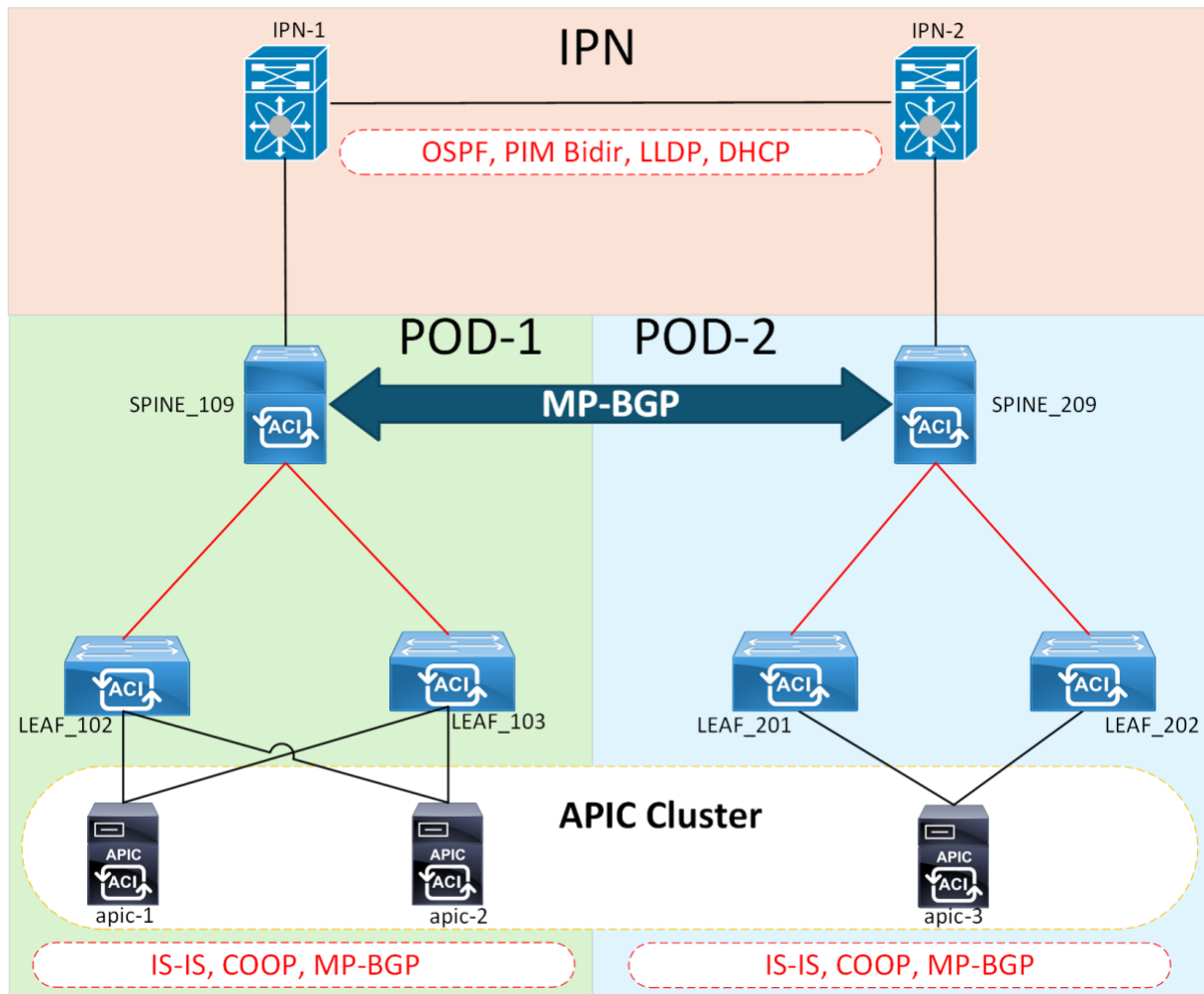


# Cisco ACI Multi-Pod Fabric Bring Up – from Scratch!



Lab By: Titus Majeza



# Overview

Cisco ACI Multi-Pod, falls under the Cisco distributed data centres solution whereby there are 2 distinct Pods that belong to the same APIC cluster/domain; which means that the separate pods are managed as if they were a single logical entity. Each pod contains its own set of spine and leafs and its own set of control-plane protocols (ISIS, COOP and MP-BGP) which helps with fault isolation within each pod. The ACI Multi-Pod solution uses an external layer 3 network known as the Inter-Pod Network (IPN) to interconnect the pods. Logical configurations like tenants, VRFs, Bridge Domains and EPGs are applicable and usable between multiple pods. In a multi-pod setup, endpoints can belong to the same EPG despite their physical location.

This lab goes through the deployment of the Cisco ACI Multi-Pod architecture. The lab contains of 2 pods with the seed pod containing 2 APICs and the 3<sup>rd</sup> APIC is contained in the second pod. Each pod contains a single spine which and the spine switch from each pod is directly connected to an IPN device. OSPF routing protocol is used for peering between each Spine and the IPN. The two IPN devices peer with each other using OPSF as well.

The Multi-Pod deployment is conducted as follows:

1. Bring up the Pod 1 fabric.
2. Register all nodes in Pod 1
3. Use the MultiPod Wizard to configure the L3Out connectivity between Pod 1 Spines and the IPN
4. Configure the Inter-Pod Network
5. Use the MultiPod Wizard to configure the L3Out connectivity between Pod 2 Spines and the IPN
6. Register Pod-2 devices

Fabric Bring up troubleshooting commands and outputs are also shown at the end of the lab.

For comprehensive information about Cisco ACI Multi-Pod please refer to:

ACI Multi-Pod Whitepaper: <https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-737855.html>

ACI Multi-Pod Configuration Guide: <https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-739714.html>

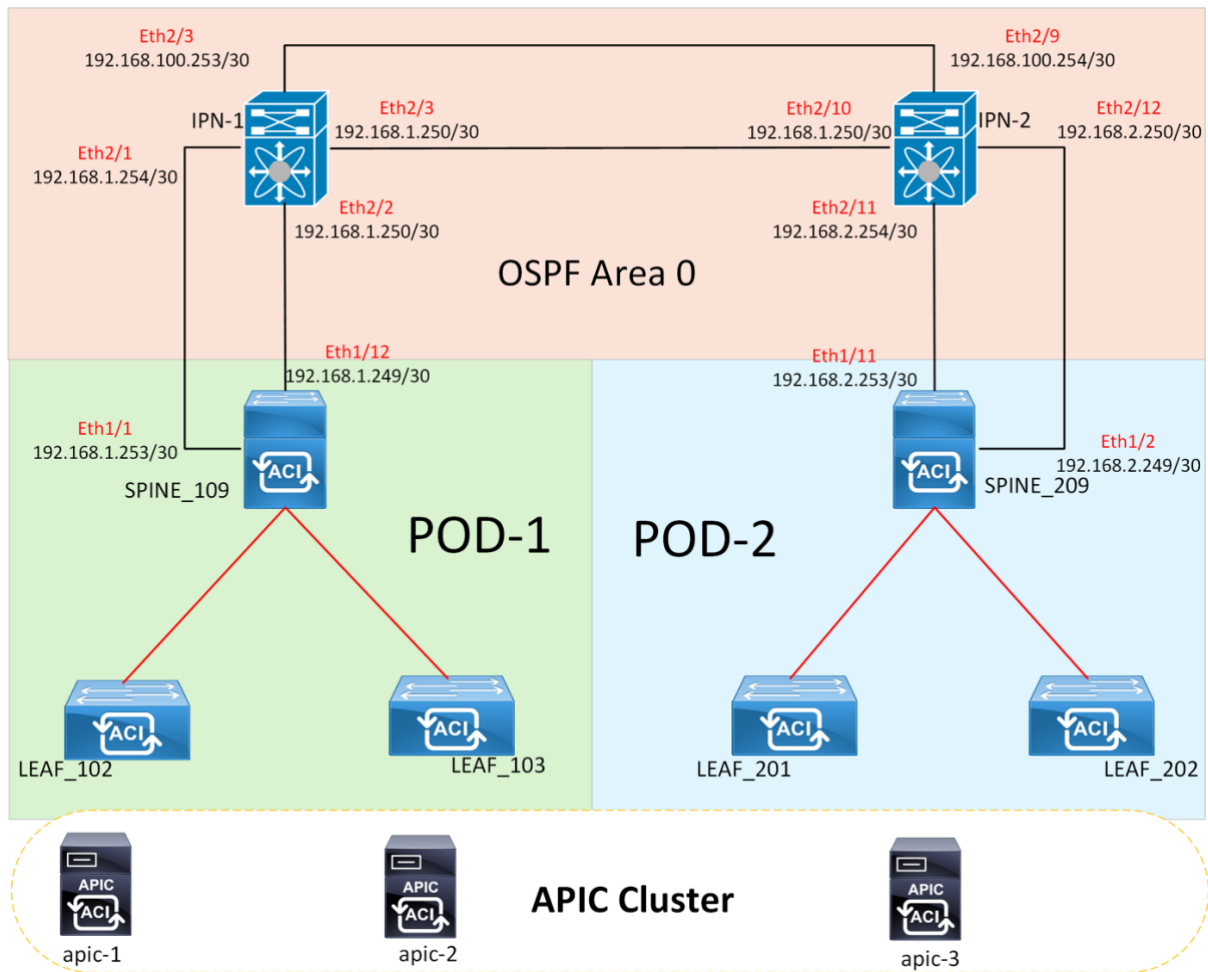
ACI Single Pod Fabric Bring Up: <https://github.com/TitusM/Cisco-Data-Center/blob/main/ACI/Cisco-ACI-v6.0-Fabric-Bring-Up.pdf>

## Note

This lab was conducted in a controlled environment. Any configurations in a production network should be implemented during a designated maintenance window. Additionally, always refer to official Cisco documentation relevant to your specific hardware and software.

# Lab-Setup

This lab consists two pods and an APIC cluster of three nodes. Pod 1 contains 2 APICs and Pod2 contains 1 APIC node. Each Pod contains a single spine and three leafs. The topology diagram below illustrates the physical connections between the hardware, along with the point to point IP addresses that are used for OSPF peering between the Spines and IPN. PIM Bidir and DHCP relay are also configured on the IPN devices.



## APIC Cluster Bring Up – Pod 1

Start the initial bootstrap process on APIC 1;

```

APIC Version: 6.0(7e)
Welcome to APIC Setup Utility
Press Enter Or Input JSON string to bootstrap your APIC node.

admin user configuration ...
  Enter the password for admin [None]:
Error: Password is not strong enough
  Enter the password for admin [None]:
  Reenter the password for admin [None]:
Out-of-band management configuration ...
  Enter the IP Address [192.168.10.1/24]: .109/27
  Enter the IP Address of default gateway [192.168.10.254]: .97
  
```

1. Enter the “admin” password that you will use to access the ACI APIC GUI.
2. Enter the out of band IP address and the default gateway.
  - a. The IP address entered here will be used to access the APIC GUI or CLI

Login the APIC GUI via a web browser and enter the “admin” password that was configured in the prior steps in order to proceed with onboarding the other nodes of the APIC cluster.

## APIC Cluster Bringup

**i** To add RMA and Standby Controller, please use existing cluster.

### 1 Connection Type

### 2 Cluster Details

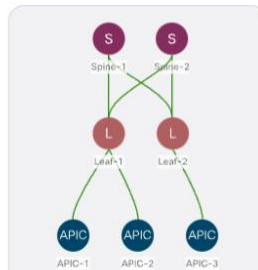
### 3 Controller Registration

### 4 Summary

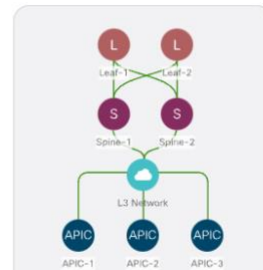
### How are your APIC controllers connected to your ACI Fabric?

Please select one of the two options below. [Help me choose](#)

#### Directly attached to leaf switches



#### Remotely attached through an L3 network



## APIC Cluster Bringup

**i** To add RMA and Standby Controller, please use existing cluster.

### ✓ Connection Type

### 2 Cluster Details

### 3 Controller Registration

### 4 Summary

### Please enter the following details for your ACI Fabric

Fabric Name \* **i**

ACI-FABRIC

Cluster Size \* **i**

3

GiPo Pool \* **i**

225.0.0.0/15

Pod ID

1

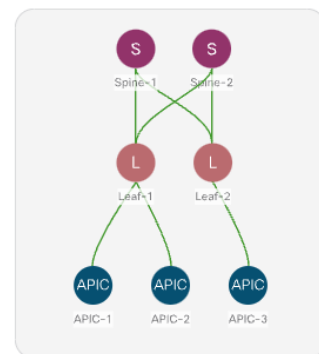
TEP Pool \* **i**

10.0.0.0/16

Infrastructure VLAN \* **i**

4093

☐ Enable IPv6 on APICs



Click “Add Controller” to add the details for APIC-2 and APIC-3.

When adding a controller, Start by Entering the CIMC details (IP and login credentials) for that specific node and validate connectivity. The second step of onboarding the controller requires the following

details: APIC name, Pod ID and Out of Band IP address that can be used to access the APIC’s GUI interface. APIC-3 is also be added at this stage however its Pod ID should be configured as “2”.

The Summary tab gives the Overview Details regarding the cluster details and configured details for each APIC node. This is the last verification checkpoint before the cluster can be deployed.

✓ Connection Type

✓ Cluster Details

✓ Controller Registration

4 Summary

Summary

Please confirm the parameters for cluster details and controllers.

Cluster Details

Fabric Name ACI-FABRIC	Cluster Size 3	Connection Type Directly Attached	
GiPo Pool 225.0.0.0/15	TEP Pool 10.0.0.0/16	Pod ID 1	Infrastructure VLAN 4093

Configure apic-3 with POD ID – 2 as it is connected to Pod 2.

General

Name \*  
apic-3

Controller ID \*  
3

Pod ID \*  
2

Serial Number \*

Out Of Band Network

IPv4 Address \*  
.113/27

IPv4 Gateway \*  
.97

Initiate the Cluster Bring-up:

APIC Cluster Bringup

✓ Bootstrap

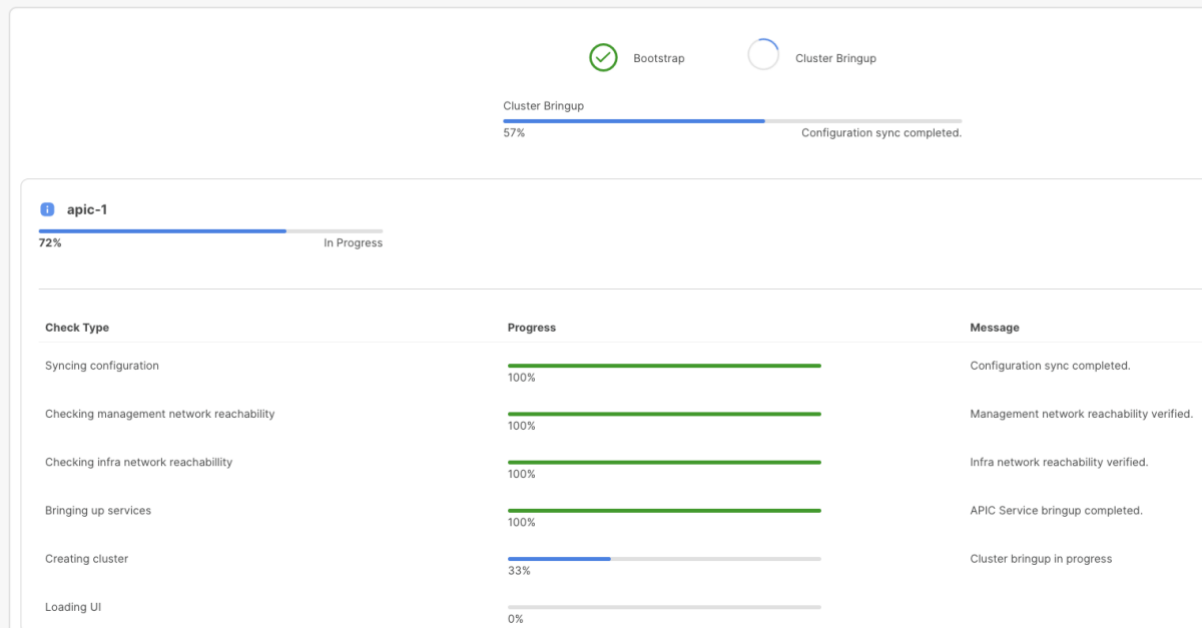
○ Cluster Bringup

Cluster Bringup

Loading status...

Wait for the Cluster Bringup process to complete

## APIC Cluster Bringup



Upon completion, Re-login into the APIC GUI;

## Fabric Nodes Registration

From this point, the ACI nodes in Pod-1 can be registered.

To Register the ACI nodes using the GUI follow the steps below:

Navigate to **Fabric >> Inventory >> Fabric Membership >> Nodes Pending Registration**.

Right Click on the device and Register the node(s).

At this point the spine and all leafs in Pod-1 are successfully registered in the ACI fabric.

The screenshot shows the Fabric Membership page with a sidebar on the left containing the following menu items: Quick Start, Topology, Pod 1, Pod Fabric Setup Policy, Fabric Membership (selected), Disabled Interfaces and Deco, and Duplicate IP Usage. The main content area displays the Fabric Membership status for Pod 1, showing 3 Leaf nodes and 1 Spine node. The status is summarized as 0 Decommissioned, 0 Maintenance, 3 Active, and 0 Inactive for both Leaf and Spine nodes. Below this, a table lists the nodes:

Serial Number	Model	Pod ID	Node ID	Name	Node Type	IP	Maintenance Mode	Status
	N9K-C93180YC-EX	1	101	leaf_101	Leaf	10.0.176.64/...	No	Active
	N9K-C93180YC-EX	1	102	leaf_102	Leaf	10.0.56.65/32	No	Active
	N9K-C93180YC-EX	1	103	leaf_103	Leaf	10.0.176.66/...	No	Active
	N9K-C9332C	1	109	spine_109	Spine	10.0.176.65/...	No	Active

The APIC cluster of 2 APICs in Pod-1 is observed to have formed successfully and is fully fit.

ID	Name	IP	Admin State	Operational State	Health State
1	apic-1	10.0.0.1	In Service	Available	Fully Fit
2	apic-2	10.0.0.2	In Service	Available	Fully Fit

Configure the initial required parameters in Pod-1 (i.e. NTP, OOB management, BGP {AS number & designate spines as the route reflectors}, DNS etc).

After the successful deployment of the first Pod, the next step is to use the ACI Multi-pod wizard from the APIC GUI.

## Configuring the Multi-Pod setup

The wizard takes care of configuring:

- An L3Out in the infra tenant specifying the spine nodes and interfaces to connect each pod to the IPN.
- Access policies for the spine interfaces connecting to the IPN.
- An internal TEP pool to be assigned to each pod.
- An external TEP pool to be assigned to each pod, used to define the control-plane IP addresses on the spines used for establishing MP-BGP EVPN adjacencies across pods and also to assign an anycast TEP address to each pod used for data-plane traffic.

Navigate to **Fabric >> Inventory >> Add Pod**

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

Inventory | Fabric Policies | Access Policies

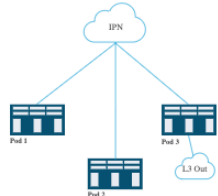
**Inventory** (⌵) (⌵) (⌵)

- Quick Start
  - Add Remote Leaf
  - Add Pod
- Topology
  - Pod 1
    - Pod Fabric Setup Policy
    - Fabric Membership
    - Disabled Interfaces and Deco
    - Duplicate IP Usage

**Add Pod**

**Pod**


Cisco ACI multipod represents the natural evolution of the original Cisco ACI stretched Fabric design and allows users to interconnect and centrally manage separate Cisco ACI fabrics.



Add Pod

**Multi-Pod spines back-to-back without IPN**

Cisco ACI Multi-Pod spines back-to-back configuration supports back-to-back spine connections between pods without requiring an Inter-Pod network. This feature supports connecting a maximum of two pods. The following ACI features are not supported with spine back-to-back configuration: ACI Multi-Site, ACI extensions to public cloud, Remote Leaf, GOLF, and APIC cluster connection over a Layer-3 network.



Add MPod B2B

Inter-Pod Connectivity Start up:

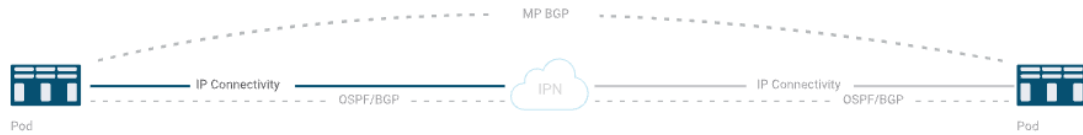
The Inter-Pod Configuration wizard will pop up with detailed instructions:

## Configure Interpod Connectivity



Physical Pod to IPN connectivity is not configured. This connectivity is a prerequisite before extending ACI to another location. Follow these steps to configure Pod to IPN connectivity:

### IP Connectivity



The interpod network (IPN) connects Cisco ACI locations to provide end-to-end network connectivity. To achieve this, spines need IP connectivity to the IPN. Identify spines and interfaces that will communicate with the IPN. IP configuration is required for at least one interface of each spine.

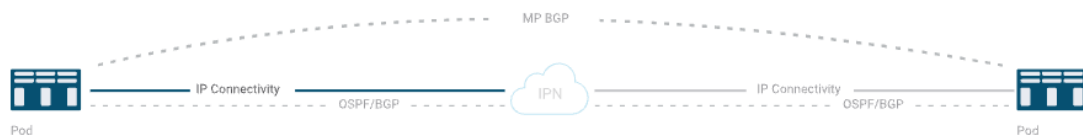
### Routing Protocols



OSPF/BGP is used in the underlay to peer between the physical spines and the IPN. To configure OSPF, you need an **OSPF Area ID**, an **Area Type** and **OSPF Interface Policy** specific settings. To configure BGP, you need **Peer-Address** and **Remote-AS** number of the IPN router.

MP-BGP is used between physical pods to exchange overlay connectivity information. This wizard provides default configuration for BGP peering.

### External TEP



The physical pod uses external TEP addresses to communicate with remote locations. Identify a subnet that is routable across the network connecting the different locations. It must not overlap with existing TEP pools.



Selected the interfaces on the spine(s) in Pod-1 that are connected to the IPN devices. Assign IP addresses to these interfaces to be able to establish IP connectivity between the spines and IPN devices. Ensure that the MTU configured on these interfaces match the MTU on the IPN interfaces.

### Configure Interpod Connectivity

**STEP 2 > IP Connectivity**

1. Overview 2. IP Connectivity 3. Routing Protocol 4. External TEP 5. Confirmation

**IP Connectivity**

The interpod network (IPN) connects Cisco ACI locations to provide end-to-end network connectivity. To achieve this, spines need IP connectivity to the IPN. Identify each spine by entering its node ID and define the interfaces that are connected to the IPN. Also provide IP configuration for at least one interface for each spine. Multiple interfaces are supported. It is best to have the same MTU set on all spine-to-IPN interfaces.

Spine ID:

**Interfaces**

Interface:	IPv4 Address:	MTU (bytes):
<input type="text" value="1/1"/>	<input type="text" value="192.168.1.253/30"/>	<input type="text" value="9150"/>
<input type="text" value="1/2"/>	<input type="text" value="192.168.1.249/30"/>	<input type="text" value="9150"/>

After assign IP addresses on the spine's interfaces, the next step is to configure the OSPF/BGP -based parameters required for peering between spines and IPN devices. This lab uses OSPF and the routing process is configured as a regular area.

### Configure Interpod Connectivity

**STEP 3 > Routing Protocol**

1. Overview 2. IP Connectivity 3. Routing Protocol 4. External TEP

**Routing Protocols**

OSPF/BGP is used in the underlay to peer between the physical spines and the IPN.

If OSPF is the routing protocol for the underlay - Configure the OSPF **Area ID**, an **Area Type** and OSPF **Interface Policy**.  
 OSPF interface policy contains OSPF-specific settings like OSPF network type, interface cost, and timers.

If BGP is the routing protocol for the underlay - Configure the **Peer-Address** and **Remote-AS** number of the IPN router.

**MP-BGP**

Use Defaults: ☒

Underlay: OSPF BGP

**OSPF**

Use Defaults: ☒

Area ID:

Area Type: NSSA area Regular area Stub area

Interface Policy:

For sub-interfaces

The OSPF Interface Policy is required under the configured OSPF routing process. In the Interface Policy, attributes like the network type, interface cost, MTU ignore etc can be configured.

Create OSPF Interface Policy

Name: IPN\_OSPF

Description: optional

Network Type: Broadcast Point-to-point Unspecified

Priority: 1

Cost of Interface: unspecified

Interface Controls: ☒ ☐

☐ Advertise subnet
 ☐ BFD
 ☐ MTU ignore
 ☐ Passive participation

Hello Interval (sec): 10

Dead Interval (sec): 40

Retransmit Interval (sec): 5

Transmit Delay (sec): 1

After the completion of OSPF configurations, the next step is to configure the External TEP pool, Data Plane TEP IP and Spine(s) Router ID(s). The External TEP pool must be routable across the IPN and it should have a subnet mask of length between /22 and /29. The External TEP pool is used to assign a unique Router-ID to each spine in the pod and a common Data Plane TEP IP. The Router-ID is used to establish MP-BGP EVPN peering between spines in different Pods. The Data Plane TEP IP represents an anycast TEP IP address used to reach any spines in the respective Pod. The purpose of this configuration is to allow for host reachability between the 2 pods. The spines in a Pod will get host information from a different Pod via the MP-BGP EVPN advertisements (Type-2 EVPN).

Configure Interpod Connectivity

STEP 4 > External TEP

1. Overview

2. IP Connectivity

3. Routing Protocol

4. External TEP

5. Confirmation

### External TEP

The physical pod uses external TEP to communicate with remote locations. Configure a subnet that is routable across the network connecting t different locations. The external TEP pool must not overlap external TEP pools belonging to other pods. The pool size should be between /27 and /22. The pool should be large enough to address all Cisco APICs, all spines, all border leafs, pod-specific TEP addresses and spine router IDs.

The wizard automatically allocates addresses for pod-specific TEP addresses and spine router IDs from the external TEP pool.

Use Defaults: ☒

Pod:	Internal TEP Pool:	External TEP Pool:	Data Plane TEP IP:
1	10.0.0.0/16	172.16.1.0/24	172.16.1.1/32

Spine ID:

Router ID:

Loopback Address:

109

172.16.1.2

Leave blank to use Router ID

- A Router-ID is unique per-spine
- A Data Plane TEP IP is unique per-pod

After the input of all required parameters, a confirmation Page shows all the list of Policies that will be configured as a result.

Configure Interpod Connectivity ✕

STEP 5 > Confirmation

1. Overview 2. IP Connectivity 3. Routing Protocol 4. External TEP 5. Confirmation

Here is the list of policies this wizard will create, you can change these names if needed

Attachable Access Entity Profiles:	IPNL3Out_EntityProfile
	Spine109_EntityProfile
External EPG:	ipnInstP
Fabric External Connection Policy:	default
Fabric External Routing Profile:	IPNL3Out_RoutingProfile
L3 Domain:	IPNL3Out_RoutedDomain
L3Out:	IPNL3Out
Logical Interface Profile:	LIFP_109
Logical Node Profile:	LNodeP_109
Spine Access Port Policy Groups:	IPNL3Out_policyGroup
	Spine109_PolicyGroup
VLAN Pool:	IPNL3Out_VlanPool

These are the individual objects created from the wizard:

IPN\_L3OUT AAEP associated with an L3 Routed Domain

Attachable Access Entity Profile - IPNL3Out\_EntityProfile

Policy Operational Faults History

Properties

Name: IPNL3Out\_EntityProfile

Description: optional

Enable Infrastructure VLAN: ☐

Domains (VMM, Physical or External) Associated to Interfaces:

name	State
IPNL3Out_RoutedDomain (L3)	formed

Spine109 AAEP associated with an L3 Routed Domain

Attachable Access Entity Profile - Spine109\_EntityProfile

Policy Operational Faults History

Properties

Name: Spine109\_EntityProfile

Description: optional

Enable Infrastructure VLAN: ☒

Domains (VMM, Physical or External) Associated to Interfaces:

name	State
IPNL3Out_RoutedDomain (L3)	formed

Navigate to **Tenants >> Infra >> Policies >> Protocol >> Fabric Ext Connection Policies:**

Fabric External Connection Policy

## Intrasite/Intersite Profile - Fabric Ext Connection Policy default

**Properties**  
Fabric ID: 1  
Name:   
Community:   
Ex: extended:as2-nn4-5-16  
  
Enable Pod Peering Profile: ☒

**Pod Peering Profile**  
Peering Type: Full Mesh Route Reflector  
Password:   
Confirm Password:

**Pod Connection Profile**

Pod ID	Data Plane TEP	Unicast TEP
1	172.16.1.1/32	172.16.1.2/32

**Fabric External Routing Profile**

Name	Subnet
IPNL3Out_RoutingProfile	192.168.1.249/30, 192.168.1.253/30

The “Community” allows PODs to import BGP paths to each other.

The Fabric External Routing Protocol contains subnets big enough to accommodate the required point-to-point IP addresses between the Spines and IPN.

These IPN subnets will be redistributed into the IS-IS routing process.

### Fabric External Routing Profile - IPNL3Out\_RoutingProfile

**Properties**  
Name: IPNL3Out\_RoutingProfile  
Description:   
  
Subnet Addresses:

Subnet
192.168.1.249/30
192.168.1.253/30

## L3 Domain

### L3 Domain Profile - IPNL3Out\_RoutedDomain

**Properties**  
Name: IPNL3Out\_RoutedDomain  
Associated Attachable Entity Profiles:

Name
IPNL3Out_EntityProfile
Spine109_EntityProfile

  
VLAN Pool:    
Security Domains:

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

Navigate to **Tenants >> infra >> Networking >> L3Outs >> IPNL3Out**

OSPF – L3OUT & the External EPG Objects

L3 Outside - IPNL3Out

SummaryPolicyStatsFaultsHistory

MainNode ProfilesExternal EPGs

Properties

Name: IPNL3Out

Alias:

Description: optional

Annotations: 

+

 Click to add a new annotation

Global Alias:

Provider Label:

enter names separated by comma

Target DSCP: Unspecified 

▼

Route Control Enforcement: ☐ Import ☒ Export

VRF: overlay-1 

▼

Resolved VRF: infra/overlay-1

L3 Domain: IPNL3Out\_RoutedDomai 

▼

Route Profile for Interleak: select a value 

▼

Route Profile for Redistribution: 

Source

Route Map

No items have been found.  
Select Actions to create a new item.

Enable BGP/EIGRP/OSPF: ☐ BGP ☒ OSPF

OSPF Area ID: backbone

OSPF Area Control: ☒ ☐

☒ Send redistributed LSAs into NSSA area☒ Originate summary LSA☐ Suppress forwarding address in translated LSA

OSPF Area Type: NSSA areaRegular areaStub area

OSPF Area Cost: 1 

▼

Create Default Leak Policy: ☐

External EPG - ipnlInstP

Properties

Name: ipnlInstP

Alias:

Annotations: 

+

 Click to add a new annotation

Global Alias:

Description: optional

pcTag: 49154

Contract Exception Tag:

Configured VRF Name: overlay-1

Resolved VRF: uni/tn-infra/ctx-overlay-1

QoS Class: Unspecified 

▼

Target DSCP: Unspecified 

▼

Configuration Status: applied

Configuration Issues:

Preferred Group Member: 

Exclude

Include

Intra Ext-EPG Isolation: 

Enforced

Unenforced

Subnets: 

IP Address

Scope

Logical Interface Profile – showing the Spine sub-interfaces that are configured with the IP addresses for OSPF peering with the IPN.

### Logical Interface Profile - LIfP\_109

Path	IP Address	Seco IP Addr	MAC Address	MTU (bytes)	Encap
Pod-1/Node-109/eth1/1	192.168.1.253/30		00:22:BD:F8:19:FF	9150	vlan-4
Pod-1/Node-109/eth1/2	192.168.1.249/30		00:22:BD:F8:19:FF	9150	vlan-4

Logical Node Profile – showing the Spine node and its assigned Router-ID.

Logical Node Profile - infra:overlay-1

Policy

Faults

History

Properties

Name: LNodeP\_109

Description: optional

Alias:

Target DSCP: Unspecified

Nodes:

Node ID	Router ID	Loopback Address
topology/pod-1/node-109	172.16.1.2	172.16.1.2

## Spine Access Port Policy Groups

Spine Access Port Policy Group - IPNL3Out\_policyGroup

Properties

Name: IPNL3Out\_policyGroup

Description: optional

Alias:

Link Level Policy: select a value

Link Flap Policy: select a value

CDP Policy: select a value

MACsec Policy: select a value

Attached Entity Profile: IPNL3Out\_EntityProfile

Spine Access Port Policy Group - Spine109\_PolicyGroup

Properties

Name: Spine109\_PolicyGroup

Description: optional

Alias:

Link Level Policy: select a value

Link Flap Policy: select a value

CDP Policy: select a value

MACsec Policy: select a value

Attached Entity Profile: Spine109\_EntityProfile

VLAN Pool (with encapsulation – 4)

## VLAN Pool - IPNL3Out\_VlanPool (Dynamic Allocation)

Policy
Operational
Faults
History

Properties

Name: IPNL3Out\_VlanPool

Description: optional

Alias:

Allocation Mode: Dynamic Allocation

Encap Blocks:

VLAN Range	Description	Allocation Mode	Role
[4]		Inherit allocMode from parent	External or On the wire encapsulation...

Domains:

Name	Type
IPNL3Out_RoutedDomain	L3 Domain

## Summary

All done! You can view a summary of what was done below.

Pod

The configuration push triggered a restart of APIC web server. you might see a server-side error until a new connection is established.

Pod

Configured

- Attachable Access Entity Profiles: IPNL3Out\_EntityProfile
- Attachable Access Entity Profiles: Spine109\_EntityProfile
- External EPG: ipInstP
- Fabric External Connection Policy: default
- Fabric External Routing Profile: IPNL3Out\_RoutingProfile
- L3 Domain: IPNL3Out\_RoutedDomain
- L3Out: IPNL3Out
- Logical Interface Profile: LIfP\_109
- Logical Node Profile: LNodeP\_109
- Spine Access Port Policy Groups: IPNL3Out\_policyGroup
- Spine Access Port Policy Groups: Spine109\_PolicyGroup
- VLAN Pool: IPNL3Out\_VlanPool

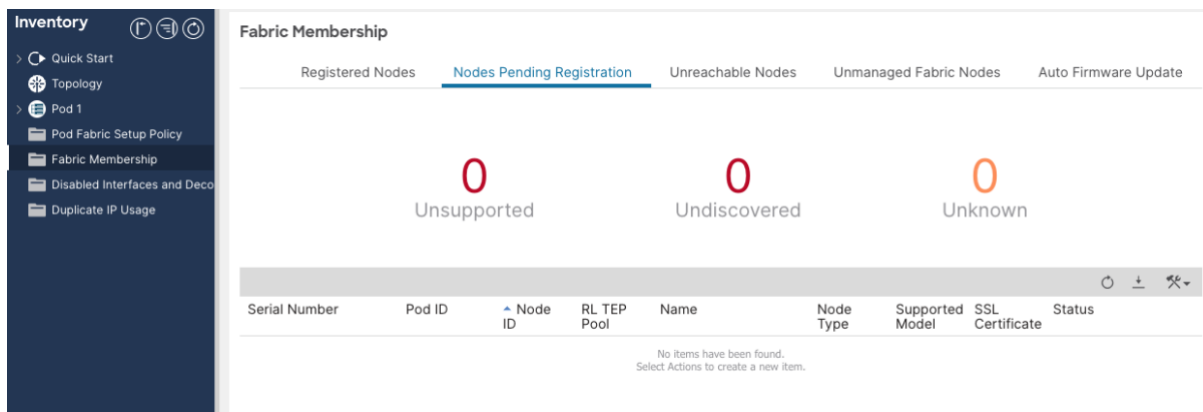
View JSON

Close

Add Another Physical Pod

After this point, there is an option to Add Another Pod which will repeat the same configuration panes, allowing the administrator to add a different Pod. In this lab, the second Pod will be added after setting up the IPN.

Before the IPN configuration is in place, all nodes in Pod-2 do not appear under the “Nodes Pending Registration” section.



The next section goes through the configuration of the IPN. After the successful configuration of the IPN, OSPF peering should be established between the Spine in pod-1 and the IPN device. Furthermore, OSPF peering will be established between the IPN devices. After the mentioned OSPF peerings have been established, the second Pod will be added via the Configuration wizard as shown before to allow Pod-2 devices to be added in the fabric.

## Inter-Pod Network (IPN Configuration)

The IPN requires the following protocols to be configured: LLDP, Multicast (PIM-Bidir), OSPF and DHCP.

### LLDP

Configure LLDP on the IPN devices and verify LLDP neighborhood with the Spines.

```
feature lldp
!
IPN-1# show lldp neig
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
spine_109                 Eth2/1              120          BR          Eth1/1
spine_109                 Eth2/2              120          BR          Eth1/2
IPN-2                     Eth2/3              120          BR          Eth2/9
IPN-2                     Eth2/4              120          BR          Eth2/10
Total entries displayed:  4
!
IPN-2# show lldp neig
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
IPN-1                     Eth2/9              120          BR          Eth2/3
IPN-1                     Eth2/10             120          BR          Eth2/4
switch                   Eth2/11             120          BR          Eth1/1
switch                   Eth2/12             120          BR          Eth1/2
Total entries displayed:  4
```

**NB:** The LLDP neighbor “switch” of IPN-2 is the unregistered spine in Pod-2.

### IPN VRF Instance

Create a dedicated VRF instance on the IPN devices. This VRF will contain inter-pod connectivity routes.



IPN-1#	IPN-2#
<pre>vrf context MPOD ! IPN-1# show vrf VRF-Name          VRF-ID State  Reason MPOD               4 Up      -- default            1 Up      -- management         2 Up      --</pre>	<pre>vrf context MPOD ! IPN-1# show vrf VRF-Name          VRF-ID State  Reason MPOD               4 Up      -- default            1 Up      -- management         2 Up      --</pre>

## OSPF Configuration

Configure OSPF on the IPN devices. OSPF is the routing protocol that is used for peering between each IPN device and ACI spines. The IPN devices form an OSPF neighborhood between each other as well. A VRF instance is configured the under the OSPF process. The configuration below configures the OSPF routing process and all interfaces that are required for OSPF peering:

- IPN device to IPN device interface
- IPN to spine(s) interface

IPN-1#	IPN-2#
<pre>feature ospf ! router ospf 100   vrf MPOD     router-id 192.168.1.1 ! interface Ethernet2/1   description To-Spine109-Eth1/1   mtu 9150   no shutdown ! interface Ethernet2/1.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.1.254/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   no shutdown ! interface Ethernet2/2   description To-Spine109-Eth1/2   mtu 9150   no shutdown ! interface Ethernet2/2.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.1.250/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   no shutdown ! interface Ethernet2/3   description To-IPN-2-Eth2/3   mtu 9150   no shutdown</pre>	<pre>feature ospf ! router ospf 100   vrf MPOD     router-id 192.168.2.1 ! interface Ethernet2/11   description To-Spine209-Eth1/1   mtu 9150   no shutdown ! interface Ethernet2/11.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.2.254/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   no shutdown ! interface Ethernet2/12   description To-Spine209-Eth1/2   mtu 9150   no shutdown ! interface Ethernet2/12.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.2.250/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   no shutdown ! interface Ethernet2/9   description To-IPN-1-Eth2/3   mtu 9150   no shutdown</pre>

<pre> interface Ethernet2/3.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.100.253/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   no shutdown ! interface Ethernet2/4   description To-IPN-2-Eth2/10   mtu 9150   no shutdown ! interface Ethernet2/4.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.100.249/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   no shutdown </pre>	<pre> interface Ethernet2/9.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.100.254/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   no shutdown ! interface Ethernet2/10   description To-IPN-1-Eth2/4   mtu 9150   no shutdown ! interface Ethernet2/10.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.100.250/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   no shutdown </pre>
--	---

Verify OSPF neighborship between IPN-1 and the Spine in Pod1 & IPN-1 and IPN-2.

<p><b>IPN-1#</b></p> <pre> IPN-1# show ip ospf neig vrf MPOD OSPF Process ID 100 VRF MPOD Total number of neighbors: 4 Neighbor ID      Pri State           Up Time  Address           Interface 172.16.1.2       1 FULL/ -         01:12:00 192.168.1.253    Eth2/1.4 172.16.1.2       1 FULL/ -         01:11:59 192.168.1.249    Eth2/2.4 192.168.2.1      1 FULL/ -         00:07:25 192.168.100.254  Eth2/3.4 192.168.2.1      1 FULL/ -         00:07:19 192.168.100.250  Eth2/4.4 </pre>	<p><b>IPN-2#</b></p> <pre> IPN-2# show ip ospf neig vrf MPOD OSPF Process ID 100 VRF MPOD Total number of neighbors: 2 Neighbor ID      Pri State           Up Time  Address           Interface 192.168.1.1      1 FULL/ -         00:05:54 192.168.100.253  Eth2/9.4 192.168.1.1      1 FULL/ -         00:05:49 192.168.100.249  Eth2/10.4 </pre>
---	--

<p><b>Spine_109#</b></p> <pre> spine_109# show ip ospf neighbors vrf overlay-1 OSPF Process ID default VRF overlay-1 Total number of neighbors: 2 Neighbor ID      Pri State           Up Time  Address           Interface 192.168.1.1      1 FULL/ -         18:27:25 192.168.1.254    Eth1/1.1 192.168.1.1      1 FULL/ -         18:27:25 192.168.1.250    Eth1/2.2 </pre>
--

#### Note

The configuration of subinterfaces on the links connecting the IPN devices to the spines is mandatory; it is, however, optional for the links between IPN devices and is only required when multiple VRFs need to be connected over the same physical interface.

## Multicast Configuration

The IPN requires Bidirectional Protocol-Independent Multicast (Bidir PIM) to be configured. Multicast in the IPN is required to forward Broadcast, Unknown Unicast and Multicast (BUM) traffic between the ACI pods.

### IPN Configuration Requirements are as follows:

- The IPN is required to support Bidir PIM for a subnet range of at least /15
- A multicast Rendezvous Point (RP) is required
  - A single RP handles all communication and if any failure occurs, a backup-RP will take over.
- Each IPN device is configured with a loopback interface and each loopback will have a different subnet mask. The loopback with the longer-prefix-match will be used.
- The RP address must be part of the same IP subnet as defined under the interface loopback.

IPN-1#	IPN-2#
<pre>feature pim ! ip pim rp-address 192.168.100.2 group-list 225.0.0.0/15 bidir ip pim rp-address 192.168.100.2 group-list 239.255.255.240/28 bidir ip pim ssm range 232.0.0.0/8 ! vrf context MPOD   ip pim ssm range 232.0.0.0/8 ! interface loopback1   description BiDir Phantom-RP   vrf member MPOD   ip address 192.168.100.1/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode</pre>	<pre>feature pim ! ip pim rp-address 192.168.100.2 group-list 225.0.0.0/15 bidir ip pim rp-address 192.168.100.2 group-list 239.255.255.240/28 bidir ip pim ssm range 232.0.0.0/8 ! vrf context MPOD   ip pim ssm range 232.0.0.0/8 ! interface loopback1   description BiDir Phantom-RP   vrf member MPOD   ip address 192.168.100.1/29   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode</pre>

192.168.100.2 is the RP-address and it will be reachable via IPN-1 which has the longest prefix-match.

### Add PIM configurations to all required interfaces on the IPN devices.

IPN-1#	IPN-2#
<pre>interface Ethernet2/1.4   ip pim sparse-mode ! interface Ethernet2/2.4   ip pim sparse-mode ! interface Ethernet2/3.4   ip pim sparse-mode ! interface Ethernet2/4.4   ip pim sparse-mode</pre>	<pre>interface Ethernet2/9.4   ip pim sparse-mode ! interface Ethernet2/10.4   ip pim sparse-mode ! interface Ethernet2/11.4   ip pim sparse-mode ! interface Ethernet2/12.4   ip pim sparse-mode</pre>

## DHCP Relay Configuration

DHCP relay configuration is required on all sub-interfaces facing the spine switches. The IP addresses of the APIC nodes are configured and DHCP messages/requests that are received will be sent to the relevant APIC node.

IPN-1#	IPN-2#
<pre>feature dhcp service dhcp ip dhcp relay ! interface Ethernet2/1.4   ip dhcp relay address 10.0.0.1   ip dhcp relay address 10.0.0.2   ip dhcp relay address 10.0.0.3 ! interface Ethernet2/2.4   ip dhcp relay address 10.0.0.1   ip dhcp relay address 10.0.0.2   ip dhcp relay address 10.0.0.3</pre>	<pre>feature dhcp service dhcp ip dhcp relay ! interface Ethernet2/11.4   ip dhcp relay address 10.0.0.1   ip dhcp relay address 10.0.0.2   ip dhcp relay address 10.0.0.3 ! interface Ethernet2/12.4   ip dhcp relay address 10.0.0.1   ip dhcp relay address 10.0.0.2   ip dhcp relay address 10.0.0.3</pre>

### Note

Since it is not possible to know beforehand in which pod the specific APIC nodes may get connected, the recommendation is to configure a DHCP relay statement for each APIC node on all the IPN interfaces connecting to the spines.

## Full IPN Configuration

IPN-1#	IPN-2#
<pre>feature ospf feature pim feature dhcp feature lldp ! service dhcp ip dhcp relay ! ip pim rp-address 192.168.100.2 group-list 225.0.0.0/15 bidir ip pim rp-address 192.168.100.2 group-list 239.255.255.240/28 bidir ! vrf context MPOD   ip pim ssm range 232.0.0.0/8 ! interface Ethernet2/1   description To-Spine109-Eth1/1   mtu 9150   no shutdown  interface Ethernet2/1.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.1.254/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode   ip dhcp relay address 10.0.0.1   ip dhcp relay address 10.0.0.2   ip dhcp relay address 10.0.0.3   no shutdown</pre>	<pre>feature ospf feature pim feature dhcp feature lldp ! service dhcp ip dhcp relay ! ip pim rp-address 192.168.100.2 group-list 225.0.0.0/15 bidir ip pim rp-address 192.168.100.2 group-list 239.255.255.240/28 bidir ! vrf context MPOD   ip pim ssm range 232.0.0.0/8 ! interface Ethernet2/9   description To-IPN-1-Eth2/3   mtu 9150   no shutdown  interface Ethernet2/9.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.100.254/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode   no shutdown  interface Ethernet2/10   description To-IPN-1-Eth2/4   mtu 9150</pre>

<pre> interface Ethernet2/2   description To-Spine109-Eth1/2   mtu 9150   no shutdown  interface Ethernet2/2.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.1.250/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode   ip dhcp relay address 10.0.0.1   ip dhcp relay address 10.0.0.2   ip dhcp relay address 10.0.0.3   no shutdown  interface Ethernet2/3   description To-IPN-2-Eth2/9   mtu 9150   no shutdown  interface Ethernet2/3.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.100.253/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode   no shutdown  interface Ethernet2/4   mtu 9150   no shutdown  interface Ethernet2/4.4   description To-IPN-2-Eth2/10   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.100.249/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode   no shutdown  interface loopback1   description BiDir Phantom-RP   vrf member MPOD   ip address 192.168.100.1/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode  router ospf 100   vrf MPOD     router-id 192.168.1.1 </pre>	<pre> no shutdown  interface Ethernet2/10.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.100.250/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode   no shutdown  interface Ethernet2/11   description To-Spine209-Eth1/1   mtu 9150   no shutdown  interface Ethernet2/11.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.2.254/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode   ip dhcp relay address 10.0.0.1   ip dhcp relay address 10.0.0.2   ip dhcp relay address 10.0.0.3   no shutdown  interface Ethernet2/12   description To-Spine209-Eth1/2   mtu 9150   no shutdown  interface Ethernet2/12.4   mtu 9150   encapsulation dot1q 4   vrf member MPOD   ip address 192.168.2.250/30   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode   ip dhcp relay address 10.0.0.1   ip dhcp relay address 10.0.0.2   ip dhcp relay address 10.0.0.3   no shutdown  interface loopback1   description BiDir Phantom-RP   vrf member MPOD   ip address 192.168.100.1/29   ip ospf network point-to-point   ip router ospf 100 area 0.0.0.0   ip pim sparse-mode  router ospf 100   vrf MPOD     router-id 192.168.2.1 </pre>
--	---

## Adding the Second Pod

After the successful configuration of the IPN, the second Pod can be added. The steps below showcase how to add the second Pod in the ACI fabric.

Add the ID of the spine in Pod-2 even though the device is still not registered in the fabric. Configure IP addresses on the interfaces that are directly connected to the IPN.

## Pod Configuration

Pod ID:

Pod TEP Pool:   
[View existing TEP Pools](#)

Spine ID:

Interfaces

Interface:	IPv4 Address:	MTU (bytes):
<input type="text" value="1/1"/>	<input type="text" value="192.168.2.253/30"/>	<input type="text" value="9150"/>
Interface:	IPv4 Address:	MTU (bytes):
<input type="text" value="1/2"/>	<input type="text" value="192.168.2.249/30"/>	<input type="text" value="9150"/>

Associate the OSPF routing process with the previously configured OSPF Interface Policy.

## Routing Protocols

OSPF/BGP is used in the underlay to peer between the physical spines and the IPN.

If OSPF is the routing protocol for the underlay - Configure the OSPF **Area ID**, an **Area Type** and OSPF **Interface Policy**.

OSPF interface policy contains OSPF-specific settings like OSPF network type, interface cost, and timers.

If BGP is the routing protocol for the underlay - Configure the **Peer-Address** and **Remote-AS** number of the IPN router.

Underlay: ☒ OSPF ☐ BGP

OSPF

Area ID:

Area Type: ☒ NSSA area ☐ Regular area ☐ Stub area

Area Cost:

Interface Policy:   
For sub-interfaces

Configure the External TEP pool for Pod-2, allocate the Data Plane TEP IP and Router-ID for the Spine(s) in Pod-2.

## Pod Configuration

External TEP addresses are used by the physical Pod to communicate with remote locations. Configure a subnet that is routable across the network connecting the different locations. The external TEP pool cannot overlap with other Pods internal or external TEP pools. The pool size should be between /27 and /22. The pool should be large enough to address all APICs, all spines, all border leafs, pod-specific TEP addresses, and spine router IDs.

The wizard will automatically allocate addresses for pod-specific TEP addresses and spine router IDs from the external TEP pool.

Proposed addresses can be modified, but modified addresses must be outside of the external TEP pool.

Use Defaults: ☒

Pod:	Internal TEP Pool:	External TEP Pool:	Data Plane TEP IP:
1	10.0.0.0/16	172.16.1.0/24	172.16.1.1/32
2	10.1.0.0/16	<input type="text" value="172.16.2.0/24"/>	<input type="text" value="172.16.2.1/32"/>

Node:

Router ID:

Loopback Address:

209

Leave blank to use Router ID

Confirmation of the Objects that will be automatically created by the APIC:

## Add Physical Pod

STEP 5 > Confirmation
1. Overview
2. Pod Fabric
3. Routing Protocol
4. External TEP
5. Confirmation

Here is the list of policies this wizard will create, you can change these names if needed

Attachable Access Entity Profiles:	IPNL3Out_EntityProfile
	Spine209_EntityProfile
Fabric External Connection Policy:	default
Fabric External Routing Profile:	IPNL3Out_RoutingProfile
L3 Domain:	IPNL3Out_RoutedDomain
L3Out:	IPNL3Out
Logical Interface Profile:	LIFP_209
Logical Node Profile:	LNodeP_209
Spine Access Port Policy Groups:	IPNL3Out_policyGroup
	Spine209_PolicyGroup
VLAN Pool:	IPNL3Out_VlanPool

## Summary:

### Summary

All done! You can view a summary of what was done below.

The configuration push triggered a restart of APIC web server. You might see a server-side error until a new connection is established.

Configured

Pod SetupP: 2

Routed Outside: IPNL3Out

Configure the IPN DHCP relay to point to the following internal TEP addresses to enable discovery of the Pod components.

APIC Name	Internal TEP Address
apic-1	10.0.0.1
apic-2	10.0.0.2

From this point, the Spine in Pod-2 appears under Nodes Pending Registration and it can be registered in the ACI fabric.

### Fabric Membership

Registered Nodes
Nodes Pending Registration
Unreachable Nodes
Unmanaged Fabric Nodes
Auto Firmware Update

0	0	1
Unsupported	Undiscovered	Unknown

Serial Number	Pod ID	Node ID	RL TEP Pool	Name	Node Type	Supported Model	SSL Certificate	Status
	1	0	0		Spine	yes	n/a	

All nodes in Pod-2 are registered in the Fabric.

## Fabric Membership

Registered Nodes

Nodes Pending Registration

Unreachable Nodes

Unmanaged Fabric Nodes

Auto Firmware Update

0

Unsupported

2

Undiscovered

1

Unknown

Serial Number	Pod ID	Node ID	RL TEP Pool	Name	Node Type	Supported Model	SSL Certificate	Status
	2	201	0	leaf_201	Unknown	no	n/a	Undiscovered
	2	202	0	leaf_202	Unknown	no	n/a	Unknown
	2	209	0	spine_209	Spine	yes	n/a	Discovering
	2	203	0	leaf_203	Unknown	no	n/a	Undiscovered

Note: ACI nodes in Pod-1 are assigned TEP IP addresses from TEP pool (10.0.0.0/16) and nodes in Pod-2 are assigned TEP IP addresses from TEP pool (10.1.0.0/16) and this can be observed from the Fabric Membership.

Pod ID	Node ID	Name	Node Type	IP	Maintenance Mode	Status
1	101	leaf_101	Leaf	10.0.176.64/32	No	Active
1	102	leaf_102	Leaf	10.0.56.65/32	No	Active
1	103	leaf_103	Leaf	10.0.176.66/32	No	Active
1	109	spine_109	Spine	10.0.176.65/32	No	Active
2	201	leaf_201	Leaf	10.1.152.66/32	No	Active
2	202	leaf_202	Leaf	10.1.152.65/32	No	Active
2	203	leaf_203	Leaf	10.1.200.64/32	No	Active
2	209	spine_209	Spine	10.1.152.64/32	No	Active

The APIC cluster is fully formed with all APICs across both Pod1 and Pod2.

## Controller Status

ID	Name	IP	Admin State	Operational State	Health State
1	apic-1	10.0.0.1	In Service	Available	Fully Fit
2	apic-2	10.0.0.2	In Service	Available	Fully Fit
3	apic-3	10.0.0.3	In Service	Available	Fully Fit

Check OSPF between IPN-2 and Spine in Pod 2

```
IPN-2# show ip ospf neig vrf MPOD
OSPF Process ID 100 VRF MPOD
Total number of neighbors: 4
Neighbor ID    Pri State          Up Time  Address          Interface
192.168.1.1    1 FULL/-          07:38:17 192.168.100.253 Eth2/9.4
192.168.1.1    1 FULL/-          07:38:12 192.168.100.249 Eth2/10.4
172.16.2.2     1 FULL/-          00:02:37 192.168.2.253   Eth2/11.4
172.16.2.2     1 FULL/-          00:02:36 192.168.2.249   Eth2/12.4
```



Verify the configured Fabric Ext Connection Policy by navigation to **Tenant >> infra >> Policies >> Protocol >> Fabric Ext Connection Policies** and Click on the *Fabric Ext Connection Policy default*:

#### Intrasite/Intersite Profile - Fabric Ext Connection Policy default

**Properties**

Fabric ID: 1

Name:

Community:   
Ex: extended:as2-nn4:5:16

Enable Pod Peering ☒

Profile:

**Pod Peering Profile**

Peering Type: Full Mesh Route Reflector

Password:

Confirm Password:

**Pod Connection Profile**

Pod ID	Data Plane TEP	Unicast TEP
1	172.16.1.1/32	172.16.1.2/32
2	172.16.2.1/32	172.16.2.2/32

**Fabric External Routing Profile**

Name	Subnet
IPNL3Out_RoutingProfile	192.168.1.249/30, 192.168.1.253/30, 192.168.2.249/30, 192.168.2.253/30

The Community value that is automatically assigned allows for the exchange of EVPN prefixes with spines in remote pods. The subnets that were used for the spines to IPN OSPF peering are displayed under the Fabric External Routing Profile.

The pod connection profile defines a new VXLAN TEP (VTEP) address called the external TEP (ETEP) address. It is used as the anycast shared address across all spine switches in a pod and as the EVPN next-hop IP address for inter-pod data-plane traffic. This IP address should not be part of the TEP pool assigned to each pod.

The Fabric External Routing Profile defines the subnets that are used in the point-to-point connections between the two separate pods in the IPN interfaces.

These subnets are redistributed into the IS-IS control plane running inside each Pod.

Spine109#	Spine209#
<pre>show ip route vrf overlay-1 ! 192.168.1.248/30, ubest/mbest: 1/0, attached, direct     *via 192.168.1.249, eth1/2.2, [0/0], 3d01h, direct 192.168.1.249/32, ubest/mbest: 1/0, attached     *via 192.168.1.249, eth1/2.2, [0/0], 3d01h, local, local 192.168.1.252/30, ubest/mbest: 1/0, attached, direct     *via 192.168.1.253, eth1/1.1, [0/0], 3d01h, direct 192.168.1.253/32, ubest/mbest: 1/0, attached     *via 192.168.1.253, eth1/1.1, [0/0], 3d01h, local, local 192.168.2.248/30, ubest/mbest: 2/0     *via 192.168.1.254, eth1/1.1, [110/3], 2d23h, ospf- default, intra</pre>	<pre>show ip route vrf overlay-1 ! 192.168.1.248/30, ubest/mbest: 2/0     *via 192.168.2.254, eth1/1.1, [110/3], 1d16h, ospf- default, intra     *via 192.168.2.250, eth1/2.2, [110/3], 1d16h, ospf- default, intra 192.168.1.252/30, ubest/mbest: 2/0     *via 192.168.2.254, eth1/1.1, [110/3], 1d16h, ospf- default, intra     *via 192.168.2.250, eth1/2.2, [110/3], 1d16h, ospf- default, intra 192.168.2.248/30, ubest/mbest: 1/0, attached, direct     *via 192.168.2.249, eth1/2.2, [0/0], 2d15h, direct 192.168.2.249/32, ubest/mbest: 1/0, attached</pre>

<pre> *via 192.168.1.250, eth1/2.2, [110/3], 2d23h, ospf- default, intra 192.168.2.252/30, ubest/mbest: 2/0 *via 192.168.1.254, eth1/1.1, [110/3], 2d23h, ospf- default, intra *via 192.168.1.250, eth1/2.2, [110/3], 2d23h, ospf- default, intra </pre>	<pre> *via 192.168.2.249, eth1/2.2, [0/0], 2d15h, local, local 192.168.2.252/30, ubest/mbest: 1/0, attached, direct *via 192.168.2.253, eth1/1.1, [0/0], 2d15h, direct 192.168.2.253/32, ubest/mbest: 1/0, attached *via 192.168.2.253, eth1/1.1, [0/0], 2d15h, local, local </pre>
--	---

Verify the Spine MP-BGP EVPN

Spine109#

```
spine_109# show bgp l2vpn evpn summary vrf overlay-1
BGP summary information for VRF overlay-1, address family
L2VPN EVPN
BGP router identifier 10.0.208.65, local AS number 65001
BGP table version is 15, L2VPN EVPN config peers 1,
capable peers 1
4 network entries and 4 paths using 720 bytes of memory
BGP attribute entries [2/416], BGP AS path entries [0/0]
BGP community entries [0/0], BGP clusterlist entries
[0/0]
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ
OutQ	Up/Down	State/PfxRcd				
172.168.2.2	4	65001	7	6	15	0
0	00:00:25	1				

Spine209#

```
spine_209# show bgp l2vpn evpn summary vrf overlay-1
BGP summary information for VRF overlay-1, address family
L2VPN EVPN
BGP router identifier 10.1.72.64, local AS number 65001
BGP table version is 8, L2VPN EVPN config peers 1,
capable peers 1
5 network entries and 5 paths using 828 bytes of memory
BGP attribute entries [2/416], BGP AS path entries [0/0]
BGP community entries [0/0], BGP clusterlist entries
[0/0]
```

Neighbor	V	AS	MsgRcvd	MsgSent	TblVer	InQ
OutQ	Up/Down	State/PfxRcd				
172.16.1.2	4	65001	7	6	8	0
0	00:00:45	2				

**Note**  
Ensure the Fabric BGP AS is configured and the Spines from each Pod are designated as route-reflectors else MP-BGP L2VPN EVPN peering will not be established.

Verify Redistribution in ACI Multi-Pod

Route Maps are at the center of redistribution between OSPF and ISIS.

On Spine\_109 (OSPF to IS-IS Redistribution):

<pre> spine_109# moquery -d sys/isis/inst-default/dom-overlay-1/interleak-ospf-default-1 Total Objects shown: 1  # isis.InterLeakP proto      : ospf inst       : default asn        : 1 childAction : descr      : dn         : sys/isis/inst-default/dom-overlay-1/interleak-ospf-default-1 lcOwn      : local modTs      : 2025-04-18T10:55:37.545+00:00 name       : nameAlias  : rn         : interleak-ospf-default-1 rtMap      : interleak_rtmap_infra_prefix_remote_pod_teps scope      : inter status     : </pre>
<pre> spine_109# moquery -d sys/isis/inst-default/dom-overlay-1/interleak-ospf-default-1 Total Objects shown: 1 </pre>

```
# isis.InterLeakP
proto      : ospf
inst       : default
asn        : 1
childAction :
descr      :
dn         : sys/isis/inst-default/dom-overlay-1/interleak-ospf-default-1
lcOwn      : local
modTs      : 2025-04-18T07:49:13.131+00:00
name       :
nameAlias  :
rn         : interleak-ospf-default-1
rtMap      : interleak_rtmap_infra_prefix_remote_pod_teps
scope      : inter
status     :
```

```
spine_109# vsh -c 'show isis protocol vrf overlay-1' | egrep -A 3 'Redis'
Redistributing :
  bgp-65001      policy interleak_rtmap_infra_prefix_remote_pod_teps
  direct         policy intra-site-deny
  ospf-default   policy interleak_rtmap_infra_prefix_remote_pod_teps
```

A look into the route-map & prefix-lists to see which routes are being distributed:

```
spine_109# show route-map interleak_rtmap_infra_prefix_remote_pod_teps
route-map interleak_rtmap_infra_prefix_remote_pod_teps, permit, sequence 1
  Match clauses:
    ip address prefix-lists: infra_prefix_remote_pod_teps infra_prefix_ipn_remote_subnets
  Set clauses:
    metric 63
route-map interleak_rtmap_infra_prefix_remote_pod_teps, permit, sequence 2
  Match clauses:
    ip address prefix-lists: infra_prefix_all_ifcs_tep_range
  Set clauses:
    metric 60

spine_109# show ip prefix-list  infra_prefix_remote_pod_teps
ip prefix-list infra_prefix_remote_pod_teps: 6 entries
  seq 2 permit 10.1.0.33/32 - SPINE 209 ANYCAST
  seq 3 permit 10.1.0.34/32 - SPINE 209 ANYCAST
  seq 4 permit 10.1.0.35/32 - SPINE 209 ANYCAST
  seq 5 permit 172.168.2.1/32 - POD 2 DATAPLANE TEP IP
  seq 6 permit 172.168.2.2/32 - SPINE 209 ROUTER ID
  seq 7 permit 10.1.0.0/16 - POD 2 TEP Pool
spine_109#
spine_109# show ip prefix-list  infra_prefix_ipn_remote_subnets
ip prefix-list infra_prefix_ipn_remote_subnets: 4 entries
IPN - SPINES OSPF ROUTING SUBNETS
  seq 1 permit 192.168.1.253/30 le 32
  seq 2 permit 192.168.1.249/30 le 32
  seq 3 permit 192.168.2.249/30 le 32
  seq 4 permit 192.168.2.253/30 le 32
spine_109#
spine_109# show ip prefix-list  infra_prefix_all_ifcs_tep_range
ip prefix-list infra_prefix_all_ifcs_tep_range: 1 entries
  seq 1 permit 10.0.0.0/27 eq 32
spine_109# Set clauses:
```

## On Spine\_209 (OSPF to IS-IS Redistribution):

```
spine_209# moquery -d sys/isis/inst-default/dom-overlay-1/interleak-ospf-default-1
Total Objects shown: 1

# isis.InterLeakP
proto      : ospf
inst       : default
asn        : 1
childAction :
descr      :
dn         : sys/isis/inst-default/dom-overlay-1/interleak-ospf-default-1
lcOwn      : local
modTs      : 2025-04-18T10:55:37.545+00:00
name       :
nameAlias  :
rn         : interleak-ospf-default-1
rtMap      : interleak_rtmap_infra_prefix_remote_pod_teps
scope      : inter
status     :
```

```
spine_209# vsh -c 'show isis protocol vrf overlay-1' | egrep -A 3 'Redis'
  Redistributing :
    bgp-65001      policy interleak_rtmap_infra_prefix_remote_pod_teps
    direct         policy intra-site-deny
    ospf-default   policy interleak_rtmap_infra_prefix_remote_pod_teps
spine_209#
```

A look into the route-map & prefix-lists to see which routes are being distributed:

```
spine_209# show route-map interleak_rtmap_infra_prefix_remote_pod_teps
route-map interleak_rtmap_infra_prefix_remote_pod_teps, permit, sequence 1
  Match clauses:
    ip address prefix-lists: infra_prefix_remote_pod_teps infra_prefix_ipn_remote_subnets
  Set clauses:
    metric 63
route-map interleak_rtmap_infra_prefix_remote_pod_teps, permit, sequence 2
  Match clauses:
    ip address prefix-lists: infra_prefix_all_ifcs_tep_range
  Set clauses:
    metric 63

spine_209# show ip prefix-list infra_prefix_remote_pod_teps
ip prefix-list infra_prefix_remote_pod_teps: 6 entries
ip prefix-list infra_prefix_remote_pod_teps: 6 entries
  seq 1 permit 10.0.0.33/32
  seq 2 permit 10.0.0.34/32
  seq 3 permit 10.0.0.35/32
  seq 4 permit 172.16.1.1/32
  seq 5 permit 172.16.1.2/32
  seq 6 permit 10.0.0.0/16
spine_209#
spine_109# show ip prefix-list infra_prefix_ipn_remote_subnets
ip prefix-list infra_prefix_ipn_remote_subnets: 4 entries
IPN - SPINES OSPF ROUTING SUBNETS
ip prefix-list infra_prefix_ipn_remote_subnets: 4 entries
  seq 1 permit 192.168.2.249/30 le 32
  seq 2 permit 192.168.2.253/30 le 32
```

```

seq 3 permit 192.168.1.249/30 le 32
seq 4 permit 192.168.1.253/30 le 32
spine_209#
spine_209# show ip prefix-list infra_prefix_all_ifcs_tep_range
ip prefix-list infra_prefix_all_ifcs_tep_range: 1 entries
    seq 1 permit 10.0.0.0/27 eq 32
spine_209#

```

## Spine\_109 (ISIS to OSPF redistribution)

```

spine_109# moquery -d sys/ospf/inst-default/dom-overlay-1/interleak-isis-isis_infra-1
Total Objects shown: 1

# ospf.InterLeakP
proto      : isis
inst       : isis_infra
asn        : 1
always     : no
childAction :
descr      :
dn         : sys/ospf/inst-default/dom-overlay-1/interleak-isis-isis_infra-1
lcOwn      : local
modTs      : 2025-04-18T09:57:05.106+00:00
name       :
nameAlias  :
rn         : interleak-isis-isis_infra-1
rtMap      : interleak_rtmap_infra_prefix_local_pod_cp_eteps_and_ifcs
scope      : inter
status     :

```

```

spine_109# show route-map interleak_rtmap_infra_prefix_local_pod_cp_eteps_and_ifcs
route-map interleak_rtmap_infra_prefix_local_pod_cp_eteps_and_ifcs, permit, sequence 1
  Match clauses:
    ip address prefix-lists: infra_prefix_local_pod_ifcs infra_prefix_local_pod_cp_eteps_and_ifcs
  Set clauses:

spine_109# show ip prefix-list infra_prefix_local_pod_ifcs
ip prefix-list infra_prefix_local_pod_ifcs: 2 entries
    seq 1 permit 10.0.0.1/32
    seq 2 permit 10.0.0.2/32
spine_109#
spine_109# show ip prefix-list infra_prefix_local_pod_cp_eteps_and_ifcs
ip prefix-list infra_prefix_local_pod_cp_eteps_and_ifcs: 1 entries
    seq 1 permit 172.16.1.2/32

```

## On Spine\_109 (OSPF Database):

```

spine_109# show ip ospf database external vrf overlay-1
    OSPF Router with ID (172.16.1.2) (Process ID default VRF overlay-1)

          Type-5 AS External Link States

Link ID      ADV Router    Age      Seq#          Checksum Tag
10.0.0.0     172.16.1.2     587      0x80000002c  0x2d9c      0
10.0.0.1     172.16.1.2     587      0x80000002c  0x23a5      0
10.0.0.2     172.16.1.2     587      0x80000002c  0x19ae      0

```

10.0.0.3	172.168.2.2	1817	0x80000025	0x51e2	0
10.0.0.33	172.16.1.2	587	0x8000002c	0xe1c6	0
10.0.0.34	172.16.1.2	587	0x8000002c	0xd7cf	0
10.0.0.35	172.16.1.2	587	0x8000002c	0xcdd8	0
10.1.0.0	172.168.2.2	627	0x8000002a	0x59d7	0
10.1.0.33	172.168.2.2	627	0x8000002b	0x0c03	0
10.1.0.34	172.168.2.2	627	0x8000002b	0x020c	0
10.1.0.35	172.168.2.2	627	0x8000002a	0xf914	0
172.16.1.0	172.16.1.2	1507	0x80000029	0x25f3	0
172.16.1.1	172.16.1.2	587	0x8000002c	0x15ff	0
172.16.1.228	172.16.1.2	1507	0x80000029	0x34ff	0
172.16.1.229	172.16.1.2	1507	0x80000029	0x2a09	0
172.168.2.0	172.168.2.2	627	0x8000002a	0x25bf	0
172.168.2.1	172.168.2.2	627	0x8000002a	0x1bc8	0
172.168.2.228	172.168.2.2	627	0x8000002a	0x34cb	0
172.168.2.229	172.168.2.2	627	0x8000002a	0x2ad4	0

<b>spine_109# show ip ospf database vrf overlay-1</b>					
OSPF Router with ID (172.16.1.2) (Process ID default VRF overlay-1)					
Router Link States (Area 0.0.0.0)					
Link ID	ADV Router	Age	Seq#	Checksum	Link Count
172.16.1.2	172.16.1.2	1538	0x8000002e	0x57b6	6
172.168.2.2	172.168.2.2	668	0x8000002f	0x645e	6
192.168.1.1	192.168.1.1	1459	0x800000cd	0xa9ae	9
192.168.2.1	192.168.2.1	1310	0x800000d1	0xad71	9
Type-5 AS External Link States					
Link ID	ADV Router	Age	Seq#	Checksum	Tag
10.0.0.0	172.16.1.2	628	0x8000002c	0x2d9c	0
10.0.0.1	172.16.1.2	628	0x8000002c	0x23a5	0
10.0.0.2	172.16.1.2	628	0x8000002c	0x19ae	0
10.0.0.3	172.168.2.2	38	0x80000026	0x4fe3	0
10.0.0.33	172.16.1.2	628	0x8000002c	0xe1c6	0
10.0.0.34	172.16.1.2	628	0x8000002c	0xd7cf	0
10.0.0.35	172.16.1.2	628	0x8000002c	0xcdd8	0
10.1.0.0	172.168.2.2	668	0x8000002a	0x59d7	0
10.1.0.33	172.168.2.2	668	0x8000002b	0x0c03	0
10.1.0.34	172.168.2.2	668	0x8000002b	0x020c	0
10.1.0.35	172.168.2.2	668	0x8000002a	0xf914	0
172.16.1.0	172.16.1.2	1548	0x80000029	0x25f3	0
172.16.1.1	172.16.1.2	628	0x8000002c	0x15ff	0
172.16.1.228	172.16.1.2	1548	0x80000029	0x34ff	0
172.16.1.229	172.16.1.2	1548	0x80000029	0x2a09	0
172.168.2.0	172.168.2.2	668	0x8000002a	0x25bf	0
172.168.2.1	172.168.2.2	668	0x8000002a	0x1bc8	0
172.168.2.228	172.168.2.2	668	0x8000002a	0x34cb	0
172.168.2.229	172.168.2.2	668	0x8000002a	0x2ad4	0

## On Spine\_209 (IS-IS to OSPF Redistribution):

<b>spine_209# moquery -d sys/ospf/inst-default/dom-overlay-1/interleak-isis-isis_infra-1</b>	
Total Objects shown: 1	
# ospf.InterLeakP	
proto	: isis
inst	: isis_infra
asn	: 1

```

always      : no
childAction :
descr       :
dn          : sys/ospf/inst-default/dom-overlay-1/interleak-isis-isis_infra-1
lcOwn       : local
modTs       : 2025-04-18T10:55:00.875+00:00
name        :
nameAlias   :
rn          : interleak-isis-isis_infra-1
rtMap       : interleak_rtmap_infra_prefix_local_pod_cp_eteps_and_ifcs
scope       : inter
status      :

```

```

spine_209# show route-map interleak_rtmap_infra_prefix_local_pod_cp_eteps_and_ifcs
route-map interleak_rtmap_infra_prefix_local_pod_cp_eteps_and_ifcs, permit, sequence 1
Match clauses:
  ip address prefix-lists: infra_prefix_local_pod_ifcs infra_prefix_local_pod_cp_eteps_and_ifcs
Set clauses:

spine_209# show ip prefix-list infra_prefix_local_pod_ifcs
ip prefix-list infra_prefix_local_pod_ifcs: 1 entries
  seq 1 permit 10.0.0.3/32
spine_209#
spine_209# show ip prefix-list infra_prefix_local_pod_cp_eteps_and_ifcs
ip prefix-list infra_prefix_local_pod_cp_eteps_and_ifcs: 1 entries
  seq 1 permit 172.168.2.2/32

```

## Fabric Discovery Troubleshooting

This section goes through Fabric Discovery validation and troubleshooting commands. The commands and explanations are adopted from the official Troubleshoot ACI Fabric Discovery; <https://www.cisco.com/c/en/us/support/docs/cloud-systems-management/application-policy-infrastructure-controller-apic/218031-troubleshoot-aci-fabric-discovery-init.html>

### Check the System State.

When a leaf has been registered in the fabric its state should be “in-service”.

```

leaf_101# moquery -c topSystem | grep state
state      : in-service
leaf_101#

```

### Check – DHCP status

```

(none)# tcpdump -ni kpm_inb port 67 or 68
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on kpm_inb, link-type EN10MB (Ethernet), capture size 262144 bytes
10:02:31.820279 IP 10.0.176.64.67 > 10.0.0.1.67: BOOTP/DHCP, Request from 64:3a:ea:93:63:01, length 345

Broadcast message from root@leaf101 (Sun Apr 13 10:02:38 2025):

This switch is now part of the ACI fabric. Please re-login with the right credentials.
Launching getty

```

The output above shows that a leaf was allocated a TEP IP by the APIC during registration.

### DHCP on the APIC

```

apic-1# ps aux | grep dhcp

```

```
ifc          11972  2.4  0.7 1565680 681540 ?      Ssl 09:44   0:36 /mgmt//bin/dhcpd.bin -f -4 -cf
/data//dhcp/dhcpd.conf -lf /data//dhcp/dhcpd.lease -pf /var/run//dhcpd.pid --no-pid bond0.4093
admin        74832  0.0  0.0 3312   656 pts/0    S+   10:08   0:00 grep dhcp
```

Validate that the dhcpd is running on the APIC and listening to the bond interface (interface that connects to the ACI fabric).

## Unregistered leaf AV details

```
(none) login: admin
*****
Fabric discovery in progress, show commands are not fully functional
Logout and Login after discovery to continue to use show commands.
Run show discoveryissues for more details.
*****
(none)# acidiag avread
Cluster of 0 lm(t):0(zeroTime) appliances (out of targeted 0 lm(t):0(zeroTime)) with FABRIC_DOMAIN
name=Undefined Fabric Domain Name set to version= lm(t):0(zeroTime); discoveryMode=PERMISSIVE
lm(t):0(zeroTime); drrMode=OFF lm(t):0(zeroTime); kafkaMode=OFF lm(t):0(zeroTime); autoUpgradeMode=OFF
lm(t):0(zeroTime); clusterInterface=infra
-----
clusterTime=<diff=0 common=2025-04-13T10:13:17.578+00:00 local=2025-04-13T10:13:17.578+00:00
pF=<displForm=1 offsSt=0 offsVlu=0 lm(t):0(zeroTime)>>
-----
```

Before the leaf is registered, it does not have details regarding the cluster.

## Registered leaf

```
leaf_101# acidiag avread
Cluster of 3 lm(t):0(2025-04-18T12:51:37.363+00:00) appliances (out of targeted 3 lm(t):0(2025-04-
18T13:01:14.070+00:00)) with FABRIC_DOMAIN name=ACI-FABRIC set to version=6.0(7e) lm(t):0(2025-04-
18T13:01:14.070+00:00); discoveryMode=PERMISSIVE lm(t):0(zeroTime); drrMode=OFF lm(t):0(zeroTime);
kafkaMode=ON lm(t):1(2025-04-18T07:13:19.173+00:00); autoUpgradeMode=OFF lm(t):3(2025-04-
18T12:51:37.796+00:00); clusterInterface=infra
appliance id=1 address=10.0.0.1 lm(t):1(2025-04-18T07:04:20.705+00:00) tep address=10.0.0.0/16
lm(t):1(2025-04-18T07:04:20.705+00:00) routable address=0.0.0.0 lm(t):0(zeroTime) oob address=0.0.0.0
lm(t):0(zeroTime) version=6.0(7e) lm(t):1(2025-04-18T07:04:28.099+00:00) chassisId=074f7d6f-1c23-11f0-
b546-2cf89bb06570 lm(t):1(2025-04-18T07:04:28.099+00:00) capabilities=0X17EEEEEEEE--0X2020--0X3--0X1
lm(t):1(2025-04-18T07:32:58.598+00:00) rK=(stable,absent,0) lm(t):0(zeroTime) aK=(stable,absent,0)
lm(t):0(zeroTime) oobrK=(stable,absent,0) lm(t):0(zeroTime) oobaK=(stable,absent,0) lm(t):0(zeroTime)
cntrlSbst=(APPROVED, Wxxxxxxx) lm(t):1(2025-04-18T12:51:37.848+00:00) (targetMbSn= lm(t):0(zeroTime),
failoverStatus=0 lm(t):0(zeroTime)) podId=1 lm(t):1(2025-04-18T07:04:20.705+00:00) commissioned=YES
lm(t):101(2025-04-18T07:30:05.294+00:00) registered=YES lm(t):1(2025-04-18T07:04:20.705+00:00)
standby=NO lm(t):0(zeroTime) DRR=NO lm(t):101(2025-04-18T07:30:05.294+00:00) apicX=NO lm(t):0(zeroTime)
virtual=NO lm(t):0(zeroTime) oob gw address=0.0.0.0 lm(t):0(zeroTime) oob address v6=0.0.0.0
lm(t):0(zeroTime) oob gw address v6=0.0.0.0 lm(t):0(zeroTime) active=YES
appliance id=2 address=10.0.0.2 lm(t):101(2025-04-18T07:31:26.429+00:00) tep
address=10.0.0.0/16 lm(t):2(2025-04-18T07:05:59.732+00:00) routable address=0.0.0.0 lm(t):0(zeroTime)
oob address=0.0.0.0 lm(t):0(zeroTime) version=6.0(7e) lm(t):2(2025-04-18T07:06:06.217+00:00)
chassisId=4768bab6-1c23-11f0-903f-34ed1b8b68ef lm(t):101(2025-04-18T07:31:26.429+00:00)
capabilities=0X17EEEEEEEE--0X2020--0X7--0X1 lm(t):3(2025-04-18T12:51:58.626+00:00)
rK=(stable,absent,0) lm(t):0(zeroTime) aK=(stable,absent,0) lm(t):0(zeroTime) oobrK=(stable,absent,0)
lm(t):0(zeroTime) oobaK=(stable,absent,0) lm(t):0(zeroTime) cntrlSbst=(APPROVED, Wxxxxxxx) lm(t):2(2025-
04-18T12:51:37.794+00:00) (targetMbSn= lm(t):0(zeroTime), failoverStatus=0 lm(t):0(zeroTime)) podId=1
lm(t):101(2025-04-18T07:31:26.429+00:00) commissioned=YES lm(t):101(2025-04-18T07:32:56.609+00:00)
registered=YES lm(t):1(2025-04-18T07:32:56.945+00:00) standby=NO lm(t):0(zeroTime) DRR=NO
lm(t):101(2025-04-18T07:32:56.609+00:00) apicX=NO lm(t):0(zeroTime) virtual=NO lm(t):0(zeroTime) oob gw
address=0.0.0.0 lm(t):0(zeroTime) oob address v6=0.0.0.0 lm(t):0(zeroTime) oob gw address v6=0.0.0.0
lm(t):0(zeroTime) active=YES
appliance id=3 address=10.0.0.3 lm(t):201(2025-04-18T12:19:40.111+00:00) tep
address=10.0.0.0/16 lm(t):3(2025-04-18T12:46:36.039+00:00) routable address=0.0.0.0 lm(t):0(zeroTime)
oob address=0.0.0.0 lm(t):0(zeroTime) version=6.0(7e) lm(t):3(2025-04-18T12:46:44.126+00:00)
chassisId=ddef615a-1c52-11f0-aa56-2cf89bb04dd0 lm(t):202(2025-04-18T12:48:45.870+00:00)
capabilities=0X17EEEEEEEE--0X2020--0X7--0X1 lm(t):3(2025-04-18T12:51:58.626+00:00)
rK=(stable,absent,0) lm(t):0(zeroTime) aK=(stable,absent,0) lm(t):0(zeroTime) oobrK=(stable,absent,0)
lm(t):0(zeroTime) oobaK=(stable,absent,0) lm(t):0(zeroTime) cntrlSbst=(APPROVED, WZxxxxxx)
lm(t):202(2025-04-18T12:48:45.870+00:00) (targetMbSn= lm(t):0(zeroTime), failoverStatus=0
lm(t):0(zeroTime)) podId=2 lm(t):201(2025-04-18T12:19:40.111+00:00) commissioned=YES lm(t):101(2025-04-
18T12:51:37.363+00:00) registered=YES lm(t):2(2025-04-18T12:51:37.368+00:00) standby=NO
lm(t):0(zeroTime) DRR=NO lm(t):101(2025-04-18T12:51:37.363+00:00) apicX=NO lm(t):0(zeroTime) virtual=NO
lm(t):0(zeroTime) oob gw address=0.0.0.0 lm(t):0(zeroTime) oob address v6=0.0.0.0 lm(t):0(zeroTime) oob
gw address v6=0.0.0.0 lm(t):0(zeroTime) active=YES
-----
clusterTime=<diff=-262 common=2025-04-18T13:01:46.378+00:00 local=2025-04-18T13:01:46.640+00:00
pF=<displForm=0 offsSt=0 offsVlu=0 lm(t):3(2025-04-18T12:51:49.791+00:00)>>
```

When the node is registered it is able to display details of the APIC nodes in the cluster.



## IP reachability to the APIC

```
leaf101# iping -V overlay-1 10.0.0.1
PING 10.0.0.1 (10.0.0.1) from 10.0.0.30: 56 data bytes
64 bytes from 10.0.0.1: icmp_seq=0 ttl=64 time=0.409 ms
64 bytes from 10.0.0.1: icmp_seq=1 ttl=64 time=0.294 ms
64 bytes from 10.0.0.1: icmp_seq=2 ttl=64 time=0.274 ms
^C
--- 10.0.0.1 ping statistics ---
3 packets transmitted, 3 packets received, 0.00% packet loss
round-trip min/avg/max = 0.274/0.325/0.409 ms
leaf101#
```

Verify ICMP connectivity to the APIC IP from the leaf node.

## Infra VLAN

```
(none)# moquery -c lldpInst
Total Objects shown: 1

# lldp.Inst
adminSt      : enabled
childAction  :
ctrl         :
dn           : sys/lldp/inst
holdTime     : 120
infraVlan    : 4093
initDelayTime : 2
lcOwn        : local
md5CACert    :
modTs        : 2025-04-13T09:46:39.414+00:00
monPolDn     : uni/fabric/monfab-default
name         :
operErr      :
optTlvSel    : mgmt-addr,port-desc,port-vlan,sys-cap,sys-desc,sys-name
rn           : inst
status       :
sysDesc      :
txFreq       : 30
```

An unregistered node is able to get the Infra VLAN details via LLDP messages. If an ACI node is located in a Pod without an APIC, the Infra VLAN check is expected to fail.

The leaf programs the infra VLAN on the ports connected to the APIC.

```
(none)# show vlan encap-id 4093

VLAN Name                Status    Ports
-----
8      infra:default         active    Eth1/2, Eth1/3

VLAN Type  Vlan-mode
-----
8      enet    CE
(none)#
```

If a node has not received an Infra VLAN on its interfaces connected to the APIC, verify if there are no wiring issues detected using the following command"

```
moquery -c lldpIf -f 'lldp.If.wiringIssues!=""'
```

## LLDP Adjacency

```
(none)# show lldp neig
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
```

```

N9K-C9372PX-E      Eth1/1      120      BR      Ethernet1/2
apic-1             Eth1/2      120              eth2-4
apic-2             Eth1/3      120              eth2-2
spine109           Eth1/49     120      BR      Eth1/31
Total entries displayed: 4
(none)#

```

Even before a node is registered in the fabric, the LLDP neighbors can be seen. This is used to validate that each node is cabled correctly.

## ACI Switch Software Version

```

(none)# show version
Cisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
Documents: http://www.cisco.com/en/US/products/ps9372/tsd_products_support_series_home.html
Copyright (c) 2002-2014, Cisco Systems, Inc. All rights reserved.
The copyrights to certain works contained in this software are
owned by other third parties and used and distributed under
license. Certain components of this software are licensed under
the GNU General Public License (GPL) version 2.0 or the GNU
Lesser General Public License (LGPL) Version 2.1. A copy of each
such license is available at
http://www.opensource.org/licenses/gpl-2.0.php and
http://www.opensource.org/licenses/lgpl-2.1.php

Software
  BIOS:          version 07.69
  kickstart:     version 16.0(7e) [build 16.0(7e)]
  system:        version 16.0(7e) [build 16.0(7e)]
  PE:            version 6.0(7e)
  BIOS compile time:      04/07/2021
  kickstart image file is: /bootflash/aci-n9000-dk9.16.0.7e.bin
  kickstart compile time: 08/14/2024 09:09:40 [08/14/2024 09:09:40]
  system image file is:   /bootflash/auto-s
  system compile time:    08/14/2024 09:09:40 [08/14/2024 09:09:40]

Hardware
  cisco N9K-C93180YC-EX ("supervisor")
  Intel(R) Xeon(R) CPU @ 1.80GHz with 24480768 kB of memory.
  Processor Board ID FDxxxxx

  Device name: none
  bootflash:      62522368 kB

Kernel uptime is 00 day(s), 00 hour(s), 55 minute(s), 21 second(s)

Last reset at 428000 usecs after Sun Apr 13 09:24:40 2025 UTC
Reason: reset-requested-by-cli-command-reload
System version: 16.0(7e)
Service: PolicyElem Ch reload

plugin
  Core Plugin, Ethernet Plugin
(none)#

```

## APIC Switch Software Version

```

apic-1# show version

```

Role	Pod	Node	Name	Version
controller	1	1	apic-1	6.0(7e)
controller	1	2	apic-2	6.0(7e)
controller	2	3	apic-3	6.0(7e)
leaf	1	101	leaf_101	n9000-16.0(7e)
leaf	1	102	leaf_102	n9000-16.0(7e)

leaf	1	103	leaf_103	n9000-16.0(7e)
spine	1	109	spine_109	n9000-16.0(7e)
leaf	2	201	leaf_201	n9000-16.0(7e)
leaf	2	202	leaf_202	n9000-16.0(7e)
leaf	2	203	leaf_203	n9000-16.0(7e)
spine	2	209	spine_209	n9000-16.0(7e)

Validate that the leaf, spines and APICs are all running the same software version.

**Note**  
Ensure the Fabric BGP AS is configured and the Spines from each Pod are designated as route-reflectors else MP-BGP L2VPN EVPN peering will not be established.

**FPGA/EPLD/BIOS**

**Note**  
The FPGA, EPLD and BIOS versions could affect the leaf node's ability to bring up the modules as expected. If these are too far out of date, the interfaces of the switch could fail to come up. Validate the running and expected versions of FPGA, EPLD, and BIOS.

```
(none)# moquery -c firmwareCardRunning
Total Objects shown: 2

# firmware.CardRunning
biosUpgSt      : upg-not-req
biosVer        : v07.69 (04/07/2021)
childAction    :
descr          :
dn             : sys/ch/supslot-1/sup/running
expectedVer    : v07.69 (04/07/2021)
interimVer     : 16.0 (7e)
internalLabel  :
modTs          : never
mode           : normal
monPolDn       : uni/fabric/monfab-default
operSt        : ok
rn             : running
srFwFlashRecVer :
srFwFlashVer   :
srFwImageVer   :
srFwRunningSrc : unknown
srFwRunningVer :
status         :
ts             : 1970-01-01T00:00:00.000+00:00
type           : switch
version        : 16.0 (7e)

# firmware.CardRunning
biosUpgSt      : upg-not-req
biosVer        : v07.69 (04/07/2021)
childAction    :
descr          :
dn             : sys/ch/lcslot-1/lc/running
expectedVer    : v07.69 (04/07/2021)
interimVer     : 16.0 (7e)
internalLabel  :
modTs          : never
mode           : normal
monPolDn       : uni/fabric/monfab-default
operSt        : ok
rn             : running
srFwFlashRecVer :
srFwFlashVer   :
srFwImageVer   :
srFwRunningSrc : unknown
srFwRunningVer :
status         :
ts             : 1970-01-01T00:00:00.000+00:00
type           : switch
version        : 16.0 (7e)
```

```
(none)# moquery -c firmwareCompRunning
Total Objects shown: 2

# firmware.CompRunning
childAction    :
descr          :
dn             : sys/ch/supslot-1/sup/fpga-1/running
epldUpgSt      : upg-not-req
expectedVer    : 0x15
internalLabel  :
modTs          : never
mode           : normal
monPolDn       : uni/fabric/monfab-default
operSt        : ok
```

```

rn          : running
status      :
ts          : 1970-01-01T00:00:00.000+00:00
type        : controller
version     : 0x15

# firmware.CompRunning
childAction :
descr       :
dn          : sys/ch/supslot-1/sup/fpga-2/running
epldUpdSt   : upg-not-req
expectedVer : 0x4
internalLabel :
modTs       : never
mode        : normal
monPolDn    : uni/fabric/monfab-default
operSt      : ok
rn          : running
status      :
ts          : 1970-01-01T00:00:00.000+00:00
type        : controller
version     : 0x4

```

## SSL

```

(none)# cd /securedata/ssl && openssl x509 -noout -subject -in server.crt
subject=serialNumber = PID:N9K-C93180YC-EX SN:FXXXXX, CN = N9K-C93180YC-EX
(none)#

```

```

(none)# cd /securedata/ssl && openssl x509 -noout -dates -in server.crt
notBefore=Aug  6 05:41:44 2019 GMT
notAfter=May 14 20:25:42 2029 GMT
(none)#

```

SSL communication is used between all fabric nodes to ensure encryption of control plane traffic. The SSL certificate used is installed during manufacturing and is generated based on the serial number of the chassis.

Ensure that the certificate is valid.

## Verify Equipment Serial Number.

```

(none)# show inventory
NAME: "Chassis",  DESCR: "Nexus C93180YC-EX Chassis"
PID: N9K-C93180YC-EX      ,  VID: V04      ,  SN: FDO2ccccc

NAME: "Slot 1 ",  DESCR: "48x10/25G      "
PID: N9K-C93180YC-EX      ,  VID: V04      ,  SN: FDO2ccccc

NAME: "GEM      ",  DESCR: "6x40/100G Switch      "
PID: N9K-C93180YC-EX      ,  VID: V04      ,  SN: FDO2ccccc

```

## Verify the status of the bootstrapping process on the leaf.

```

(none)# moquery -c pconsBootStrap
Total Objects shown: 1

# pcons.BootStrap
allLeaderAcked      : no
allPortsInService   : no
allResponsesFromLeader : yes
canBringPortInService : no
childAction          :
completedPolRes      : no

```

```
dn : rescont/bootstrap
lcOwn : local
modTs : 2025-04-13T10:33:29.920+00:00
policySyncNodeBringup : yes
rn : bootstrap
state : completed
status :
timerTicks : 257
try : 0
worstCaseTaskTry : 0
```

The bootstrap process is when the leaf is downloading initial configuration from the APIC.

Verify the date and time and ensure that there is a small delta between the APIC and switch time.

```
apic-1# date
Sun Apr 13 10:30:53 UTC 2025
apic-1#
```

Verify that the equipment modules are online, powered up and operating at normal thresholds.

```
(none)# show module

Mod  Ports  Module-Type                Model                Status
---  ---
1    54      48x10/25G+6x40/100G Switch  N9K-C93180YC-EX      ok

Mod  Sw          Hw
---  ---
1    16.0 (7e)    1.0

Mod  MAC-Address(es)                Serial-Num
---  ---
1    00-a6-ca-09-e5-df to 00-a6-ca-09-e6-28  Fhxxxxxxx

Mod  Online Diag Status
---  ---
1    pass
```

```
(none)# show environment
Power Supply:
Voltage: 12.0 Volts

Power      Actual      Total
Supply     Model      Output     Capacity   Status
-----
1          NXA-PAC-650W-PI      N/A W      650 W      ok
2          NXA-PAC-650W-PI      N/A W      650 W      shut

Module     Model      Actual      Power
           Model      Draw       Allocated  Status
           Model      (Watts )   (Watts )
-----
1          N9K-C93180YC-EX      0 W        492 W      Powered-Up
fan1       NXA-FAN-30CFM-B      N/A        N/A        Powered-Up
fan2       NXA-FAN-30CFM-B      N/A        N/A        Powered-Up
fan3       NXA-FAN-30CFM-B      N/A        N/A        Powered-Up
fan4       NXA-FAN-30CFM-B      N/A        N/A        Powered-Up
```

N/A - Per module power not available

Power Usage Summary:

```
-----
Power Supply redundancy mode (configured)           Non-Redundant (combined)
Power Supply redundancy mode (operational)          Non-Redundant (combined)

Total Power Capacity (based on configured mode)      650 W
Total Power of all Inputs (cumulative)               650 W
Total Power Output (actual draw)                    0 W
Total Power Allocated (budget)                      N/A
Total Power Available for additional modules         N/A
```

Fan:

```
-----
Fan           Model           Hw           Status
-----
Fan1(sys_fan1) NXA-FAN-30CFM-B    --          ok
Fan2(sys_fan2) NXA-FAN-30CFM-B    --          ok
Fan3(sys_fan3) NXA-FAN-30CFM-B    --          ok
Fan4(sys_fan4) NXA-FAN-30CFM-B    --          ok
Fan_in_PS1     --              --          ok
Fan_in_PS2     --              --          unknown
Fan Speed: Zone 1: 0x0
Fan Air Filter : Absent
```

Temperature:

```
-----
Module  Sensor                MajorThresh  MinorThres  CurTemp  Status
              (Celsius)      (Celsius)   (Celsius)
-----
1      Inlet(1)                70          42         N/A      normal
1      outlet(2)              80          70         N/A      normal
1      x86 processor(3)       90          80         N/A      normal
1      Sugarbowl(4)          110         90         N/A      normal
1      Sugarbowl vrm(5)       120        110         N/A      normal
(none)#
```

**Verify that the APIC is sending LLDP TLVs matching the parameters set in the setup script.**

```
apic-1# acidiag run lldptool out eth2-1
Chassis ID TLV
  MAC: 2c:f8:9b:b0:65:70
Port ID TLV
  MAC: 2c:f8:9b:b0:65:70
Time to Live TLV
  120
Port Description TLV
  eth2-1
System Name TLV
  apic-1
System Description TLV
  topology/pod-1/node-1
Management Address TLV
  IPv4: 10.0.0.1
  Ifindex: 2
Cisco Port State TLV
  1
Cisco Node Role TLV
  0
Cisco Node ID TLV
  1
Cisco POD ID TLV
  1
Cisco Fabric Name TLV
  ACI-FABRIC
Cisco Appliance Vector TLV
```

```
Id: 1
IPv4: 10.0.0.1
UUID: 72480098-
Cisco Node IP TLV
IPv4:10.0.0.1
Cisco Port Role TLV
1
Cisco Infra VLAN TLV
4093
Cisco Serial Number TLV
WZxxxxxxx
Cisco Authentication Cookie TLV
988001963
Cisco Standby APIC TLV
0
End of LLDPDU TLV
```

**Verify that the APIC is receiving LLDP TLVs from the directly connected leaf node.**

```
apic-1# acidiag run lldptool in eth2-1
Chassis ID TLV
MAC: 10:b3:d6:a4:7e:b2
Port ID TLV
Local: Eth1/2
Time to Live TLV
120
Port Description TLV
topology/pod-1/paths-101/pathep-[eth1/2]
System Name TLV
leaf101
System Description TLV
topology/pod-1/node-101
System Capabilities TLV
System capabilities: Bridge, Router
Enabled capabilities: Bridge, Router
Management Address TLV
MAC: 10:b3:d6:a4:7e:b2
Ifindex: 83886080
Cisco 4-wire Power-via-MDI TLV
4-Pair PoE supported
Spare pair Detection/Classification not required
PD Spare pair Desired State: Disabled
PSE Spare pair Operational State: Disabled
Cisco Port Role TLV
4
Cisco Port Mode TLV
0
Cisco Port State TLV
1
Cisco Serial Number TLV
FDO233201DV
Cisco Model TLV
N9K-C93180YC-EX
Cisco Node Role TLV
1
Cisco Firmware Version TLV
n9000-16.0(7e)
Cisco Infra VLAN TLV
4093
Cisco Name TLV
leaf101
Cisco Fabric Name TLV
ACI-FABRIC
Cisco Node IP TLV
IPv4:10.0.176.64
Cisco Node ID TLV
```



```

    101
Cisco POD ID TLV
    1
Cisco Appliance Vector TLV
    Id: 1
    IPv4: 10.0.0.1
    UUID: 72480098-184b
    Id: 2
    IPv4: 10.0.0.2
    UUID: a0466b6a-184b
LLDP-MED Capabilities TLV
    Device Type: netcon
    Capabilities: LLDP-MED, Network Policy, Extended Power via MDI-PSE
LLDP-MED Network Policy TLV
    01400000
End of LLDPDU TLV

```

## Validate the APIC cluster

```

apic-1# acidiag cluster
admin password:

Running...

Checking Wiring and UUID: OK
Checking AD Processes: Running
Checking All Apics in Commission State: OK
Checking All Apics in Active State: OK
Checking Fabric Nodes: OK
Checking Apic Fully-Fit: OK
Checking Shard Convergence: OK
Checking Leadership Degration: Optimal leader for all shards
Ping OOB IPs:
APIC-1: 10.66.55.109 - OK
APIC-2: 10.66.55.111 - OK
APIC-3: 10.66.55.113 - OK
Ping Infra IPs:
APIC-1: 10.0.0.1 - OK
APIC-2: 10.0.0.2 - OK
APIC-3: 10.0.0.3 - OK
Checking APIC Versions: Same (6.0(7e))
Checking SSL: OK
Full file system(s): None

Done!

```

## Validate if all settings match across all APICs.

```

pic-1# avread
Cluster:
-----
operSize          3
clusterSize       3
fabricDomainName  ACI-FABRIC
version           6.0(7e)
discoveryMode     PERMISSIVE
drrMode           OFF
kafkaMode         ON
autoUpgradeMode   OFF

APICs:
-----

```

	APIC 1	APIC 2	APIC 3
version	6.0(7e)	6.0(7e)	6.0(7e)
address	10.0.0.1	10.0.0.2	10.0.0.3
oobAddress	10.66.55.109/27	10.66.55.111/27	10.66.55.113/27
oobAddressV6	fc00::1/7	::	::

routableAddress	0.0.0.0	0.0.0.0	0.0.0.0
tepAddress	10.0.0.0/16	10.0.0.0/16	10.0.0.0/16
podId	1	1	2
chassisId	074f7d6f--9bb06570	4768bab6--1b8b68ef	ddef615a--9bb04dd0
cntrlSbst_serial	(APPROVED,WZxxxxxxxxc)	(APPROVED,WZxxxxxxxxx)	(APPROVED,WZccxxxxxxxxx)
active	YES	YES	YES
flags	cra-	cra-	cra-
health	255	255	255
apic-1#			

```
(none)# show discoveryissues
=====
Check 1 Platform Type
=====
Test01 Retrieving Node Role                                     PASSED
    [Info] Current node role: LEAF
    [Info] Please check CH09 DHCP status section for configured node role
=====
Check 2 FPGA/BIOS in sync test
=====
Test01 FPGA version check                                     PASSED
    [Info] No issues found for FPGA versions
Test02 BIOS version check                                     PASSED
    [Info] No issues found for BIOS versions
=====
Check 3 HW Modules Check
=====
Test01 Fans status check                                     PASSED
    [Info] All fans status is ok
Test02 Power Supply status check                             PASSED
    [Info] All PSUs status is ok
Test03 Fan Tray status check                                 PASSED
    [Info] All FanTrays status is ok
Test04 Line Card status check                                PASSED
    [Info] All LineCard status is ok
=====
Check 4 Node Version
=====
Test01 Check Current Version                                 PASSED
    [Info] Node current running version is : n9000-16.0(7e)
=====
Check 5 System State
=====
Test01 Check System State                                    FAILED
    [Warn] Top System State is : out-of-service
    [Info] Node upgrade is in notscheduled state
=====
Check 6 Updated LLDP Adjacencies
=====
Port: eth1/1
    Test02 Adjacency Check                                     PASSED
        [Warn] Adjacency detected with Non-ACI node on port:eth1/1
Port: eth1/49
    Test02 Wiring Issues Check                                 PASSED
        [Info] No Wiring Issues detected
    Test03 Port Types Check                                    PASSED
        [Info] No issues with port type, type is:fab
    Test04 Port Mode Check                                     PASSED
        [Info] No issues with port mode, type is:routed
    Test02 Adjacency Check                                     PASSED
        [Info] Adjacency detected with spine
Port: eth1/2
    Test02 Wiring Issues Check                                 PASSED
        [Info] No Wiring Issues detected
    Test03 Port Types Check                                    PASSED
        [Info] No issues with port type, type is:leaf
    Test04 Port Mode Check                                     PASSED
```

```

        [Info] No issues with port mode, type is:trunk
Test02 Adjacency Check                                     PASSED
        [Info] Adjacency detected with APIC
Port: eth1/3
Test02 Wiring Issues Check                                 PASSED
        [Info] No Wiring Issues detected
Test03 Port Types Check                                    PASSED
        [Info] No issues with port type, type is:leaf
Test04 Port Mode Check                                    PASSED
        [Info] No issues with port mode, type is:trunk
Test02 Adjacency Check                                    PASSED
        [Info] Adjacency detected with APIC
=====
Check 7 BootStrap Status
=====
Test01 Check Bootstrap/L3Out config download              FAILED
        [Warn] Bootstrap/L3OutConfig URL not found
        [Info] Ignore this if this node is not an IPN attached device
=====
Check 8 Infra VLAN Check
=====
Test01 Check if infra VLAN is received                    PASSED
        [Info] Infra VLAN received is : 4093
Test02 Check if infra VLAN is deployed                    PASSED
        [Info] Infra VLAN deployed successfully
=====
Check 9 DHCP Status
=====
Test01 Check Node Id                                     FAILED
        [Error] Valid Node Id not received via DHCP response
Test02 Check Node Name                                    FAILED
        [Error] Valid Node name not revevied via DHCP
Test03 Check TEP IP                                      FAILED
        [Error] Valid TEP IP not revevied via DHCP
Test04 Check Configured Node Role                         FAILED
        [Error] Valid Node Role not received via DHCP response
Test05 DHCP Msg Stats                                    FAILED
        [Info] Total DHCP discover sent by switch : 629

        [Error] Cannot retriive DHCP offer stats
        [Error] Cannot retriive DHCP request stats
        [Error] Cannot retriive DHCP ACK stats
        [Fatal-Error] Please check DHCP issues...Aborting command execution
(none)#

```

```

leaf101# show discoveryissues
=====
Check 1 Platform Type
=====
Test01 Retrieving Node Role                               PASSED
        [Info] Current node role: LEAF
        [Info] Please check CH09 DHCP status section for configured node role
=====
Check 2 FPGA/BIOS in sync test
=====
Test01 FPGA version check                                 PASSED
        [Info] No issues found for FPGA versions
Test02 BIOS version check                                 PASSED
        [Info] No issues found for BIOS versions
=====
Check 3 HW Modules Check
=====
Test01 Fans status check                                  PASSED
        [Info] All fans status is ok
Test02 Power Supply status check                          PASSED
        [Info] All PSUs status is ok

```

```

Test03 Fan Tray status check                                     PASSED
    [Info] All FanTrays status is ok
Test04 Line Card status check                                   PASSED
    [Info] All LineCard status is ok
=====
Check 4 Node Version
=====
Test01 Check Current Version                                   PASSED
    [Info] Node current running version is : n9000-16.0(7e)
=====
Check 5 System State
=====
Test01 Check System State                                     PASSED
    [Info] TopSystem State is : in-service
=====
Check 6 Updated LLDP Adjacencies
=====
Port: eth1/49
    Test02 Wiring Issues Check                                 PASSED
        [Info] No Wiring Issues detected
    Test03 Port Types Check                                   PASSED
        [Info] No issues with port type, type is:fab
    Test04 Port Mode Check                                    PASSED
        [Info] No issues with port mode, type is:routed
    Test02 Adjacency Check                                    PASSED
        [Info] Adjacency detected with spine
Port: eth1/2
    Test02 Wiring Issues Check                                 PASSED
        [Info] No Wiring Issues detected
    Test03 Port Types Check                                   PASSED
        [Info] No issues with port type, type is:leaf
    Test04 Port Mode Check                                    PASSED
        [Info] No issues with port mode, type is:trunk
    Test02 Adjacency Check                                    PASSED
        [Info] Adjacency detected with APIC
Port: eth1/3
    Test02 Wiring Issues Check                                 PASSED
        [Info] No Wiring Issues detected
    Test03 Port Types Check                                   PASSED
        [Info] No issues with port type, type is:leaf
    Test04 Port Mode Check                                    PASSED
        [Info] No issues with port mode, type is:trunk
    Test02 Adjacency Check                                    PASSED
        [Info] Adjacency detected with APIC
Port: eth1/1
    Test02 Adjacency Check                                    PASSED
        [Warn] Adjacency detected with Non-ACI node on port:eth1/1
=====
Check 7 BootStrap Status
=====
Test01 Check Bootstrap/L3Out config download                 FAILED
    [Warn] BootStrap/L3OutConfig URL not found
    [Info] Ignore this if this node is not an IPN attached device
=====
Check 8 Infra VLAN Check
=====
Test01 Check if infra VLAN is received                       PASSED
    [Info] Infra VLAN received is : 4093
Test02 Check if infra VLAN is deployed                       PASSED
    [Info] Infra VLAN deployed successfully
=====
Check 9 DHCP Status
=====
Test01 Check Node Id                                         PASSED
    [Info] Node Id received is : 101
Test02 Check Node Name                                       PASSED
    [Info] Node name received is : leaf101
Test03 Check TEP IP                                          PASSED
    [Info] TEP IP received is : 10.0.176.64

```

```

Test04 Check Configured Node Role                                     PASSED
    [Info] Configured Node Role received is : LEAF
=====
Check 10 IS-IS Adj Info
=====
Test01 check IS-IS adjacencies                                     PASSED
    [Info] IS-IS adjacencies found on interfaces:
    [Info] eth1/49.7
=====
Check 11 Reachability to APIC
=====
Test01 Ping check to APIC                                         PASSED
    [Info] Ping to APIC IP 10.0.0.1 from 10.0.176.64 successful
=====
Check 12 BootScript Status
=====
Test01 Check BootScript download                                  PASSED
    [Info] BootScript successfully downloaded at 2025-04-13T10:02:32.986+00:00 from URL
    http://10.0.0.1:7777/fwrepo/boot/node-FD0233201DV
=====
Check 13 SSL Check
=====
Test01 Check SSL certificate validity                             PASSED
    [Info] SSL certificate validation successful
=====
Check 14 AV Details
=====
Test01 Check AV details                                          PASSED
    [Info] AppId: 1 address: 10.0.0.1 registered: YES version: 6.0(7e)
    [Info] AppId: 2 address: 10.0.0.2 registered: YES version: 6.0(7e)
=====
Check 15 Policy Download
=====
Test01 Policy download status                                    PASSED
    [Info] Registration to all shards complete
    [Info] Policy download is complete
    [Info] PconsBootStrap MO in complete state
=====
Check 16 Version Check
=====
Test01 Check Switch and APIC Version                             PASSED
    [Info] Switch running version is : n9000-16.0(7e)
    [Info] APIC running version is : 6.0(7e)
leaf101#

```

## References:

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