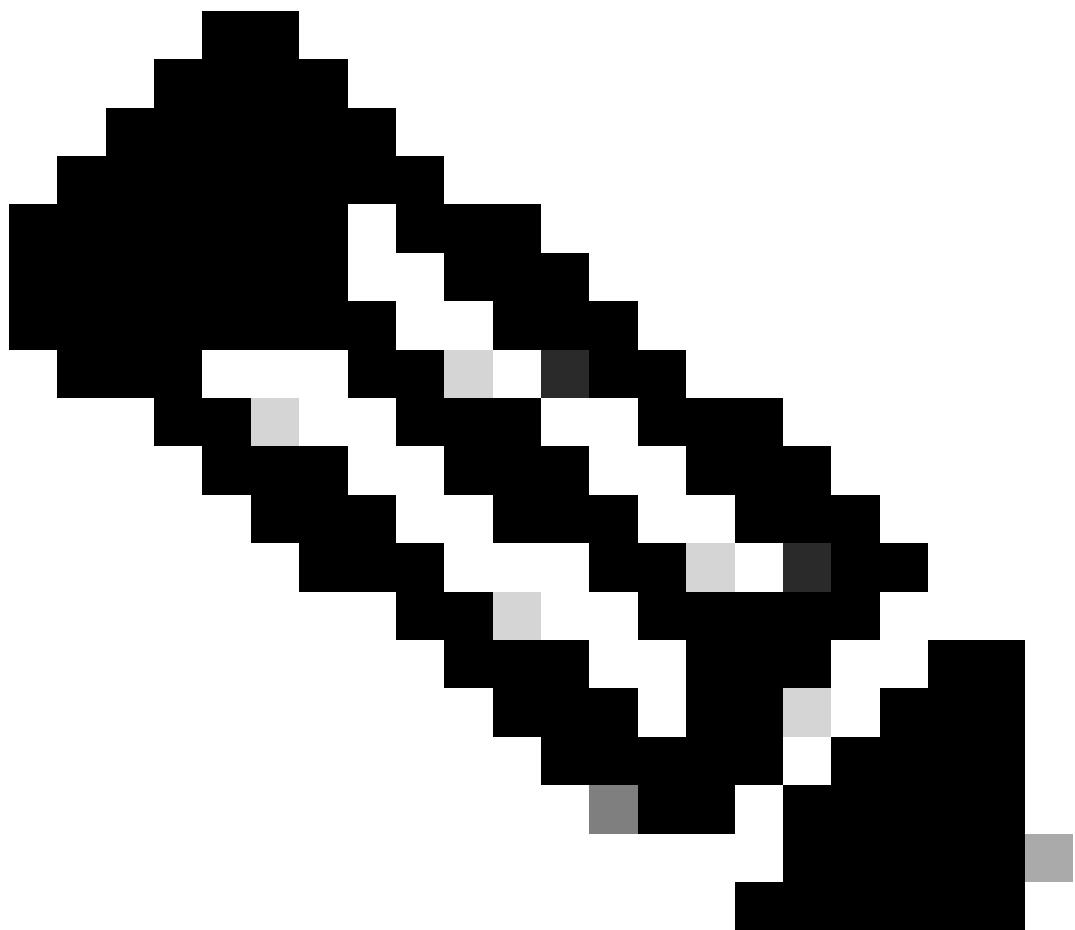
**Name** - The name of the Leaf Interface Profile. This name can be between 1 and 64 alphanumeric characters.

**Interface Selectors** - Create a corresponding **relationship** between interfaces and interface policy.

**Name** - The name of the Access Port Selector. This name can be between 1 and 64 alphanumeric characters.

**Interface IDs** - The interface ID is interconnected with APIC. In the document topology, this interface ID is 1/47 or 1/48.

**Interface Policy Group** - Choose the **Attached Entity Profile** created in Step 1.4.



**Note:** In the topology of this document, the interfaces connecting the three APICs to the Leaf are not the same.

Since APIC 3 is not connected to the Eth1/47 interface, the interface IDs of 1/47-1/48 cannot be created.

It is necessary to create separate interface profiles for Eth1/47 and Eth1/48.

---

## 1.6. Apply Interface Profile to the Leaf

Navigate to the APIC web GUI path; Fabric > Access Policies > Switches > Leaf Switches > Profiles.

[System](#)[Tenants](#)[Fabric](#)[Virtual Network](#)[Inventory](#)[Fabric Policies](#)[Access Policies](#)

## Policies

[Quick Start](#)[Interface Configuration](#)[Switch Configuration](#)[Switches](#)[Leaf Switches](#)[Profiles](#)[Create Leaf Profile](#)[Policy Groups](#)[Overrides](#)[Spine Switches](#)[Modules](#)[Interfaces](#)[Policies](#)[Physical and External Domains](#)[Pools](#)

# Create Leaf Profile

## STEP 1 > Profile

1. Profile

2. Associations

Name:	Leaf-APIC-48								
Description:	optional								
Leaf Selectors:	<span style="float: right;">Delete <span style="border: 1px solid red; padding: 2px;">+</span></span>								
<table border="1"><thead><tr><th>Name</th><th>Blocks</th><th>Policy Group</th></tr></thead><tbody><tr><td>APIC-48</td><td>101-102,111-112</td><td>select an option</td></tr><tr><td colspan="2"><span style="float: right;">Update <span style="border: 1px solid red; padding: 2px;">Cancel</span></span></td></tr></tbody></table>		Name	Blocks	Policy Group	APIC-48	101-102,111-112	select an option	<span style="float: right;">Update <span style="border: 1px solid red; padding: 2px;">Cancel</span></span>	
Name	Blocks	Policy Group							
APIC-48	101-102,111-112	select an option							
<span style="float: right;">Update <span style="border: 1px solid red; padding: 2px;">Cancel</span></span>									
<span style="float: right;">Previous <span style="border: 1px solid red; padding: 2px;">Cancel</span> Next</span>									

Name - The name of the Leaf Profile. This name can be between 1 and 64 alphanumeric characters.

Leaf Selectors - Choose the **Leaf ID** to which the interface configuration is pushed.

Name - The name of the Leaf group.

Blocks - Choose the **switch node ID**.

# Create Leaf Profile

## STEP 2 > Associations

1. Profile

2. Associations

Interface Selector Profiles:

Select	Name	Description
<input type="checkbox"/>	system-port-profile-node-102	
<input type="checkbox"/>	system-port-profile-node-111	
<input type="checkbox"/>	system-port-profile-node-112	
<input type="checkbox"/>	test	
<input checked="" type="checkbox"/>	Leaf-48	

Module Selector Profiles:

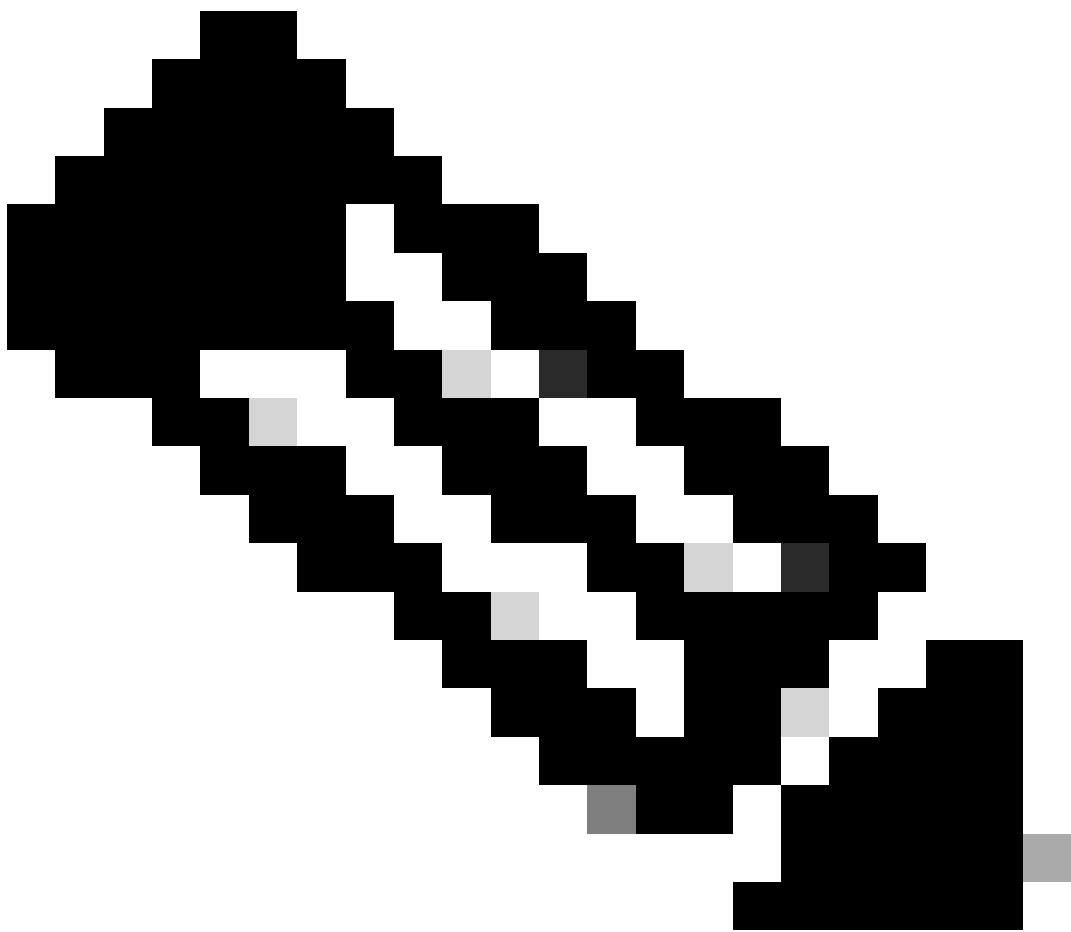
Select	Name	Description

Previous

Cancel

Finish

Interface Selector Profiles - Choose the **Attached Entity Profile** created in Step 1.5.



**Note:** In this document example, two switch profiles must be configured. The first one is to choose Leaf 101-102, Leaf 111-112, and assign the interface profile to Eth1/48. The second is to choose Leaf 111-112 and assign the interface profile to Eth1/47.

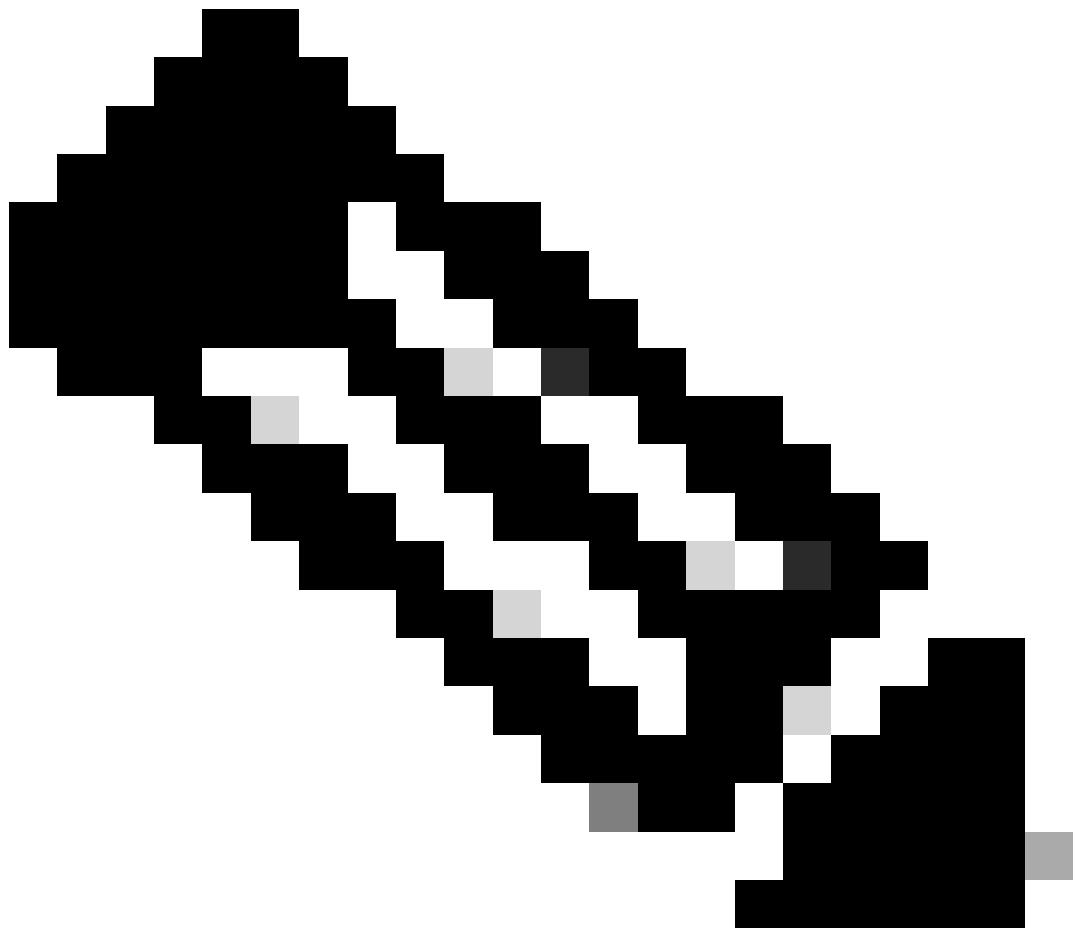
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For more troubleshooting details about Access Policy, refer to [Troubleshoot ACI Access Policies](#).

## **2. Assign INB Address in mgmt Tenant**

### **2.1. Create Bridge Domain (BD) INB Subnet**

Navigate to the APIC web GUI path; Tenants > mgmt > Networking > Bridge Domains > inb.



**Note:** This document uses the default BD and default VRF.

You can also create a new VRF and BD in order to perform similar configurations.

---

System **Tenants** Fabric Virtual Networking Admin Operations Apps Integrations

ALL TENANTS | Add Tenant | Tenant Search: name or descr | common | **mgmt** | guangxil | guangxil2 | infra

**mgmt**

- Quick Start
- mgmt**
- Application Profiles
- Networking**
- Bridge Domains**
- inb**
- VRFs
- L2Outs
- L3Outs
- SR-MPLS VRF L3Outs
- Dot1Q Tunnels
- Contracts
- Policies
- Services
- Security
- Node Management EPGs
- External Management Network Instance Pr...
- Node Management Addresses
- Managed Node Connectivity Groups
- IP Address Pools

**Bridge Domain - inb**

Summary	<b>Policy</b>	Operational	Stats	Health	Faults	History	Policy Viewer																
General																							
<b>L3 Configurations</b>																							
Advanced/Troubleshooting																							
<b>Properties</b> It is recommended to disable Unicast Routing when no subnets are configured. Unicast Routing: <input checked="" type="checkbox"/> Operational Value for Unicast Routing: true Custom MAC Address: 00:22:BD:F8:19:FF Virtual MAC Address: Not Configured Subnets: <table border="1"> <thead> <tr> <th>Gateway Address</th> <th>Description</th> <th>Scope</th> <th>Primary IP Address</th> <th>Virtual IP</th> <th>Subnet Control</th> <th>Matching Tag Selector</th> </tr> </thead> <tbody> <tr> <td colspan="7">No items have been found. Select Actions to create a new item.</td> </tr> </tbody> </table> EP Move Detection Mode: <input type="checkbox"/> GARP based detection Associated L3 Outs: <table border="1"> <thead> <tr> <th>L3 Out</th> </tr> </thead> <tbody> <tr> <td>L3 Out</td> </tr> </tbody> </table>								Gateway Address	Description	Scope	Primary IP Address	Virtual IP	Subnet Control	Matching Tag Selector	No items have been found. Select Actions to create a new item.							L3 Out	L3 Out
Gateway Address	Description	Scope	Primary IP Address	Virtual IP	Subnet Control	Matching Tag Selector																	
No items have been found. Select Actions to create a new item.																							
L3 Out																							
L3 Out																							
<input type="button" value="Show Usage"/> <input type="button" value="Reset"/> <b>Submit</b>																							

## Create Subnet

Gateway IP: **192.168.6.254/24**  
address/mask

Treat as virtual IP address:

Make this IP address primary:

Scope:  Advertised Externally  
 Shared between VRFs

Description: optional

Subnet Control:  No Default SVI Gateway  
 Querier IP

IP Data-plane Learning: **Disabled**

L3 Out for Route Profile: **select a value**

ND RA Prefix Policy: **select a value**

Policy Tags: **+** Click to add a new tag

**Cancel** **Submit**

Gateway IP - The INB subnet gateway.

Scope - Choose according to the route leakage method you used. Here, choose to use **L3out**, and then click **Advertised Externally**.

## 2.2. Create INB EPG

Navigate to the APIC web GUI path; Tenants > mgmt > Node Management EPGs.

[System](#)[Tenants](#)[Fabric](#)[Virtual N](#)

ALL TENANTS

| Add Tenant

| Tenant Search: **mgmt**

Quick Start

mgmt

- > Application Profiles
- > Networking
- > Contracts
- > Policies
- > Services
- Security

Node Management EPGs

- Create Out-of-Band Management EPG
- > Existing Create In-Band Management EPG
- > Node Management Addresses
- > Managed Node Connectivity Group
- > IP Address Pools

Node

Name

Type

default

## Create In-Band Management EPG



Name:   

Annotations:  Click to add a new annotation

Encap:   
e.g., vlan-1

Bridge Domain:

Static Routes:

IP Address	<input type="button" value="Delete"/>	<input type="button" value="Add"/>
------------	---------------------------------------	------------------------------------

Name - The name of the INB EPG.

Encap - Choose **VLAN** in the VLAN Pool as you created in Step 1.1.

Bridge Domain - Choose the BD created in Step 2.1.

### 2.3. Assign Static INB IP Address to the Device

Navigate to the APIC web GUI path; Tenants > mgmt > Node Management Addresses > Static Node Management Addresses.

[System](#)[Tenants](#)[Fabric](#)[Virtual Networkir](#)

ALL TENANTS

Add Tenant

Tenant Search:

name or d

**mgmt**

C► Quick Start

▼ mgmt

&gt; Application Profiles

&gt; Networking

&gt; Contracts

&gt; Policies

&gt; Services

Security

&gt; Node Management EPGs

&gt; External Management Network Instance Profiles

▼ Node Management Addresses

default

Static Node Management Addresses

> Managed [Create Static Node Management Addresses](#)

&gt; IP Address Pools

## Create Static Node Management Addresses



Node Range:  -   
From To

Config:  Out-Of-Band Addresses  
 In-Band Addresses

### In-Band IP Addresses

In-Band Management EPG:

In-Band IPV4 Address:   
address/mask

In-Band IPV4 Gateway:

In-Band IPV6 Address:   
address/mask

In-Band IPV6 Gateway:

[Cancel](#)

[Submit](#)

Node Range - The Node ID to be assigned to the INB address. The assigned INB address increases sequentially with the Node ID.

Configuration - Choose **In-Band Addresses**.

In-Band Management EPG - Choose the **EPG** created in Step 2.2.

In-Band IPV4 Address - The first assigned INB address.

In-Band IPV4 Gateway - Configure it as the address of the subnet added in Step 2.1.

ALL TENANTS

Add Tenant

Tenant Search: name or descr

common

mgmt

**mgmt**

Quick Start

mgmt

&gt; Application Profiles

&gt; Networking

&gt; Contracts

&gt; Policies

&gt; Services

Security

&gt; Node Management EPGs

&gt; External Management Network Instance Pr...

&gt; Node Management Addresses

default

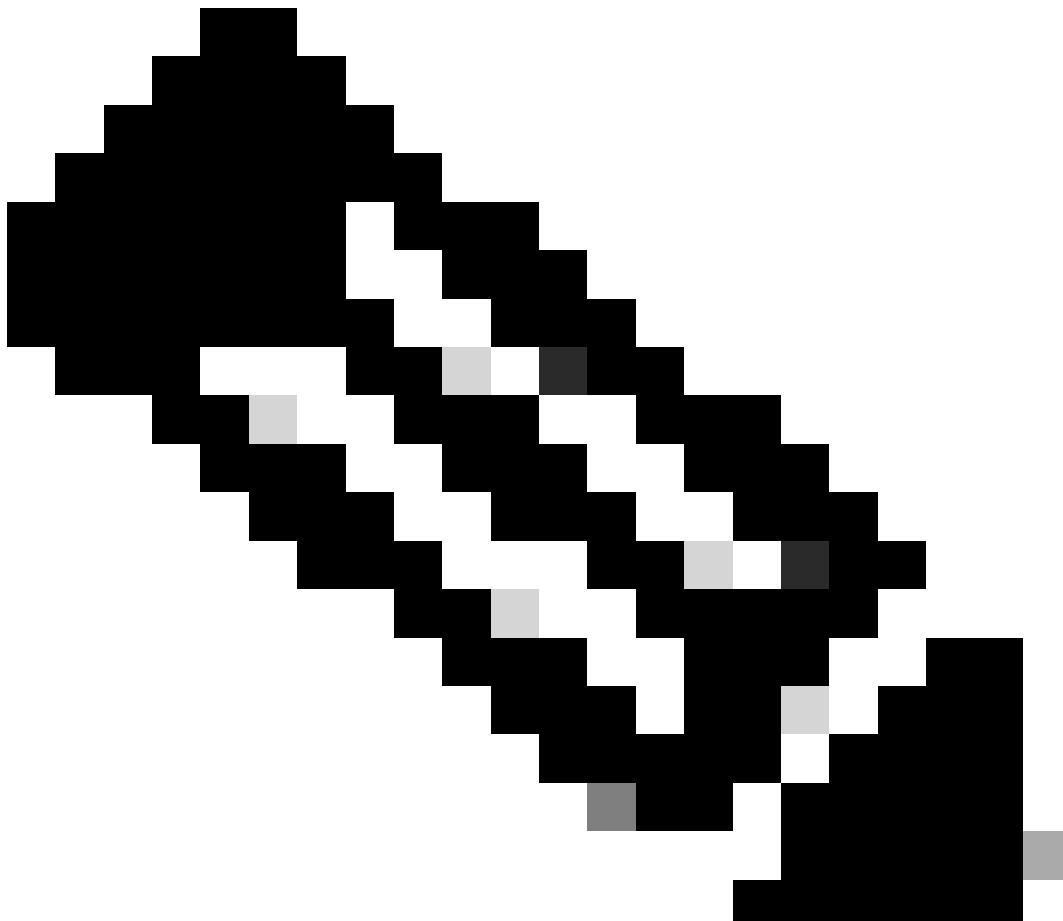
Static Node Management Addresses

&gt; Managed Node Connectivity Groups

&gt; IP Address Pools

**Static Node Management Addresses**

Node ID	Name	Type	EPG	IPV4 Address	IPV4 Gateway
pod-2/node-3	f6apic3	In-Band	default	192.168.6.3/24	192.168.6.254
pod-1/node-1	f6apic1	In-Band	default	192.168.6.1/24	192.168.6.254
pod-1/node-2	f6apic2	In-Band	default	192.168.6.2/24	192.168.6.254
pod-1/node-101	f6leaf101	In-Band	default	192.168.6.101/24	192.168.6.254
pod-1/node-102	f6leaf102	In-Band	default	192.168.6.102/24	192.168.6.254
pod-2/node-112	f6leaf112	In-Band	default	192.168.6.112/24	192.168.6.254
pod-2/node-111	f6leaf111	In-Band	default	192.168.6.111/24	192.168.6.254
pod-1/node-202	f6spine202	In-Band	default	192.168.6.202/24	192.168.6.254
pod-1/node-201	f6spine201	In-Band	default	192.168.6.201/24	192.168.6.254
pod-2/node-212	f6spine212	In-Band	default	192.168.6.212/24	192.168.6.254
pod-2/node-211	f6spine211	In-Band	default	192.168.6.211/24	192.168.6.254



---

**Note:** After completing the configuration in Step 2.3., all Leaf and APIC can communicate through INB.

---

### 3. Leak INB Address

You can share the INB subnet to other networks through any route leakage method. INB EPG can be regarded as a special EPG. There is no difference with normal EPG when configuring route leakage.

This document only configures L3out as an example.

#### 3.1. Create L3out in mgmt Tenant

[System](#)[Tenants](#)[Fabric](#)[Virtual Networkir](#)

ALL TENANTS

Add Tenant

Tenant Search:

name or de

**mgmt**

Quick Start

mgmt

Application Profiles

Networking

Bridge Domains

VRFs

L2Outs

L3Outs

Create L3Out

SR-MPLS VRF L3Outs

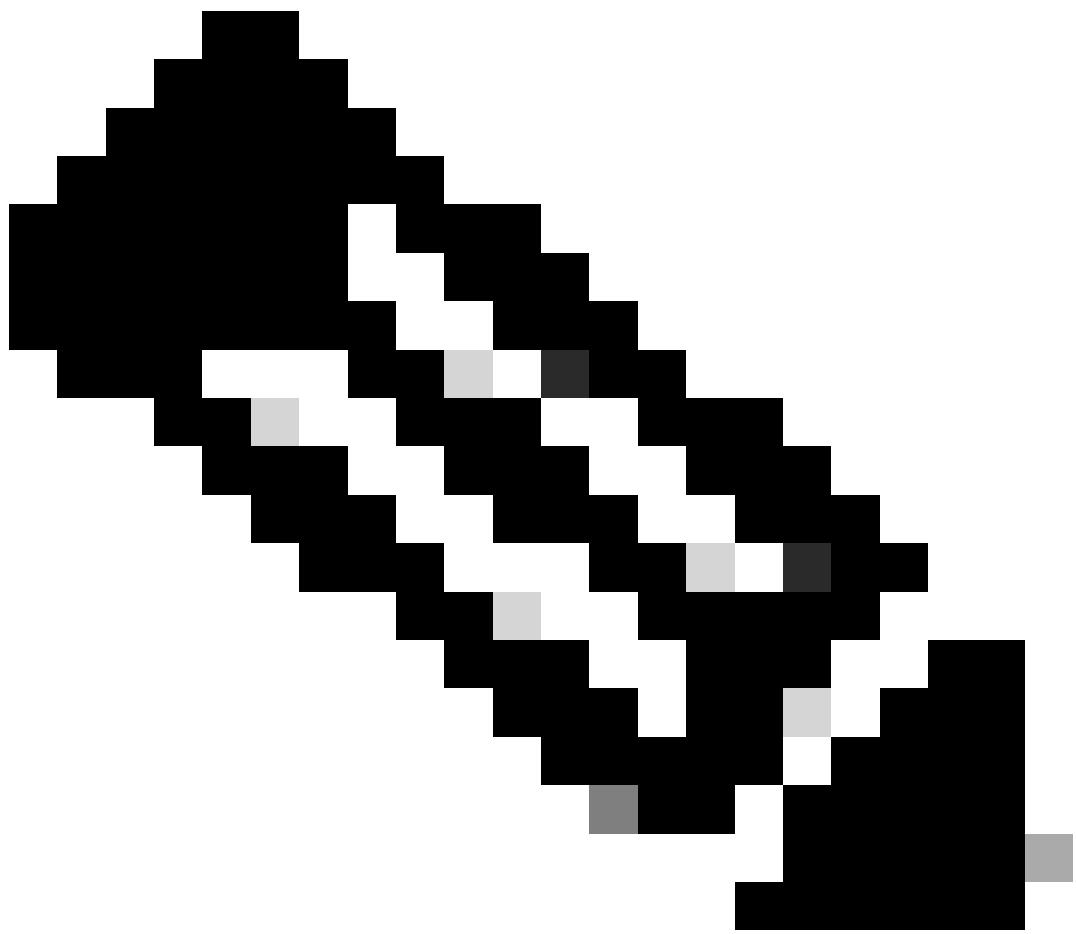
Dot1Q Tunnels

Contracts

Policies

Services

In this example, a physical interface is used with a router running the simple Open Shortest Path First (OSPF) protocol.



**Note:** If you want to know more details about L3out, refer to the L3out white paper; [ACI Fabric L3Out White Paper](#).

---

## Create L3Out

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



### 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.

The screenshot shows the 'Identity' configuration page for an L3Out named 'INB-L3out'. The configuration includes:

- Name: INB-L3out
- VRF: inb
- L3 Domain: F6\_inb
- Use for GOLF:
- Protocol Selection:
  - 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

At the bottom right are buttons for Previous, Cancel, and Next, with 'Next' highlighted.

Name - The name of the INB L3out.

VRF - Choose the VRF where the L3out route is located. In this document, the simplest configuration is used, and the VRF INB in the mgmt tenant is selected.

L3 Domain - Create and choose according to the actual situation. For detailed information about L3 Domain, refer to the L3out white paper.

OSPF - In this example, L3out runs the OSPF protocol. Choose a **dynamic routing protocol** or use **static routing** according to the actual situation.

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: **Routed** Routed Sub SVI Floating SVI

Layer 2: **Port** Direct Port Channel

**Nodes**

Node ID	Router ID	Loopback Address
f2leaf102 (Node-102)	192.168.1.6	192.168.1.6 Leave empty to not configure any Loopback

**Hide Interfaces**

**Interface** IP Address MTU (bytes)

eth1/40 192.168.2.1/24 1500

address/mask

Previous Cancel **Next**

Configure the interface according to your network plan.

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:
1/40	OSPF_P2P

Previous Cancel **Next**

For OSPF, the default network type is broadcast. This example changes the network type to point-to-point.

## Create L3Out



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

### External EPG

The L3Out Network or External EPG is used for traffic classification, contract associations, and route control policies. Classification is matching external networks to this EPG for applying contracts. Route control policies are used for filtering dynamic routes exchanged between the ACI fabric and external devices, and leaked into other VRFs in the fabric.

Name:  all-subnet-epg

Provided Contract:  ▼

Consumed Contract:  ▼

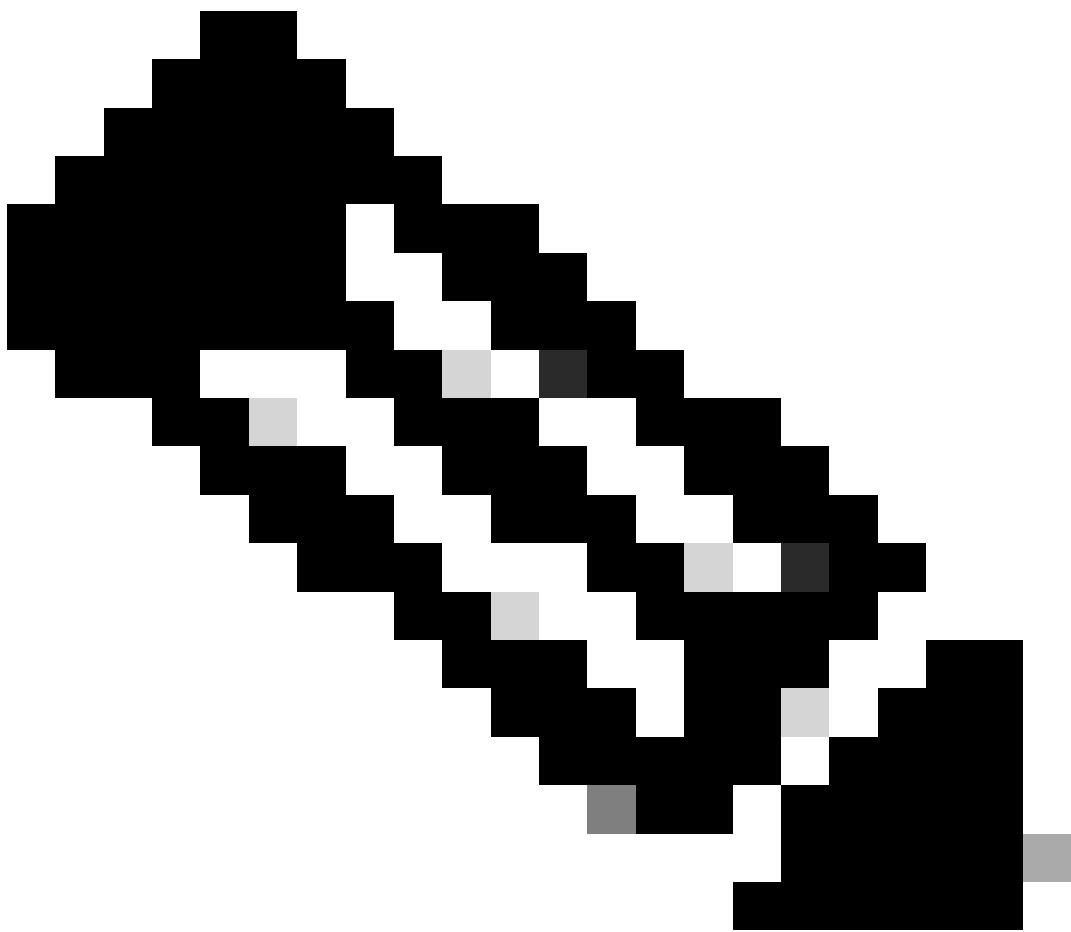
Default EPG for all external networks:  checked

Previous

Cancel

Finish

In this example, there is only one L3out and only EPG, and the default Default EPG for all external networks option can be used.



**Note:** If you have multiple L3out EPGs in the same VRF, configure this option carefully. For more information, refer to the L3out white paper.

After configuring the router, the OSPF neighbor status can change to FULL.

```
admin-Infra# show lldp neighbors
Capability codes:
  (R) Router, (B) Bridge, (T) Telephone, (C) DOCSIS Cable Device
  (W) WLAN Access Point, (P) Repeater, (S) Station, (O) Other
Device ID          Local Intf      Hold-time  Capability  Port ID
f6leaf102.aci.pub    Eth4/37       120           BR          Eth1/40
admin-Infra# show run
```

```
version 8.2(6)
```

```
feature ospf
interface loopback66
  vrf member aci-inb
  ip address 192.168.1.7/32
  ip router ospf aci-inb area 0.0.0.0
```

```

interface Ethernet4/37
  vrf member aci-inb
  ip address 192.168.2.2/24
  ip ospf network point-to-point
  ip router ospf aci-inb area 0.0.0.0
  no shutdown
vrf context aci-inb
  address-family ipv4 unicast
router ospf aci-inb
  vrf aci-inb
    router-id 192.168.1.7

admin-Infra# show ip ospf neighbors vrf aci-inb
OSPF Process ID aci-inb VRF aci-inb
Total number of neighbors: 1
Neighbor ID      Pri State          Up Time   Address      Interface
192.168.1.6      1 FULL/ -        00:04:01  192.168.2.1    Eth4/37
admin-Infra#

f6leaf102# show ip int bri vrf mgmt:inb
IP Interface Status for VRF "mgmt:inb"(27)
Interface          Address          Interface Status
eth1/40            192.168.2.1/24  protocol-up/link-up/admin-up
vlan7              192.168.6.254/24  protocol-up/link-up/admin-up
lo37               192.168.1.6/32   protocol-up/link-up/admin-up
f6leaf102# show ip ospf neighbors vrf mgmt:inb
OSPF Process ID default VRF mgmt:inb
Total number of neighbors: 1
Neighbor ID      Pri State          Up Time   Address      Interface
192.168.1.7      1 FULL/ -        00:05:08  192.168.2.2    Eth1/40
f6leaf102#

```

If you need troubleshooting in L3out, refer to [Troubleshoot ACI External Forwarding](#).

### 3.2. Associated BD to L3out

Navigate to the APIC web GUI path; Tenants > mgmt > Networking > Bridge Domains > inb.

Associated L3outs - Choose the name of the **mgmt L3out** created in Step 3.1.

### 3.3. Create Contracts

Navigate to the APIC web GUI path: Tenants > mgmt > Contracts > Standard.

[System](#)[Tenants](#)[Fabric](#)[Virtual Networki](#)

ALL TENANTS

Add Tenant

Tenant Search:  name or c

## mgmt

[Quick Start](#)[mgmt](#)[Application Profiles](#)[Networking](#)[Contracts](#)[Standard](#)[Create Contract](#)[Taboos](#)[Export Contract](#)[Imported](#)[Filters](#)[Out-Of-Band Contracts](#)[Policies](#)

## Create Contract



Name:	ALL
Alias:	
Scope:	VRF
QoS Class:	Unspecified
Target DSCP:	Unspecified
Description:	optional

Annotations: Click to add a new annotation

Subjects:

Name	Description
ALL	

Cancel

Submit

Create Contract Subject

Alias:	<input type="text"/>
Description:	<input type="text"/> optional
Target DSCP:	Unspecified
Apply Both Directions:	<input checked="" type="checkbox"/>
Reverse Filter Ports:	<input checked="" type="checkbox"/>
Wan SLA Policy:	<input type="text"/> select an option

**Filter Chain**

L4-L7 Service Graph:	<input type="text"/> select an option
QoS Priority:	<input type="text"/>

**Filters**

Name	Directives	Action	Priority
common/any	<input type="text"/>	Permit	default level

**Update** **Cancel**

**Cancel** **OK**

In this example, the contract allows all traffic. If you need more details about the contract, refer to the contract white paper; [Cisco ACI Contract Guide White Paper](#).

### 3.4. Apply Contract to INB EPG

Navigate to the APIC web GUI path; Tenants > mgmt > Node Management EPGs > In-Band EPG - default.

The screenshot shows the APIC web GUI interface for managing contracts. The main navigation bar includes System, **Tenants**, Fabric, Virtual Networking, Admin, Operations, Apps, and Integrations. Under the Tenants tab, the 'mgmt' tenant is selected. In the left sidebar, under 'mgmt', the 'Node Management EPGs' section is expanded, and the 'In-Band EPG - default' profile is selected. The main content area displays the properties of this EPG, including its bridge domain (inb) and provided/consumed contracts. The 'Provided Contracts' table has one row with 'mgmt/ALL' as the name. The 'Consumed Contracts' table also has one row with 'mgmt/ALL' as the name. At the bottom right, there are 'Show Usage', 'Reset', and a red-bordered 'Submit' button.

Provided Contracts - Choose the **contract** created in Step 3.3.

Consumed Contracts - Choose the **contract** created in Step 3.3.

### 3.5. Apply Contract to L3out EPG

Navigate to the APIC web GUI path; Tenants > mgmt > Networking > L3Outs > INB-L3out > External EPGs > all-subnet-epg.

The screenshot shows the APIC web GUI interface. The top navigation bar has tabs for System, Tenants, Fabric, Virtual Networking, Admin, Operations, Apps, and Integrations. The 'Tenants' tab is selected. Below the navigation is a search bar for 'ALL TENANTS' and a tenant search dropdown with options like common, mgmt, guangxil, guangxil2, and infra. On the left, a sidebar under the 'mgmt' heading shows categories: Application Profiles, Networking (selected), L2Outs, L3Outs (selected), Logical Node Profiles, External EPGs (selected), and SR-MPLS VRF L3Outs. Under 'External EPGs', 'all-subnet-epg' is selected. The main content area is titled 'External EPG - all-subnet-epg'. It has tabs for Policy, Operational, Health, Faults, and History, with 'Policy' selected. Below these are tabs for General, Contracts (selected), Inherited Contracts, Subject Labels, and EPG Labels. A sub-header 'Healthy' is present. A table lists columns: Name, Tenant, Tenant Alias, Contract Type, Provided / Consumed, QoS Class, and State. A message says 'No items have been found. Select Actions to create a new item.' To the right, a context menu is open with options: Add Provided Contract (highlighted), Add Consumed Contract (highlighted), Add Consumed Contract Interface, Taboo Contract, Add Intra Ext-EPG Contract, and Delete.

Add Provided Contracts - The contract created in Step 3.3.

Add Consumed Contracts - The contract created in Step 3.3.

After applying it, you can see the contract in Provided and Consumed.

This screenshot shows the same APIC web GUI as the previous one, but after applying contracts. The 'Contracts' tab is selected. The table now displays two rows:

Name	Tenant	Tenant Alias	Contract Type	Provided / Consumed	QoS Class	State	Label	Subject Label
ALL	mgmt		Contract	Provided	Unspecified	formed		
ALL	mgmt		Contract	Consumed	Unspecified	formed		

## Verify

You can see the INB route in the External Router.

```
admin-Infra# show ip route vrf aci-inb
IP Route Table for VRF "aci-inb"
'*' denotes best ucast next-hop
'***' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
```

```

'%<string>' in via output denotes VRF <string>

192.168.1.6/32, ubest/mbest: 1/0
  *via 192.168.2.1, Eth4/37, [110/5], 00:37:40, ospf-aci-inb, intra
192.168.1.7/32, ubest/mbest: 2/0, attached
  *via 192.168.1.7, Log66, [0/0], 00:04:06, local
  *via 192.168.1.7, Log66, [0/0], 00:04:06, direct
192.168.2.0/24, ubest/mbest: 1/0, attached
  *via 192.168.2.2, Eth4/37, [0/0], 00:37:51, direct
192.168.2.2/32, ubest/mbest: 1/0, attached
  *via 192.168.2.2, Eth4/37, [0/0], 00:37:51, local
192.168.6.0/24, ubest/mbest: 1/0
  *via 192.168.2.1, Eth4/37, [110/20], 00:24:38, ospf-aci-inb, type-2
admin-Infra#
admin-Infra# ping 192.168.6.1 vrf aci-inb
PING 192.168.6.1 (192.168.6.1): 56 data bytes
64 bytes from 192.168.6.1: icmp_seq=0 ttl=62 time=0.608 ms
64 bytes from 192.168.6.1: icmp_seq=1 ttl=62 time=0.55 ms
64 bytes from 192.168.6.1: icmp_seq=2 ttl=62 time=0.452 ms
64 bytes from 192.168.6.1: icmp_seq=3 ttl=62 time=0.495 ms
64 bytes from 192.168.6.1: icmp_seq=4 ttl=62 time=0.468 ms

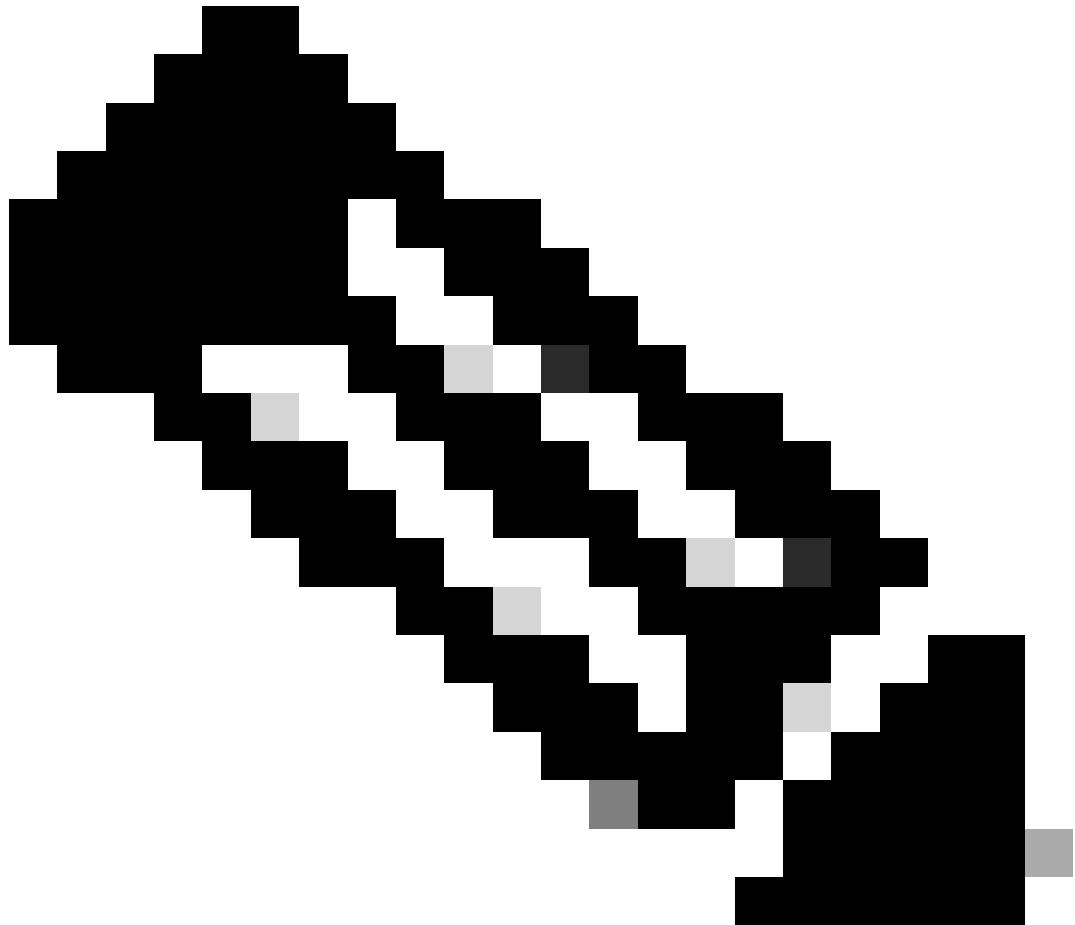
--- 192.168.6.1 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.452/0.514/0.608 ms
admin-Infra# ping 192.168.6.3 vrf aci-inb
PING 192.168.6.3 (192.168.6.3): 56 data bytes
64 bytes from 192.168.6.3: icmp_seq=0 ttl=61 time=0.731 ms
64 bytes from 192.168.6.3: icmp_seq=1 ttl=61 time=0.5 ms
64 bytes from 192.168.6.3: icmp_seq=2 ttl=61 time=0.489 ms
64 bytes from 192.168.6.3: icmp_seq=3 ttl=61 time=0.508 ms
64 bytes from 192.168.6.3: icmp_seq=4 ttl=61 time=0.485 ms

--- 192.168.6.3 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.485/0.542/0.731 ms
admin-Infra# ping 192.168.6.201 vrf aci-inb
PING 192.168.6.201 (192.168.6.201): 56 data bytes
64 bytes from 192.168.6.201: icmp_seq=0 ttl=63 time=0.765 ms
64 bytes from 192.168.6.201: icmp_seq=1 ttl=63 time=0.507 ms
64 bytes from 192.168.6.201: icmp_seq=2 ttl=63 time=0.458 ms
64 bytes from 192.168.6.201: icmp_seq=3 ttl=63 time=0.457 ms
64 bytes from 192.168.6.201: icmp_seq=4 ttl=63 time=0.469 ms

--- 192.168.6.201 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.457/0.531/0.765 ms
admin-Infra# ping 192.168.6.211 vrf aci-inb
PING 192.168.6.211 (192.168.6.211): 56 data bytes
64 bytes from 192.168.6.211: icmp_seq=0 ttl=63 time=0.814 ms
64 bytes from 192.168.6.211: icmp_seq=1 ttl=63 time=0.525 ms
64 bytes from 192.168.6.211: icmp_seq=2 ttl=63 time=0.533 ms
64 bytes from 192.168.6.211: icmp_seq=3 ttl=63 time=0.502 ms
64 bytes from 192.168.6.211: icmp_seq=4 ttl=63 time=0.492 ms

--- 192.168.6.211 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.492/0.573/0.814 ms
admin-Infra#

```



**Note:** If your ACI version was old, the spine nodes do not respond to ping on the in-band as they use loopback interfaces for connectivity which do not respond to Address Resolution Protocol (ARP).

When in-band management is set up, the Cisco APIC always prefers in-band for any traffic that is sourced from the Cisco APIC (like TACACS).

OOB is still accessible for hosts that are sending requests to the OOB address specifically.

---

## Troubleshoot

First, you must check if there are any faults with INB.

On Switch:

```
f6leaf102# show vrf mgmt:inb
VRF-Name          VRF-ID State    Reason
mgmt:inb          27   Up      --
```

```

f6leaf102#
f6leaf102# show ip int bri vrf mgmt:inb
IP Interface Status for VRF "mgmt:inb"(27)
Interface          Address           Interface Status
eth1/40            192.168.2.1/24    protocol-up/link-up/admin-up
vlan7              192.168.6.254/24   protocol-up/link-up/admin-up
lo37               192.168.1.6/32     protocol-up/link-up/admin-up

f6leaf102#
f6leaf102# show ip route vrf mgmt:inb
IP Route Table for VRF "mgmt:inb"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

192.168.1.6/32, ubest/mbest: 2/0, attached, direct
  *via 192.168.1.6, lo37, [0/0], 02:12:38, local, local
  *via 192.168.1.6, lo37, [0/0], 02:12:38, direct
192.168.1.7/32, ubest/mbest: 1/0
  *via 192.168.2.2, eth1/40, [110/5], 00:03:09, ospf-default, intra
192.168.2.0/24, ubest/mbest: 1/0, attached, direct
  *via 192.168.2.1, eth1/40, [0/0], 00:37:13, direct
192.168.2.1/32, ubest/mbest: 1/0, attached
  *via 192.168.2.1, eth1/40, [0/0], 00:37:13, local, local
192.168.6.0/24, ubest/mbest: 1/0, attached, direct, pervasive
  *via 192.168.224.64%overlay-1, [1/0], 00:24:06, static
192.168.6.102/32, ubest/mbest: 1/0, attached
  *via 192.168.6.102, vlan7, [0/0], 00:21:38, local, local
192.168.6.254/32, ubest/mbest: 1/0, attached, pervasive
  *via 192.168.6.254, vlan7, [0/0], 00:21:38, local, local
f6leaf102#

```

On APIC:

```

f6apic1# ifconfig
bond0.10: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1496
      inet 192.168.6.1  netmask 255.255.255.0  broadcast 192.168.6.255
      inet6 fe80::2ef8:9bff:fee8:8a10  prefixlen 64  scopeid 0x20<link>
        ether 2c:f8:9b:e8:8a:10  txqueuelen 1000  (Ethernet)
          RX packets 37  bytes 1892 (1.8 KiB)
          RX errors 0  dropped 0  overruns 0  frame 0
          TX packets 889  bytes 57990 (56.6 KiB)
          TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

f6apic1# show inband-mgmt
Table1 : INB-Mgmt Node Details

```

Type	Node ID	IP Address	Gateway	Inband EPG	Oper State
f6apic1	1	192.168.6.1/24	192.168.6.254	default	up
f6apic2	2	192.168.6.2/24	192.168.6.254	default	up
f6apic3	3	192.168.6.3/24	192.168.6.254	default	up
f6leaf101	101	192.168.6.101/24	192.168.6.254	default	up
f6leaf102	102	192.168.6.102/24	192.168.6.254	default	up
f6leaf111	111	192.168.6.111/24	192.168.6.254	default	up
f6leaf112	112	192.168.6.112/24	192.168.6.254	default	up

f6spine201	201	192.168.6.201/24	192.168.6.254	default	up
f6spine202	202	192.168.6.202/24	192.168.6.254	default	up
f6spine211	211	192.168.6.211/24	192.168.6.254	default	up
f6spine212	212	192.168.6.212/24	192.168.6.254	default	up

Table2 : InB-Mgmt EPG Details

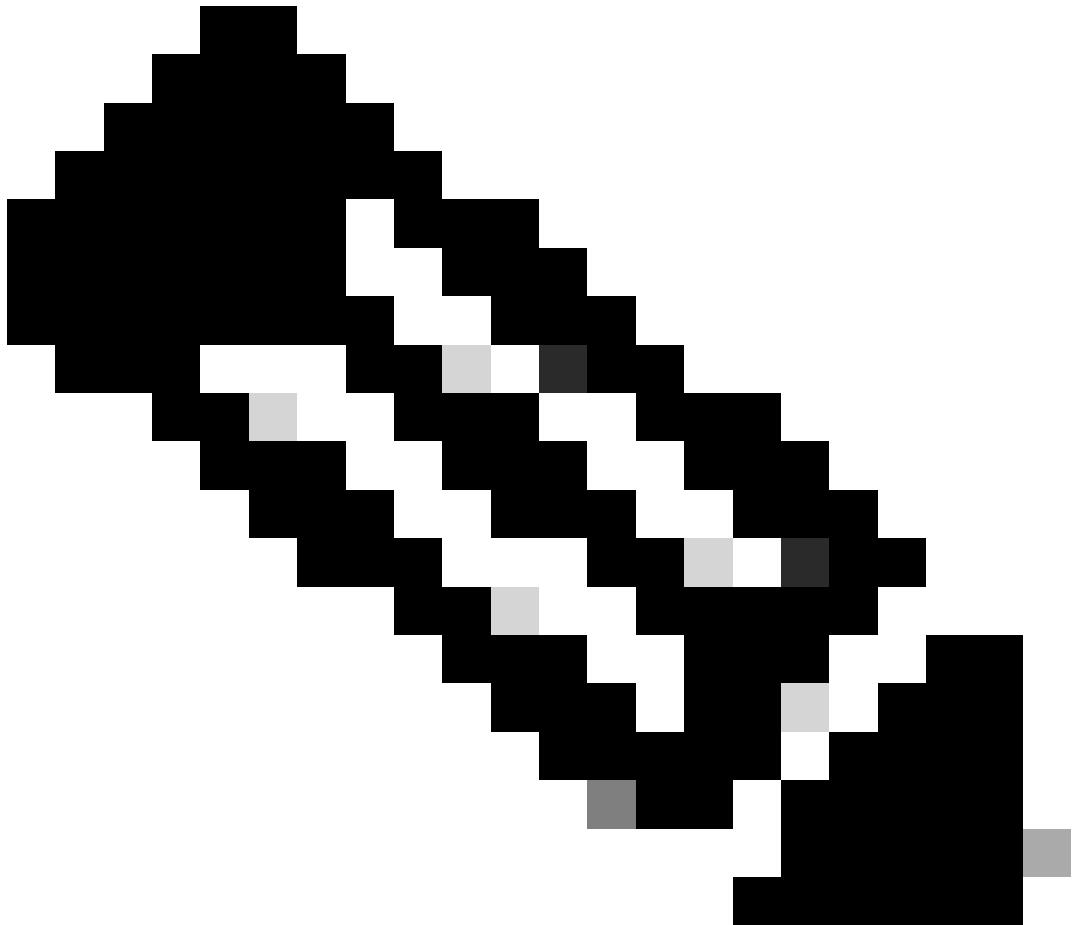
Name	Qos	Tag	Nodes	Vlan	Oper State
default	unspecified	32778	1	vlan-10	up
default	unspecified	32778	2	vlan-10	up
default	unspecified	32778	3	vlan-10	up
default	unspecified	32778	101	vlan-10	up
default	unspecified	32778	102	vlan-10	up
default	unspecified	32778	111	vlan-10	up
default	unspecified	32778	112	vlan-10	up
default	unspecified	32778	201	vlan-10	up
default	unspecified	32778	202	vlan-10	up
default	unspecified	32778	211	vlan-10	up
default	unspecified	32778	212	vlan-10	up

Table3 : INB-Mgmt EPG Contract Details

INBAND-MGMT-EPG	Contracts	App Epg	L3 External Epg	Oper State
default(P)	ALL	default	all-subnet-epg	up
default(C)	ALL	default	all-subnet-epg	up

```
f6apic1#
f6apic1# bash
admin@f6apic1:~> ip route show
default via 192.168.6.254 dev bond0.10 metric 32
192.168.6.0/24 dev bond0.10 proto kernel scope link src 192.168.6.1
192.168.6.254 dev bond0.10 scope link src 192.168.6.1
admin@f6apic1:~> route -n
Kernel IP routing table
0.0.0.0      192.168.6.254    0.0.0.0        UG      32      0          0 bond0.10
192.168.6.0    0.0.0.0        255.255.255.0   U       0      0          0 bond0.10
192.168.6.254  0.0.0.0        255.255.255.255 UH      0      0          0 bond0.10
```

admin@f6apic1:~>



**Note:** This Enforce Domain Validation function checks the VLAN/Domain and interface configuration used by EPG. If it is not enabled, Leaf ignores the Domain check when pushing the configuration. Once this feature is enabled, it cannot be disabled. It is recommended to turn this option on in order to avoid incomplete configuration.

Feel free to reach out to Cisco TAC for further troubleshooting assistance.

## Related Information

- [Cisco ACI In-Band Management Configuration for Hardware Flow Telemetry Export](#)
- [Troubleshoot ACI External Forwarding](#)
- [Troubleshoot ACI L3Out - Subnet 0.0.0.0/0 and System PCTag 15](#)
- [Troubleshooting Unexpected Route Leaking in ACI](#)
- [Troubleshoot ACI Access Policies](#)
- [ACI Fabric L3Out White Paper](#)
- [Cisco ACI Contract Guide White Paper](#)
- [Cisco Technical Support & Downloads](#)