

Configure In-Band Management in ACI

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.

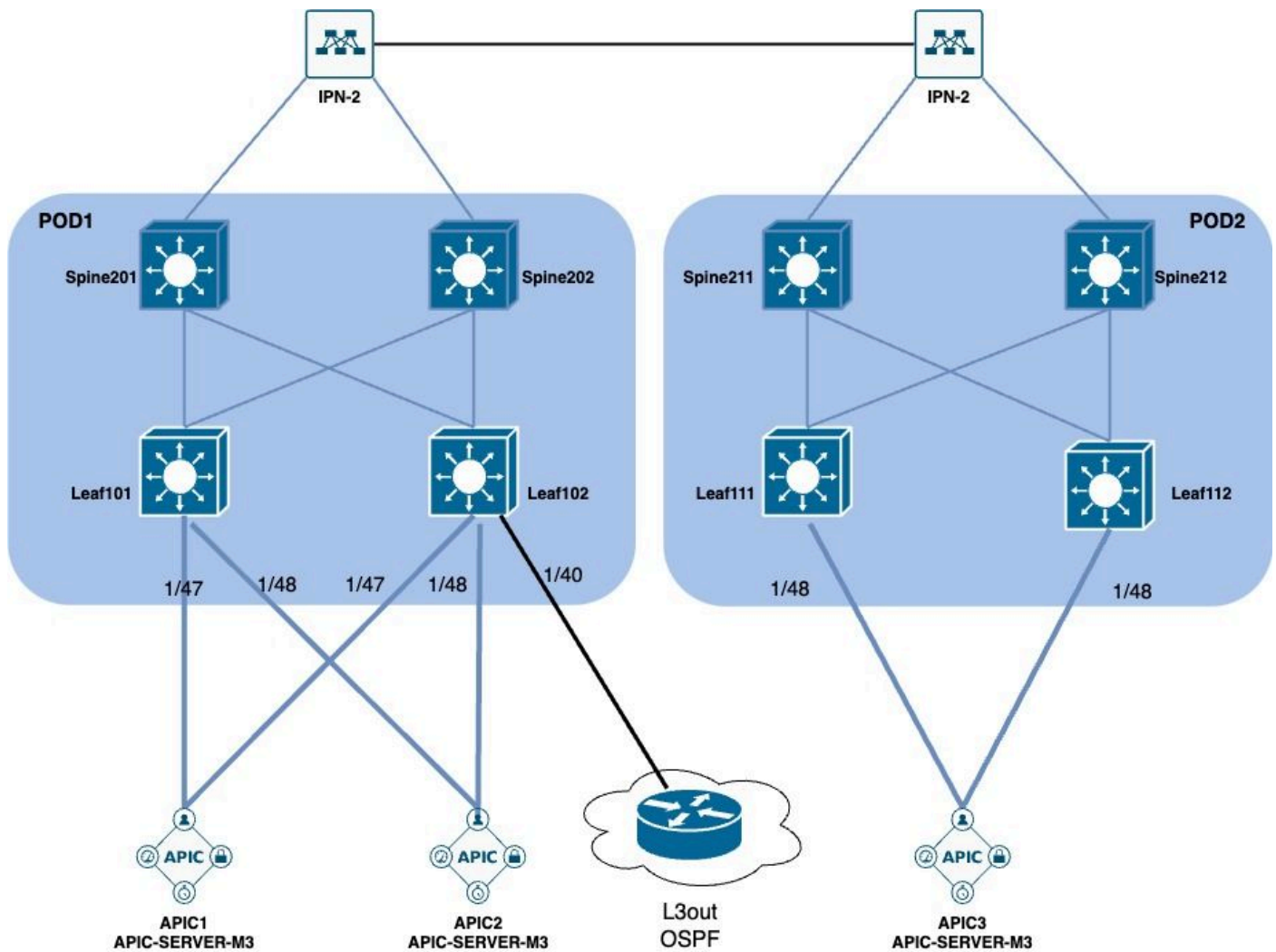
Configure

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.

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

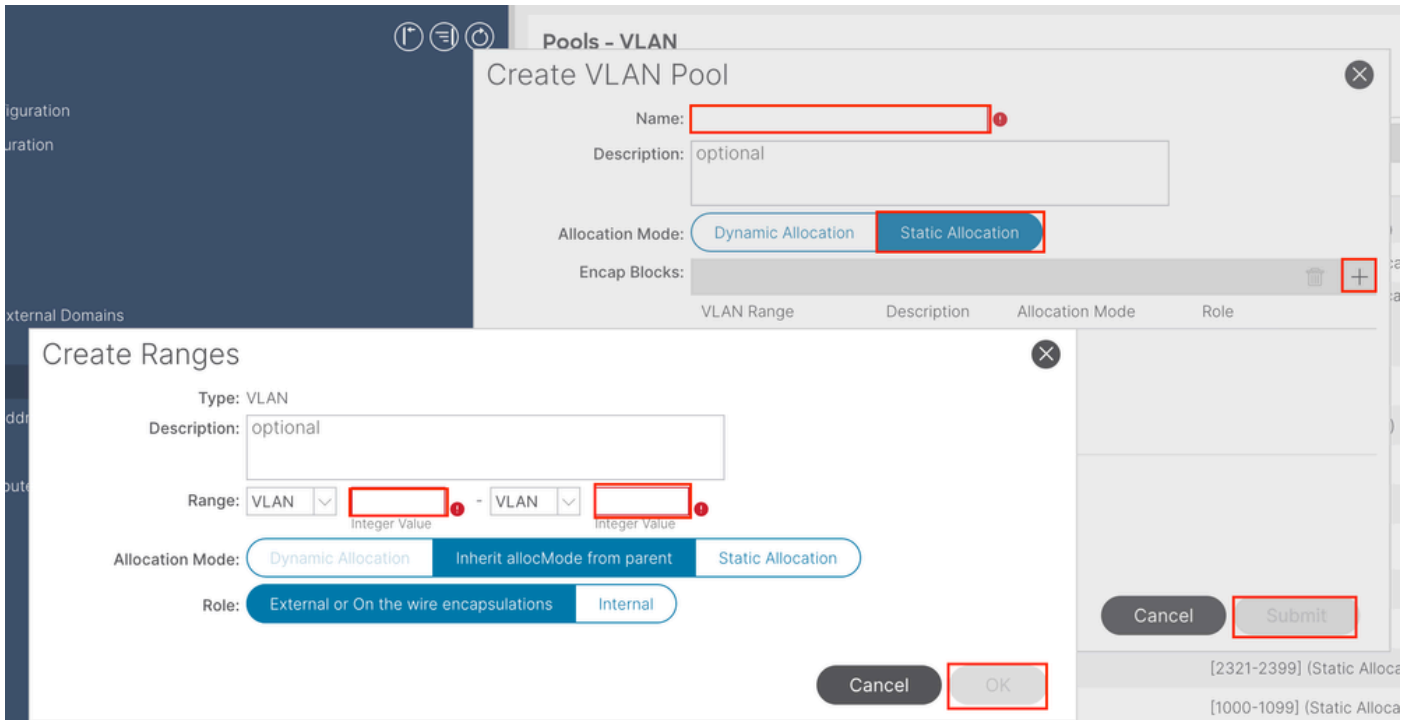
Create VLAN Pool

> Multicast Address

> VSAN

> VSAN Attributes

> VXLAN



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.

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Quick Start

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Switch Configuration

> Switches

> Modules

> Interfaces

> Policies

Physical and External Domains

> External Bridged Domains

> Fibre Channel Domains


> L3 Domains


> Physical Domains


Create Physical Domain



> Pools

Create Physical Domain

Name: 

Associated Attachable Entity Profile: 

VLAN Pool: 

Security Domains:  

Select	Name	Description

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.

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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

1. Profile

STEP 1 > Profile

Name:

Description: optional

Enable Infrastructure VLAN:

Association to Interfaces:

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

Domain Profile Encapsulation
 +

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

Application EPGs	Encap	Primary Encap	Mode

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.

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Access Policies

Policies



Quick Start

Interface Configuration

Switch Configuration

> Switches

> Modules

∨ Interfaces

∨ Leaf Interfaces

> Profiles

∨ Policy Groups

∨ Leaf Access

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:

Description:

Attached Entity Profile:

Link Level Policy:

CDP Policy:

LLDP Policy:

Advanced Settings

802.1x Port Authentication:

MCP:

Transceiver policy:

Monitoring Policy:

CoPP Policy:

PoE Interface:

DWDM:

Port Security:

Egress Data Plane Policing:

Priority Flow Control:

Fibre Channel Interface:

Slow Drain:

Ingress Data Plane Policing:

Storm Control Interface:

L2 Interface:

STP Interface Policy:

Link Flap Policy:

SyncE Interface Policy:

Link Level Flow Control Policy:

MACsec:

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.

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Access Policies

Policies



Quick Start

Interface Configuration

Switch Configuration

> Switches

> Modules

> Interfaces

> Leaf Interfaces

> Profiles

Create Leaf Interface Profile

> Policy Groups

Create FEX Profile

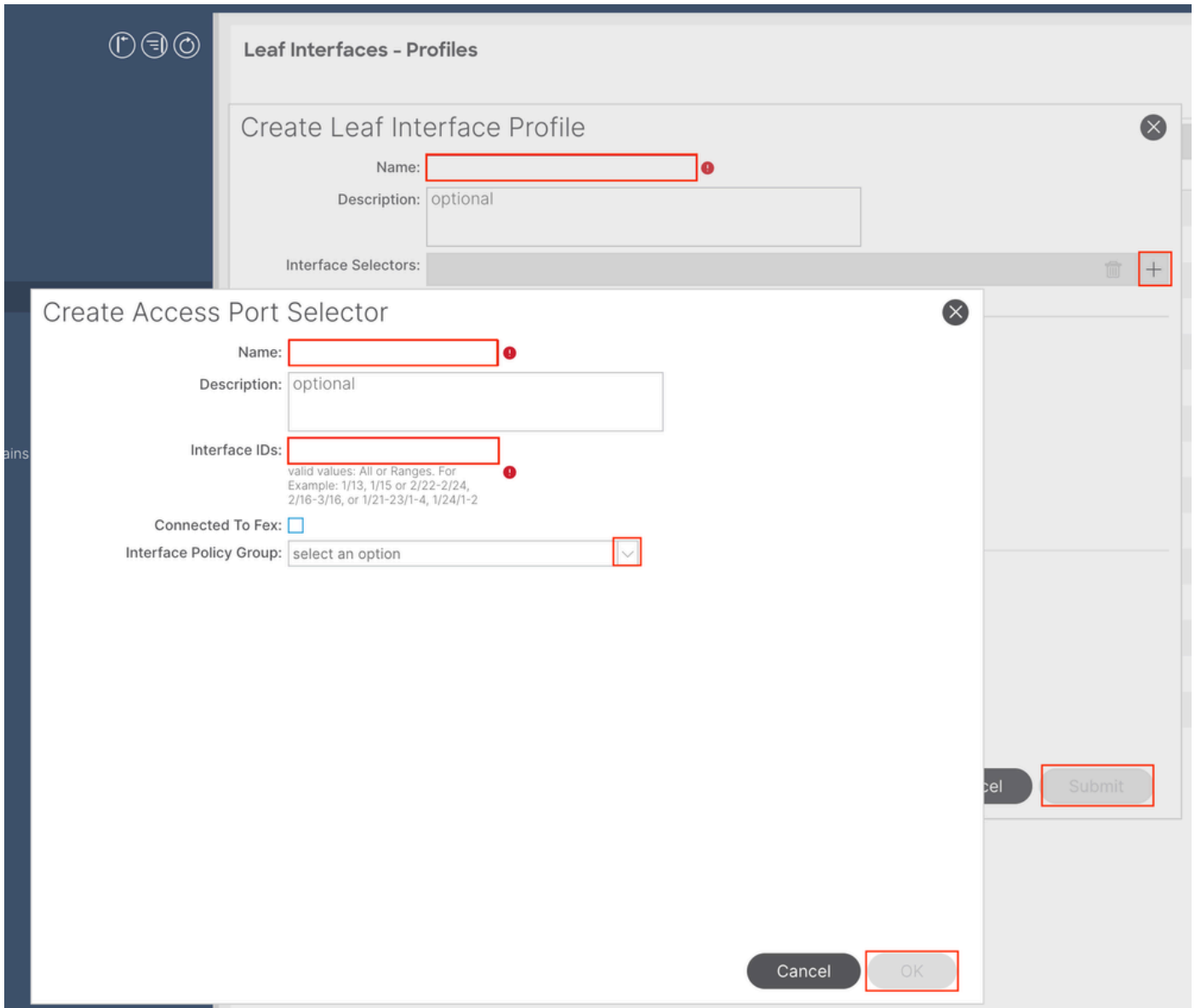
> Overrides

> Spine Interfaces

> Policies

> Physical and External Domains

> Pools



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.

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Quick Start

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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:

Name	Blocks	Policy Group
APIC-48	101-102,111-112	select an option

Update Cancel

Previous Cancel Next

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.

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 **Policy** Operational Stats Health Faults History Policy Viewer

General **L3 Configurations** Advanced/Troubleshooting

Properties

Warning It is recommended to disable Unicast Routing when no subnets are configured.

Unicast Routing:

Operational Value for Unicast Routing: true

Custom MAC Address: 00:22:BD:F8:19:FF

Virtual MAC Address: Not Configured

Subnets: +

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.						

EP Move Detection Mode: GARP based detection

Associated L3 Outs: +

- L3 Out

Show Usage Reset **Submit**

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** Enabled

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 use. 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

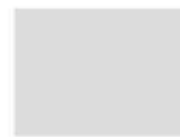
Create In-Band Management EPG

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

Cancel

Submit

Name - The name of the INB EPG.

Encap - Choose VLAN in the VLAN Pool as you create 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.

ALL TENANTS

Add Tenant

Tenant Search:

name or d

mgmt



Quick Start

mgmt

- > Application Profiles
- > Networking
- > Contracts
- > Policies
- > Services
- Security
- > Node Management EPGs
- > External Management Network Instance Profiles

Node Management Addresses

default

Static Node Management Addresses

Managed Create Static Node Management Addresses

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:

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.

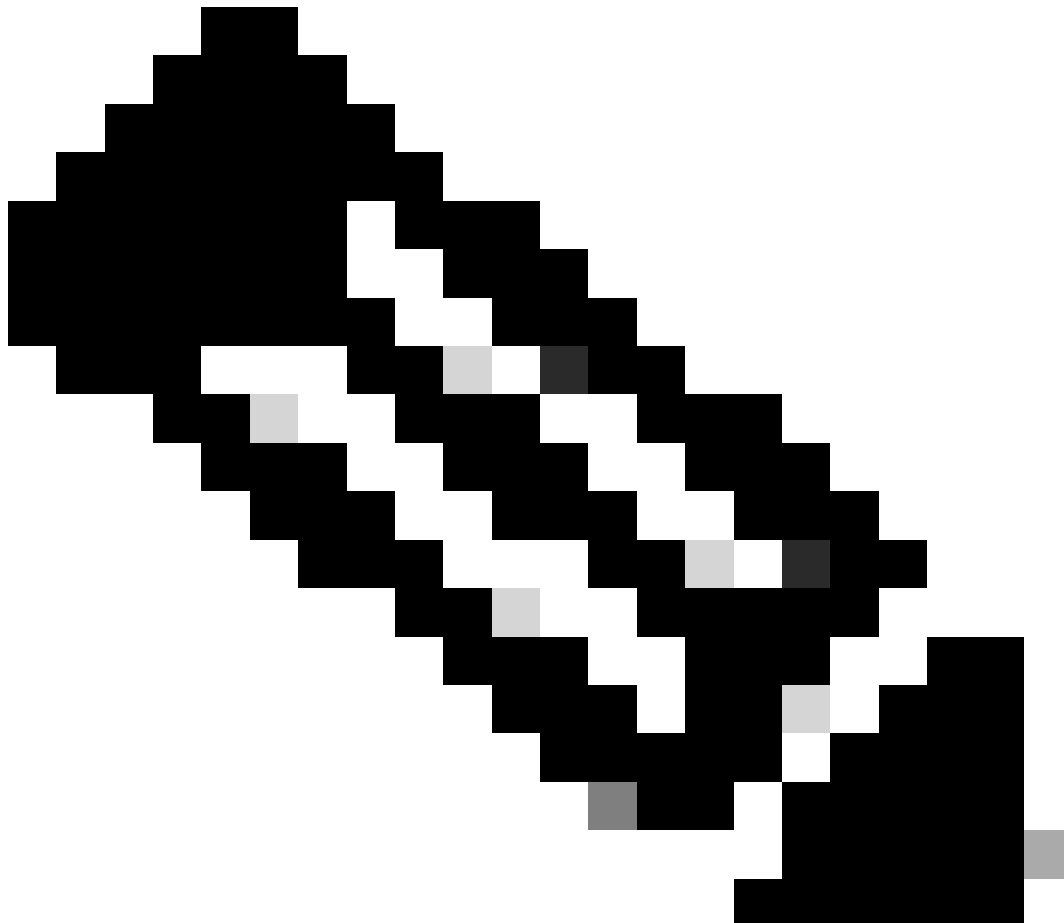
mgmt

- Quick Start
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 - Node Management EPGs
 - External Management Network Instance Pr...
 - Node Management Addresses
 - default
 - Static Node Management Addresses
 - Managed Node Connectivity Groups
 - 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 Networkin

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

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: INB-L3out

VRF: inb

L3 Domain: F6_inb

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

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	+ Hide Interfaces <small>Leave empty to not configure any Loopback</small>
f2leaf102 (Node-102)	192.168.1.6	192.168.1.6	
Interface	IP Address	MTU (bytes)	+
eth1/40	192.168.2.1/24 <small>address/mask</small>	1500	

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:

Provided Contract: ▾

Consumed Contract: ▾

Default EPG for all external networks:

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.

The screenshot displays the APIC web GUI interface for configuring a Bridge Domain. The top navigation bar includes 'System', 'Tenants', 'Fabric', 'Virtual Networking', 'Admin', 'Operations', 'Apps', and 'Integrations'. The 'Tenants' section is expanded to show 'mgmt', 'guangxil', 'guangxil2', and 'infra'. The 'mgmt' tenant is selected, and the 'Networking' > 'Bridge Domains' > 'inb' path is followed. The 'Bridge Domain - inb' configuration page is shown with the 'Policy' tab selected. The 'L3 Configurations' sub-tab is active, displaying a table of properties for the Bridge Domain. The table has columns for 'Address', 'IP Address', 'IP', 'Control', and 'Selector'. The first row shows '106.20.1.254/24' for the Address, 'Advert...' for IP Address, and 'False' for both IP and Control. Below the table, the 'EP Move Detection Mode' is set to 'GARP based detection'. The 'Associated L3 Outs' section shows a dropdown menu with 'INB-L3out' selected. The 'Update' button is highlighted. At the bottom right, there are buttons for 'Show Usage', 'Reset', and 'Submit'.

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

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Standard

Create Contract

Export Contract

Taboos

Imported

Filters

Out-Of-Band Contracts

Policies

Create Contract



Name:

Alias:

Scope:

QoS Class:

Target DSCP:

Description:

Annotations: Click to add a new annotation

Subjects:

--	--	--	--

Name	Description
------	-------------

ALL	
-----	--

Cancel

Submit

Create Contract Subject

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: select an option

Name	Directives	Action	Priority
common/any		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.

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

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

mgmt

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 - Security
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 - In-Band EPG - default**
 - Out-of-Band EPG - default
 - External Management Network Instance Profiles
 - Node Management Addresses
 - Managed Node Connectivity Groups
 - IP Address Pools

In-Band EPG - default

Policy Stats Health Faults History

Operational

Properties

Bridge Domain: inb

Resolved Bridge Domain: inb

Provided Contracts:

Name	Tenant	Type	QoS Class	Match Type	State
mgmt/ALL			Unspecified	AtleastOne	unformed

Update Cancel

Consumed Contracts:

Name	Tenant	Type	QoS Class	State
mgmt/ALL			Unspecified	unformed

Update Cancel

Contract Interfaces:

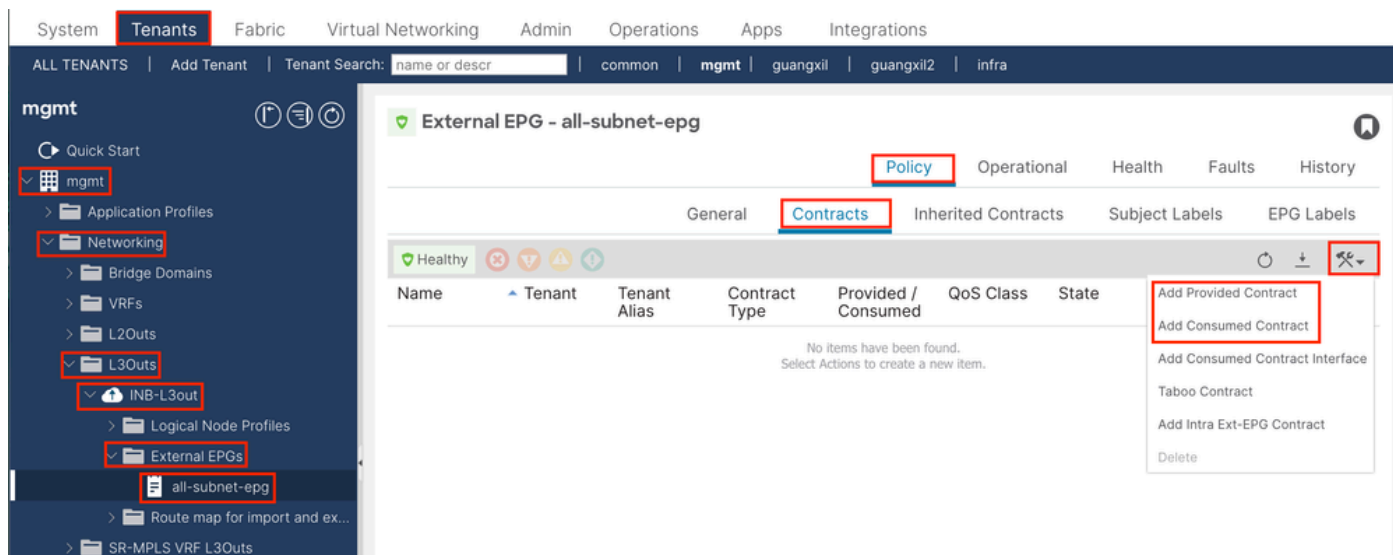
Show Usage Reset Submit

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

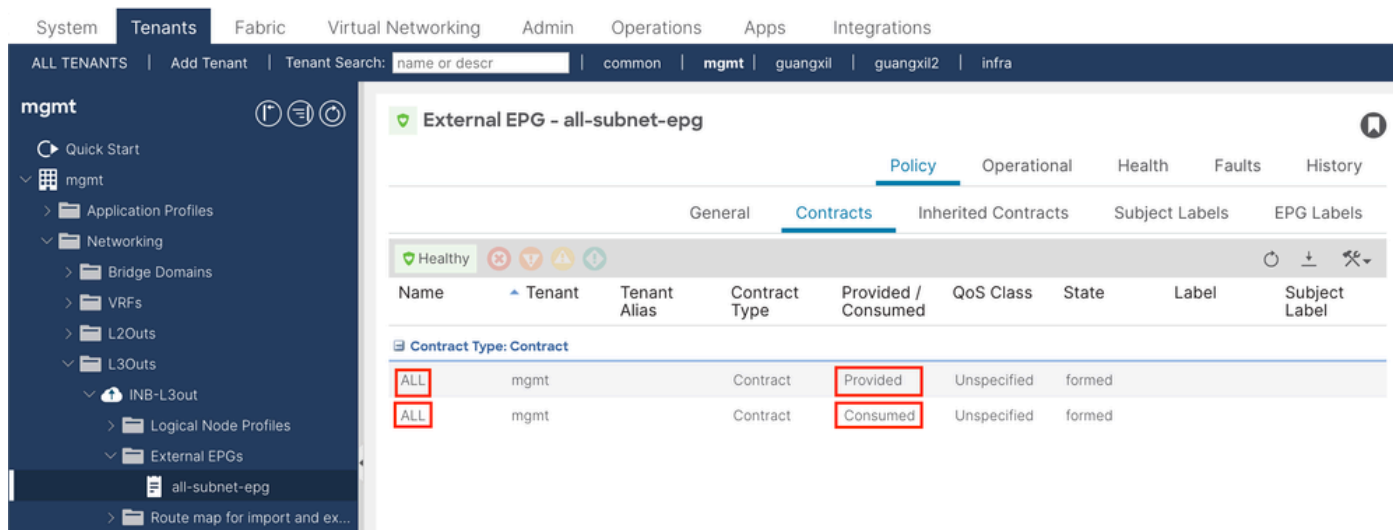
Navigate to the APIC web GUI path; Tenants > mgmt > Networking > L3Outs > INB-L3out > External EPGs > all-subnet-epg.



Add Provided Contracts - The contract created in Step 3.3.

Add Consumed Contracts - The contract created in Step 3.3.

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



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, Lo66, [0/0], 00:04:06, local
  *via 192.168.1.7, Lo66, [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

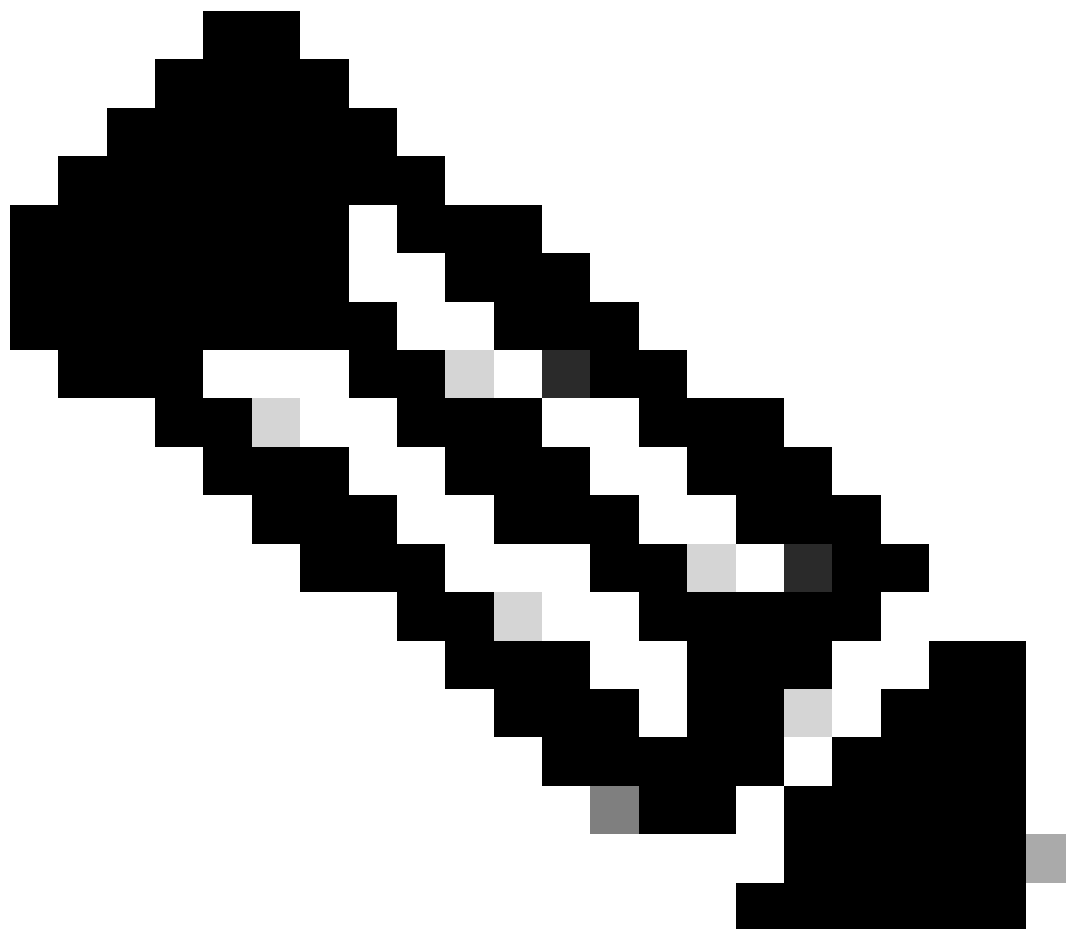
--- 192.168.6.1 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.452/0.514/0.608 ms
admin-Infra# ping 192.168.6.3 vrf aci-inb
PING 192.168.6.3 (192.168.6.3): 56 data bytes
64 bytes from 192.168.6.3: icmp_seq=0 ttl=61 time=0.731 ms
64 bytes from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

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

QuickStart | Dashboard | Controllers | **System Settings** | Smart Licensing | Faults | History | Config Zones | Active Sessions | Security

This object was created by an unknown orchestrator. It is recommended to only modify this object using the appropriate orchestrator.

System Settings

- APIC Connectivity Preferences
- APIC Passphrase
- BD Enforced Exception List
- BGP Route Reflector
- Control Plane MTU
- COOP Group
- Date and Time
- Endpoint Controls
- Fabric Security
- Fabric-Wide Settings**
- Global AES Passphrase Encryption Settings
- Global Endpoints (Beta)
- ISIS Policy
- Load Balancer
- Nexus Cloud Connectivity
- Port Tracking

Fabric-Wide Settings Policy

Properties

- Disable Remote EP Learning: To disable remote endpoint learning in VRFs containing external bridged/routed domains
- Enforce Subnet Check: To disable IP address learning on the outside of subnets configured in a VRF, for all VRFs
- Enforce EPG VLAN Validation: Validation check that prevents overlapping VLAN pools from being associated to an EPG
- Enforce Domain Validation: Validation check if a static path is added but no domain is associated to an EPG
- Spine Opflex Client Authentication: To enforce Opflex client certificate authentication on spine switches for GOLF and Linux
- Leaf Opflex Client Authentication: To enforce Opflex client certificate authentication on leaf switches for GOLF and Linux
- Spine SSL Opflex: To enable SSL Opflex transport for spine switches
- Leaf SSL Opflex: To enable SSL Opflex transport for leaf switches
- SSL Opflex Versions: TLSv1
 TLSv1.1
 TLSv1.2
- Reallocate Gipo: Reallocate some non-stretched BD gipos to make room for stretched BDs
- Restrict Infra VLAN Traffic: Enable to restrict infra VLAN traffic to only specified network paths. These enabled network paths are defined by infra security entry policies

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[Related Information](#)

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](#)