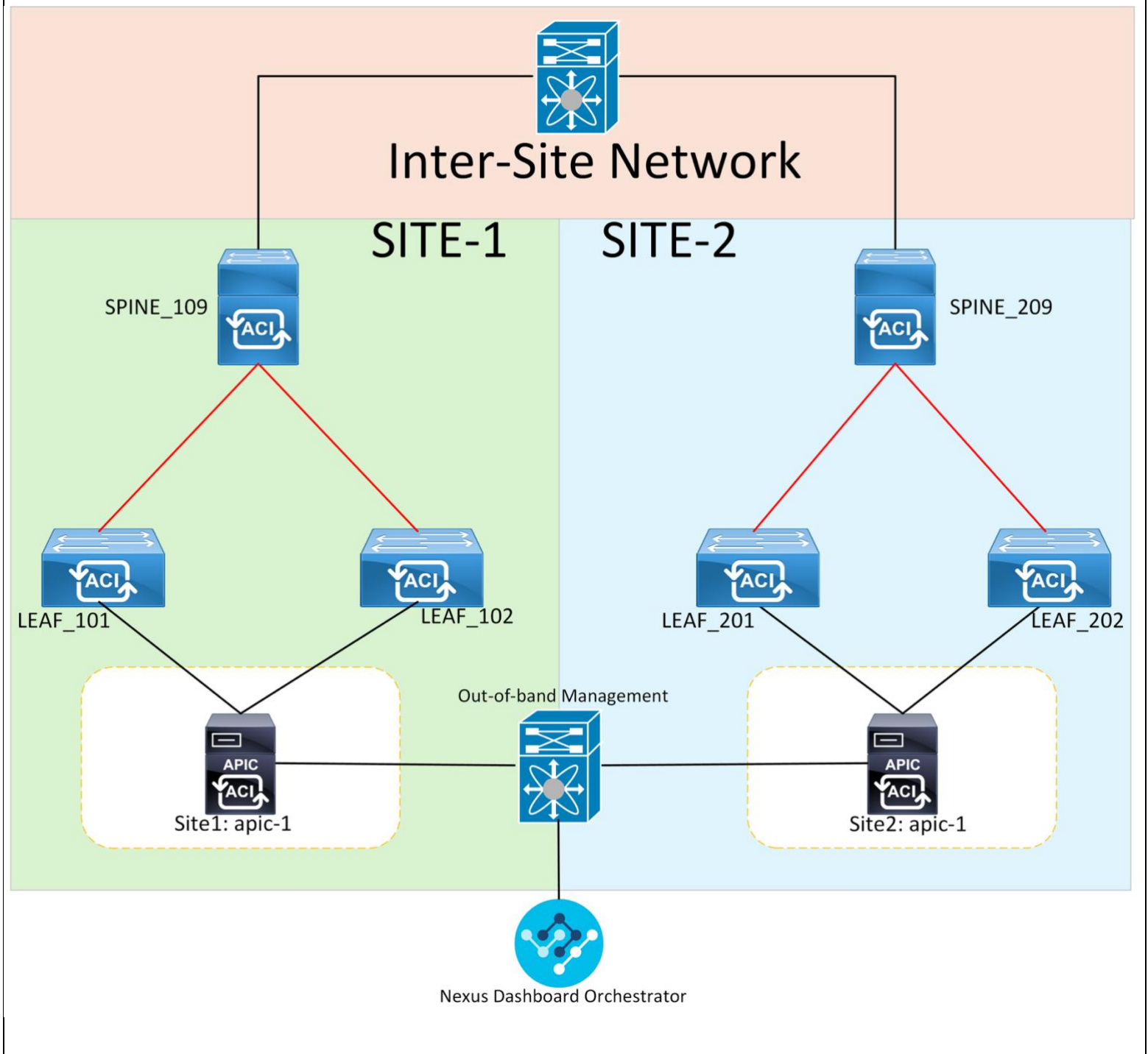




Cisco ACI Multi-Site Configuration

(<https://www.linkedin.com/in/titus-majeza/>)



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.



Introduction

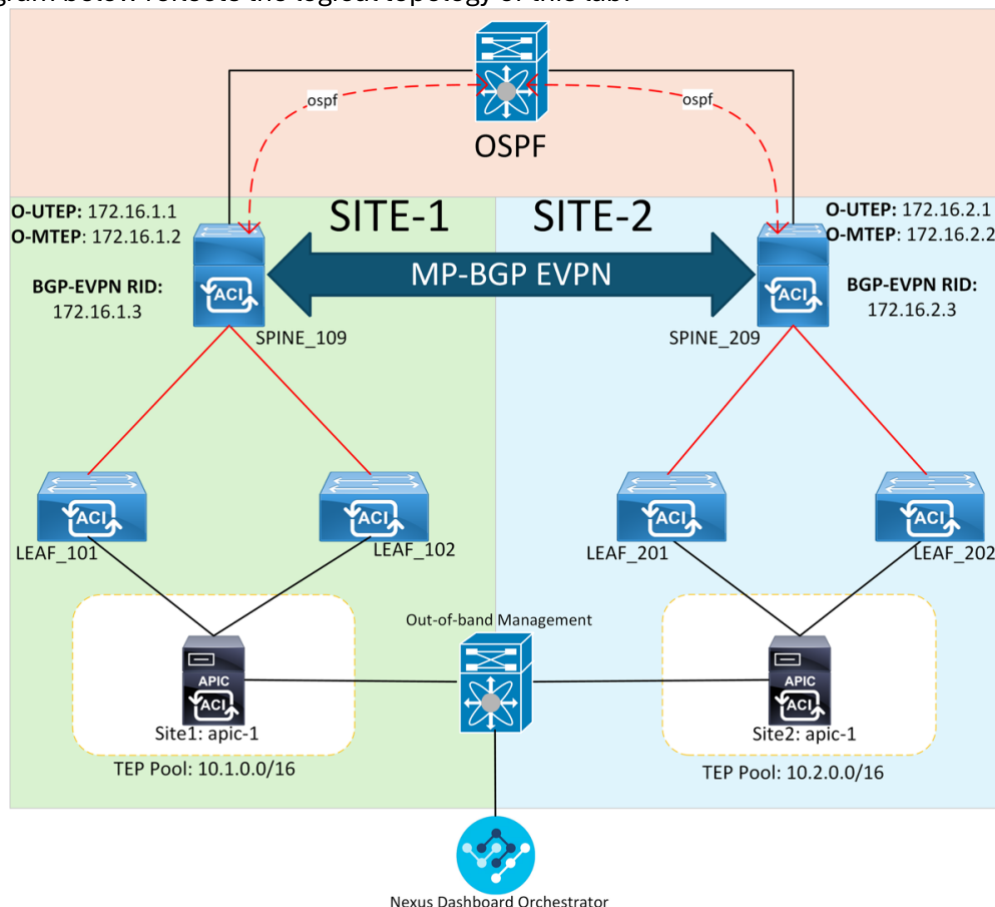
Cisco ACI Multi-Site is a robust solution for building scalable, distributed data centers. In this architecture, each site runs as an independent ACI fabric managed by its own APIC cluster. To unify management and policy control across all sites, Cisco introduces the Nexus Dashboard Orchestrator (NDO). Acting as a centralized policy engine, the NDO provides a single point of visibility and configuration, enabling seamless application deployment and consistent policy enforcement across multiple locations.

Communication between the NDO and each APIC cluster occurs over the out-of-band management network. For inter-site data communication, a Layer 3 Inter-Site Network (ISN) is used. This ISN acts as a routed backbone connecting the ACI fabrics, enabling endpoint reachability across sites.

As part of the fabric integration with the ISN, spine switches at each site peer with the ISN using OSPF. This dynamic routing setup allows the spines to exchange reachability information with the external ISN routers. Once basic connectivity is established, MP-BGP EVPN is used to extend the overlay control plane between sites. Through MP-BGP EVPN peering over the ISN, the sites exchange endpoint information (such as MAC and IP) to ensure seamless Layer 2 and Layer 3 connectivity across the entire Multi-Site fabric.

This lab provides a guide on the full bring-up process of a Cisco ACI Multi-Site deployment—from onboarding fabrics into the NDO, to configuring the ISN and establishing OSPF and MP-BGP EVPN peering across the sites.

The diagram below reflects the logical topology of this lab.



ACI Fabrics Parameters Verification

Ensure that each site is configured with its respective BGP autonomous system (AS) number and the spine is selected as the route-reflector node for that site.

On the APIC GUI, **Navigate to System >> System Settings >> BGP Route Reflector:**

The screenshot shows the APIC GUI with the 'System Settings' menu on the left and the 'BGP Route Reflector Policy - BGP Route Reflector' configuration page on the right. The 'Properties' section includes fields for Name (default), Description (optional), Autonomous System Number (65001), and Domain ID Base (0). Below these is a table for Route Reflector Nodes.

Pod ID	Node ID	Node Name	Description
1	109	Spine109	

Ensure that the BGP Route Reflector policy is applied to the Pod Policy Group

On the APIC GUI, navigate to **Fabric >> Fabric Policies >> Pods >> Click on the Pod Policy Group** and verify that the BGP Route Reflector Policy is attached or associated to the Pod Policy group.

Ensure that the following are in place on the individual fabrics:

- VLAN Pool with VLAN 4
- External Routed Domain
- AAEP
- Interface Policy Group that is associated to the Spine Interfaces connecting to the ISN device(s)

Add ACI Fabrics to the Nexus Dashboard

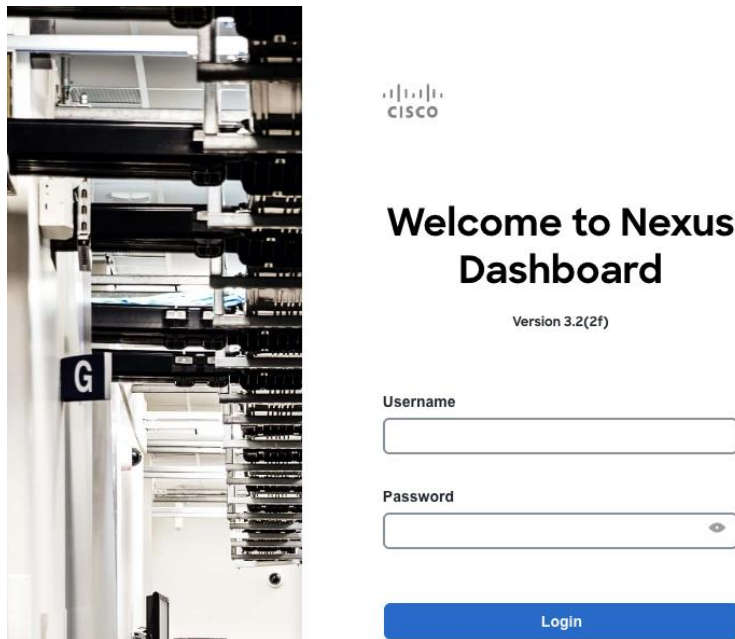
Before ACI fabrics can be managed in any way by the Nexus Dashboard Orchestrator, they need to be added to the Nexus Dashboard platform. The Cisco Nexus Dashboard is a central management console for multiple data center sites and a common platform for hosting Cisco data center applications, such as the Nexus Dashboard Orchestrator, Nexus Dashboard Insights and the Nexus Dashboard Fabric Controller.



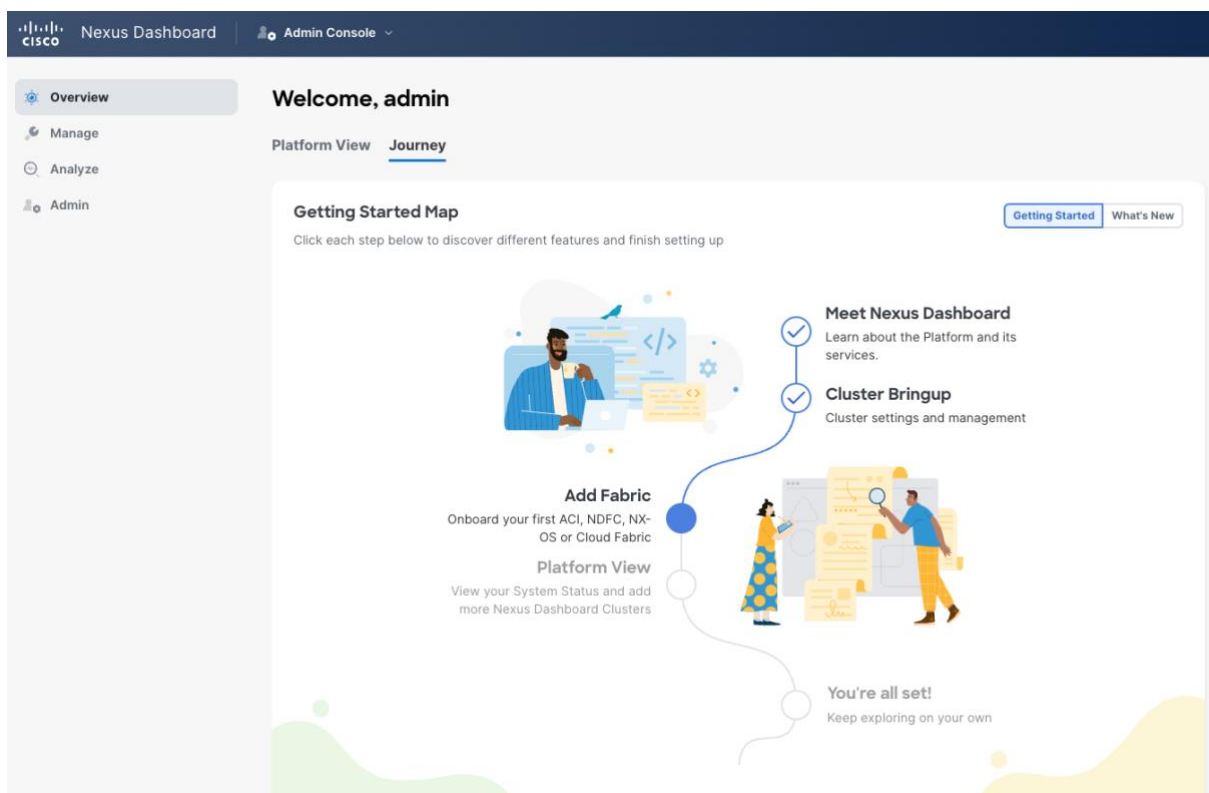
Although multiple services can be deployed on top of the Nexus Dashboard platform, this lab only focuses on the Orchestrator service. This lab does not show the initial deployment to bring up a Nexus Dashboard cluster. The Nexus Dashboard is already in place, ready to have ACI fabrics to be onboarded.

The steps below show how to add Cisco ACI fabrics to the Nexus Dashboard.

Login to the Nexus Dashboard.



The image shows the login page of the Nexus Dashboard. On the left is a vertical photograph of a server rack. The main content area has the Cisco logo at the top, followed by the heading "Welcome to Nexus Dashboard" and "Version 3.2(2f)". Below this are two input fields: "Username" and "Password". The "Password" field has an eye icon to toggle visibility. At the bottom is a blue "Login" button.

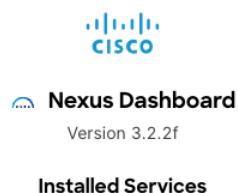
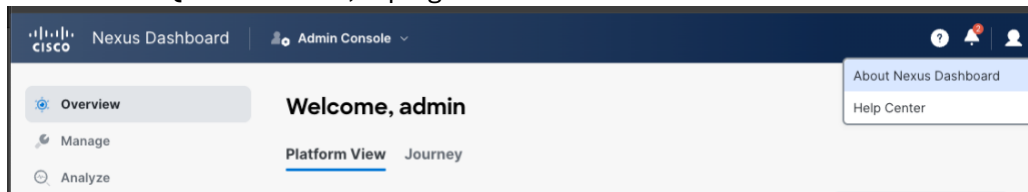


The image shows the "Overview" page of the Nexus Dashboard. The top navigation bar includes the Cisco logo, "Nexus Dashboard", and "Admin Console". A left sidebar contains links for Overview, Manage, Analyze, and Admin. The main content area is titled "Welcome, admin" and has tabs for "Platform View" and "Journey". The "Journey" tab is active, showing a "Getting Started Map". This map is a vertical timeline with four steps: 1. "Add Fabric" (Onboard your first ACI, NDFC, NX-OS or Cloud Fabric), 2. "Platform View" (View your System Status and add more Nexus Dashboard Clusters), 3. "Cluster Bringup" (Cluster settings and management), and 4. "Meet Nexus Dashboard" (Learn about the Platform and its services). The first step is highlighted with a blue circle. At the bottom right of the map is a button labeled "Getting Started" and a link "What's New".



Verify the Nexus Dashboard Software Version and Installed Services.

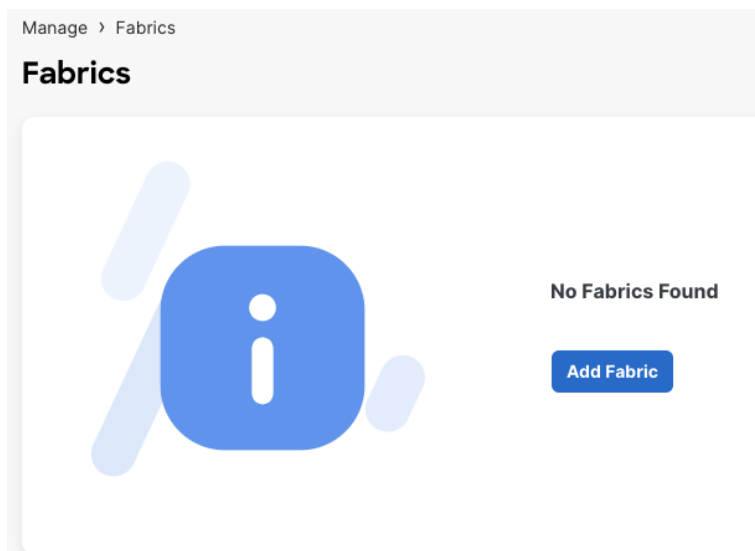
Click on the Question Mark, top right screen and Click on About Nexus Dashboard



Start to onboard the ACI fabrics:

Navigate to **Manage >> Fabrics**

Initially, there are no Fabrics added.



To onboard an ACI fabric, the mandatory fields required are:

1. The Hostname/IP address of the site's APIC mgmt address
2. Login credentials (Username & Password) for that specific ACI fabric

Click on "Add Fabric".



Add Fabric

You can add a controller or a group of NX-OS Switches to be part of a fabric.

[What is a Fabric?](#) | [How to prepare your ACI and NX-OS Switches for Nexus Dashboard](#)

1 Add Fabric

2 Details

3 Summary

Add Fabric

Add your fabric's host name/IP and login information below to fetch your fabric and add it to Nexus Dashboard.

Hostname/IP Address *

Username *

Password *

Login Domain ⓘ

☐ Use Proxy

☐ Validate Peer certificate

Security Domains

Name

[+ Add Security Domains](#)

Enter the desired name of your ACI Site and its respective location.

You can add a controller or a group of NX-OS Switches to be part of a fabric.

[What is a Fabric?](#) | [How to prepare your ACI and NX-OS Switches for Nexus Dashboard](#)

✓ Add Fabric

2 Details

3 Summary

Details

Now add a name and location to identify each fabric on Nexus Dashboard.

	Controller Address .16	Fabric Name ACI Fabric1	Type ACI	Spine Switches 1	Leaf Switches 3
---	---------------------------	----------------------------	-------------	---------------------	--------------------

Name *

Location *

[See on map](#)

It is evident that Nexus dashboard already has visibility to the site's inventory (number of spine switches and leaf switches shown).

The Summary tab shows the information that has been entered to on-board an ACI fabric. This tab gives the administrator the opportunity to perform final verifications before saving the configuration.




✓ Add Fabric

✓ Details

3 Summary

Summary



Controller Address
1.16

Fabric Name
ACI Fabric 1

Type
ACI

Spine Switches
1

Leaf Switches
3


Details

Name
Berlin-Site

Location
Berlin, 16, Germany

Click Save.

The fabric is successfully added.



All done!

The fabric has successfully been added to Nexus Dashboard. We started collecting the data and performing analysis on this fabric, this will take some time.

View Fabric Berlin-Site

Manage > Fabrics > Berlin-Site


Berlin-Site

General

Controllers

Berlin, 16, Germany

ACI



General

Type
ACI

Fabric Connectivity to Nexus Dashboard
↑ Up

Software Version
6.0(9d)

Onboarding Time
Tuesday, May 6, 07:54 AM

Inventory

Leafs
3

Spines
1

Controllers
1

The “Controllers” tab gives information regarding the controllers management IP address, hardware serial number and the Software version running on the APIC.

General

Controllers

Management IP Address (OOB)	Serial Number	Inband IP Address	Version	State
1.16		0.0.0.0	6.0(9d)	↑ Up



Add the second fabric to the Nexus Dashboard using the same steps outline above.

✓ Add Fabric

2 Details

3 Summary

Details

Now add a name and location to identify each fabric on Nexus Dashboard.

Controller Address

.17

Fabric Name

ACI Fabric1

Type

ACI

Spine Switches

1

Leaf Switches

3

Name

Budapest-Site

Location

Budapest, 05, Hungary

See on map

All done!

The fabric has successfully been added to Nexus Dashboard. We started collecting the data and performing analysis on this fabric, this will take some time.

View Fabric Budapest-Site

Verify that the “Fabric Connectivity to Nexus Dashboard” is “Up”.

Budapest-Site

General

Controllers

Budapest, 05, Hungary

ACI

General

Type

ACI

Fabric Connectivity to Nexus Dashboard

↑ Up

Software Version

6.0(8f)

Onboarding Time

Tuesday, May 6, 08:49 PM

Inventory

Leafs

3

Spines

1

Controllers

1

Click on Controller to verify the Serial Numbers of the APIC controller in the respective onboarded site.

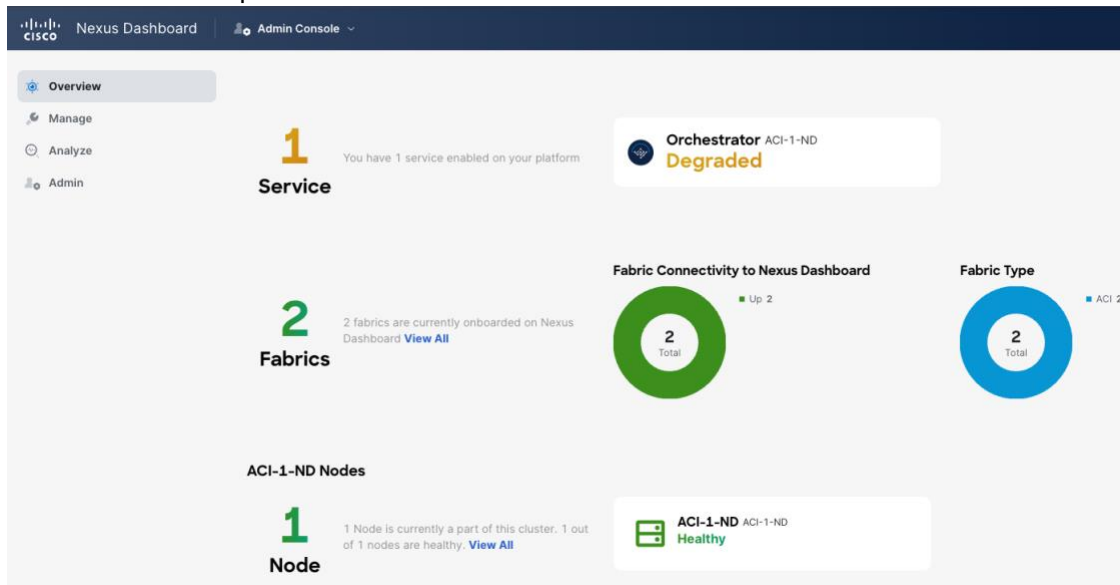
Budapest-Site

General

Controllers

Management IP Address (OOB)	Serial Number	Inband IP Address	Version	State
.17		0.0.0.0	6.0(8f)	↑ Up

Navigate to the “Overview” tab to view the summary of the Nexus Dashboard Platform Health, the number and types of Fabrics onboarded. In this lab, 2 ACI fabrics are onboarded on the Nexus Dashboard platform.



Navigate to **Manage >> Fabrics** to view the onboarded ACI fabrics, their Health Score, Fabric Type, Connectivity status and firmware versions running on the APICs of the 2 fabrics. These verifications showcase how the Nexus Dashboards is a single pane of glass providing visibility across different fabrics.

The screenshot shows the 'Manage > Fabrics' screen. It features a 'Filter by attributes' search bar and an 'Add Fabric' button. Below is a table listing the onboarded fabrics:

Health Score	Name	Type	Connectivity Status	Firmware Version	Enabled Services
Healthy	Budapest-Site	ACI	Up	6.0(9d)	0
Healthy	Berlin-Site	ACI	Up	6.0(9d)	0

Add and Manage ACI Fabrics on the Nexus Dashboard Orchestrator

After the successful onboarding of the Cisco ACI fabrics on the Nexus Dashboard, the ACI Fabrics will be added to the Nexus Dashboard Orchestrator. The Cisco Nexus Dashboard Orchestrator (NDO) is a tool/service that runs on top of a Cisco Nexus Dashboard cluster. The main function of Cisco NDO is to configure, orchestrate, and monitor multiple data center sites with a common configuration. Cisco NDO enables you to provision, monitor the health status, and manage the full lifecycle of Cisco ACI networking policies and stretched tenant policies across Cisco ACI sites. These policies can be pushed to the different Cisco APIC domains for rendering them on the physical switches building those fabric.



Adding fabrics to NDO is a crucial step as it enables infrastructure configuration that will enable the Spines to form the OSPF peering with the ISN. Furthermore, additional configuration will be put in place to enable Fabric-to-Fabric connectivity.

Click on drop-down next to “Admin Console” to move on to Nexus Dashboard Orchestrator (NDO).

Navigate to Manage >> Fabrics

The ACI sites that were added to the ND platform are shown however their initial state is “Unmanaged” which means that the fabrics are still not under the Orchestrator’s administration domain.

Controller Connectivity	Name	Type	State	Version
OK	Berlin-Site	ACI	Unmanaged	6.0(9d)
OK	Budapest-Site	ACI	Unmanaged	6.0(8f)

Click on the State drop down-menu to change the fabric state to “Managed”.

Controller Connectivity	Name	Type	State	Version
OK	Berlin-Site	ACI	Unmanaged	6.0(9d)
OK	Budapest-Site	ACI	Managed	6.0(9d)

A Fabric ID will be required for the Orchestrator to manage the fabric.

Enter Fabric 1 for the “Berlin” site.

Managed Configuration
Fabric ID *

Fabric Id value must be in range 1-255

Add

Managed Configuration
Fabric ID *

Add

After adding the Fabric ID, the fabric’s State changes to “Managed”.



Fabrics

Filter by attributes

Controller Connectivity	Name	Type	State	Version
OK	Berlin-Site Fabric ID: 1	ACI	Managed	6.0(9d)
OK	Budapest-Site	ACI	Unmanaged	6.0(8f)

Managed
 Unmanaged

Repeat the same procedure for the second ACI fabric, to get both fabrics to be Managed by the orchestrator.

ACI fabrics are now in Managed State as required.

Fabrics

Filter by attributes

Controller Connectivity	Name	Type	State	Version
OK	Berlin-Site Fabric ID: 1	ACI	Managed	6.0(9d)
OK	Budapest-Site Fabric ID: 2	ACI	Managed	6.0(9d)

Fabric to Fabric Connectivity Configuration

Site to Site connectivity is established through the Inter-Site network. To establish this communication between the 2 ACI fabrics/sites, each Site is required to have an OSPF peering with the Inter-Site Network (ISN) and an MP-BGP EVPN peering between the spines of the two sites. The ISN can be a generic Layer 3 infrastructure that interconnects different sites in the Cisco ACI Multi-Site solution.

Spines are connected to the ISN device(s) using point-to-point subinterfaces with a fixed VLAN 4. Sub-interfaces are configured on the spine interfaces and ISN interfaces.

Routing information between sites is made possible using the following components:

1. BGP-EVPN Router ID (EVPN-RID)

This is a unique address defined on each spine node in a Cisco ACI fabric, which is used for MP-BGP EVPN adjacencies between the spines in different sites.

2. Overlay Unicast TEP (O-UTEP)

This is a common anycast address that is shared by all spine nodes in a pod at the same site. The O-UTEP identifies the site and the pod. It is used to source and receive unicast VXLAN data-plane-traffic.

NB: O-UTEP is assigned per pod in each site.



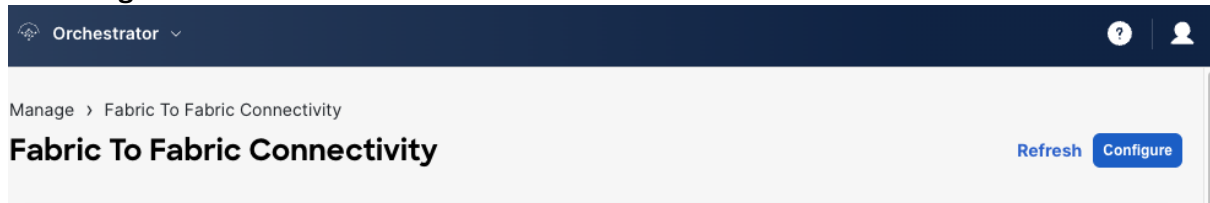
3. Overlay Multicast TEP (O-MTEP)

This is a common anycast address that is shared by all spine nodes in the same site and is used to perform headend replication for BUM (Broadcast, Unknown Unicast and Multicast traffic).

NB: O-MTEP is assigned per site, despite the number of pods.

Inter-Fabric Connectivity:

On the Nexus Dashboard Orchestrator, navigate to **Manage >> Fabric to Fabric Connectivity >> Configure**



The initial “Configure” page shows the BGP default settings.

A screenshot of the 'Configure' page for Fabric To Fabric Connectivity. The breadcrumb trail is 'Manage > Fabric To Fabric Connectivity > Configure'. The page title is 'Configure'. There are two tabs: 'General Settings' (selected) and 'Fabrics'. Under 'General Settings', there is a sub-section 'Control Plane Configuration'. The BGP settings are as follows: BGP Peering Type is set to 'full-mesh' in a dropdown menu; Keep-Alive Interval (Seconds) is 60; Hold Interval (Seconds) is 180; Stale Interval (Seconds) is 300; Graceful Restart is enabled (toggle switch is on); Maximum AS Limit is 0; and BGP TTL Between Peers is 16.

Click on Fabrics:

Both fabrics are ready for Interface-fabric Connectivity.



Manage > [Fabric To Fabric Connectivity](#) > Configure

Configure

Refresh [Audit Logs](#) [Deploy](#)

General Settings [Fabrics](#)

✓ Berlin-Site

✓ Budapest-Site

✓ Fabric ready for Inter-fabric connectivity.

● Fabric Berlin-Site

Refresh [Edit Fabric Config](#)

✓ Fabric-to-Fabric Connectivity Success

Healthy Level warning

Pod pod-1

Spine109

BGP peering off

✓ Berlin-Site

✓ Budapest-Site

✓ Fabric ready for Inter-fabric connectivity.

● Fabric Budapest-Site

Refresh [Edit Fabric Config](#)

✓ Fabric-to-Fabric Connectivity Success

Healthy Level warning

Pod pod-1

Spine209

BGP peering off

On each site, Click Edit Fabric Config and enter the respective details for each site:

Berlin-Site	Budapest-Site
Multi-Fabric : <input checked="" type="checkbox"/>	Multi-Fabric : <input checked="" type="checkbox"/>
Overlay Multicast TEP: 172.16.1.2	Overlay Multicast TEP: 172.16.2.2
BGP AS Number: AS65001 (automatically populated from the fabric's settings)	BGP AS Number: AS65002 (automatically populated from the fabric's settings)
OSPF Area ID: 0	OSPF Area ID: 0
OSPF Area Type: regular	OSPF Area Type: regular
External Routed Domain: Configured on the APIC	External Routed Domain: Configured on the APIC

Settings Berlin-Site

Inter-Fabric Connectivity

General

Fabric ID

1

Multi-Fabric

☐

Overlay Multicast TEP ⓘ

e.g. 1.1.1.1

BGP

BGP Autonomous System Number

65001

BGP Password

OSPF Area ID

OSPF Area Type

External Routed Domain

OSPF Policies

Settings Budapest-Site

Inter-Fabric Connectivity

General

Fabric ID

2

Multi-Fabric

☐

Overlay Multicast TEP ⓘ

e.g. 1.1.1.1

BGP

BGP Autonomous System Number

65002

BGP Password

OSPF Area ID

OSPF Area Type

External Routed Domain

OSPF Policies

Under OSPF Policies, click on “Add Policy” to create a customized OSPF policy with “network type” Point-to-Point.

OSPF Policies

Name

msc-ospf-policy-default

Network type: unspecified



common/default

Network type: unspecified



+ Add Policy



Add Policy

Policy Name *

Network Type

Priority *

Cost of Interface *

Interface Controls

Hello Interval (Seconds) *

Dead Interval (Seconds) *

Retransmit Interval (Seconds) *

Transmit Delay (Seconds) *

This is the policy that will be applied on the Spine interfaces that are peering with the ISN interfaces.

After Saving the Fabric Configurations, click on Pod

✓ Successfully Deployed.



Fabric Berlin-Site

Refresh

Edit Fabric Config



Fabric-to-Fabric Connectivity Success



Healthy Level warning

Pod pod-1



Spine109

BGP peering off

The Overlay Unicast TEP (O-UTEP) is configured here:



pod-1

major

critical

minor

warning

Overlay Unicast TEP *

e.g. 1.1.1.1

External TEP Role ⓘ

Click on the Spine to add the interfaces that are connected to the ISN.

Spine109

major

critical

minor

warning

Ports

ID

+ Add Port

The wizard to configure each interface pops up, requiring the Port ID, IP address for OSPF peering and the MTU size.

Add Port

General

Ethernet Port ID *

e.g. 1/1

IP Address *

Description

MTU *

Range from 576 to 9216

Settings ⓘ

OSPF

Enabled

Disabled

BGP

Enabled

Disabled

Since this lab uses OSPF peering between the spines and ISN, it is required to Enable OSPF and associate the OSPF Policy to the previously created OSPF policy.



Settings ⓘ


OSPF

OSPF Policy *

OSPF Authentication

☒ None ☐ MD5 ☐ Simple

After configuring all ports:

 **Spine109**



- major

- critical

- minor

- warning

Ports

ID		
1/31	IP: 172.16.1.39/30, MTU: 9216	
1/32	IP: 172.16.1.35/30, MTU: 9216	
+ Add Port		

BGP peering



Toggle the “BGP peering” knob to configure the BGP EVPN Router-ID of the spine.

BGP peering




BGP-EVPN ROUTER-ID

e.g. 1.1.1.1

Spine is route reflector




Save and Deploy to the fabric. Ensure that the “BGP peering is on”.

 **Fabric Berlin-Site**


[Refresh](#)

[Edit Fabric Config](#)

✓ Fabric-to-Fabric Connectivity Success

 Healthy Level warning

Pod pod-1

 **Spine109**
BGP peering on

Repeat the same procedure for the second site.



The resulting configurations can be seen from each respective APIC.

On the APIC GUI, navigate to **Tenants >> infra**
Under Policies >> Protocol >> Fabric Ext Connection Policies >> Fabric Ext Connection Policy. The Data Plane Multicast and Unicast TEPs are configured under this policy.

Intrasite/Intersite Profile - Fabric Ext Connection Policy

Policy Faults

Properties

Fabric ID: 1

Name:

Community: extended:as2-nn4:1:11
Ex: extended:as2-nn4:5:16

Site ID: 1

Data Plane Multicast TEP: 172.16.1.2/32

Enable Pod Peering Profile: ☐

Pod Connection Profile

Pod ID	Data Plane TEP	Unicast TEP	Multi-site Unicast Data Plane TEP
1			172.16.1.1/32

Site Peering Profile

Peering Type: Full Mesh

Remote Sites

Site ID	Data Plane Unicast TEP	Data Plane Multicast TEP
2	172.16.2.1/32	172.16.2.2/32

An L3Out profile is configured under the infra tenant. This is the L3Out configuration that enables OSPF connectivity between the Spine and ISN.

infra

Quick Start

infra

- Application Profiles
- Networking
 - Bridge Domains
 - VRFs
 - L2Outs
 - L3Outs
- Intersite
 - Logical Node Profiles
 - node-109-profile
 - Configured Nodes
 - Logical Interface Profiles
 - External EPGs
 - Route map for import and expo...
- SR-MPLS Infra L3Outs
- Dot1Q Tunnels
- Contracts
- Policies
- Services

L3 Outside - intersite

Properties

Global Alias:

Provider Label: hcloudGolfLabel
enter names separated by comma

Target DSCP: Unspecified

Route Control Enforcement: ☐ Import ☒ Export

VRF: overlay-1

Resolved VRF: infra/overlay-1

L3 Domain: PROD_L3DOM

Route Profile for Interleak: select a value

Route Profile for Redistribution: Source

Enable BGP/EIGRP/OSPF: ☒ BGP ☒ 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



The Logical Node Profile shows the ACI node (Spine109) and the configured Router-ID

The screenshot shows the 'Logical Node Profile - node-109-profile' configuration page. On the left is a navigation pane with a tree structure: 'infra' > 'Networking' > 'L3Outs' > 'intersite' > 'Logical Node Profiles' > 'node-109-profile'. The main area displays the 'Properties' of the profile:

- Name: node-109-profile
- Description: optional
- Alias: (empty field)
- Target DSCP: Unspecified
- Nodes: A table with two columns: 'Node ID' and 'Router ID'. It contains one entry: 'topology/pod-1/node-109' with Router ID '172.16.1.3'.

The Logical Interface Profile shows the Spine interfaces and the IP addresses that were configured.

Logical Interface Profiles

Name	Description	IP Address	Secondary IP Address	Path
interface-109-1-31-profile		172.16.1.39/30		Pod-1/Node-109/eth1/31
interface-109-1-32-profile		172.16.1.35/30		Pod-1/Node-109/eth1/32

Each interface is by default configured as a sub-interface with VLAN encapsulation 4.

Logical Interface Profile - interface-109-1-31-profile

Policy | Faults | History

General | **Routed Sub-Interfaces**

Path	IP Address	Secondary IP Address	MAC Address	MTU (bytes)	Encap	PTP	MultiPod Direct
Pod-1/Node-109/eth1/31	172.16.1.39/30		00:22:BD:F8:19:FF	9216	vlan-4	Disabled	False

Inter Site Network (ISN) Configuration

After the successful configuration on all sites, the ISN configurations can be put in place on the ISN device. The configurations are shown in the section below.

The ISN represents the Layer 3 network that is used as a transit between multiple ACI fabrics. The ISN enables spines from different fabrics to form BGP-EVPN peering and VXLAN tunnels are formed across sites to enable endpoints from different sites to communicate if required.

The LLDP neighborship between the ISN router and Spines in the ACI fabrics is shown below.

```
ISN# 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
Spine109       Eth1/49         120        BR           Eth1/32
Spine209       Eth1/50         120        BR           Eth1/32
Spine109       Eth1/51         120        BR           Eth1/31
Spine209       Eth1/52         120        BR           Eth1/31
```



OSPF peering between the spines in different ACI fabrics and the ISN is required. The ISN interfaces that connect to the ISN should be configured as sub-interfaces using encapsulation VLAN 4. The full configuration of the ISN is shown below.

```
feature lldp
feature ospf
!
vrf context ISN
  address-family ipv4 unicast
!
interface Ethernet1/49.4
  description ** To Site1 Spine109 E1/32 **
  mtu 9216
  encapsulation dot1q 4
  vrf member ISN
  no ip redirects
  ip address 172.16.1.34/30
  ip ospf network point-to-point
  ip router ospf ISN area 0.0.0.0
  no shutdown
!
interface Ethernet1/50
  mtu 9216
  no shutdown

interface Ethernet1/50.4
  description ** To Site2 Spine209 E1/32 **
  mtu 9216
  encapsulation dot1q 4
  vrf member ISN
  no ip redirects
  ip address 172.16.2.34/30
  ip ospf network point-to-point
  ip router ospf ISN area 0.0.0.0
  no shutdown
!
interface Ethernet1/51
  mtu 9216
  no shutdown

interface Ethernet1/51.4
  description ** To Site1 Spine109 E1/31 **
  mtu 9216
  encapsulation dot1q 4
  vrf member ISN
  no ip redirects
  ip address 172.16.1.38/30
  ip ospf network point-to-point
  ip router ospf ISN area 0.0.0.0
  no shutdown
!
interface Ethernet1/52
  mtu 9216
  no shutdown

interface Ethernet1/52.4
  description ** To Site2 Spine209 E1/31 **
  mtu 9216
  encapsulation dot1q 4
  vrf member ISN
  no ip redirects
  ip address 172.16.2.38/30
  ip ospf network point-to-point
  ip router ospf ISN area 0.0.0.0
  no shutdown
!
router ospf ISN
  log-adjacency-changes
  vrf ISN
```



ACI and ISN OSPF Verification

This section verifies that OSPF peering is successfully provisioned between the Spines of each site and the ISN.

ISN device:

```
ISN# show ip ospf neig vrf ISN
OSPF Process ID ISN VRF ISN
Total number of neighbors: 4
Neighbor ID      Pri State           Up Time  Address      Interface
172.16.1.3       1 FULL/ -         00:02:30 172.16.1.35  Eth1/49.4
172.16.2.3       1 FULL/ -         00:07:17 172.16.2.35  Eth1/50.4
172.16.1.3       1 FULL/ -         00:02:33 172.16.1.39  Eth1/51.4
172.16.2.3       1 FULL/ -         00:07:21 172.16.2.39  Eth1/52.4
```

SPINE – Site-1

```
Spine109# 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
172.16.1.34      1 FULL/ -         00:38:46 172.16.1.34  Eth1/32.32
172.16.1.34      1 FULL/ -         00:38:48 172.16.1.38  Eth1/31.31
```

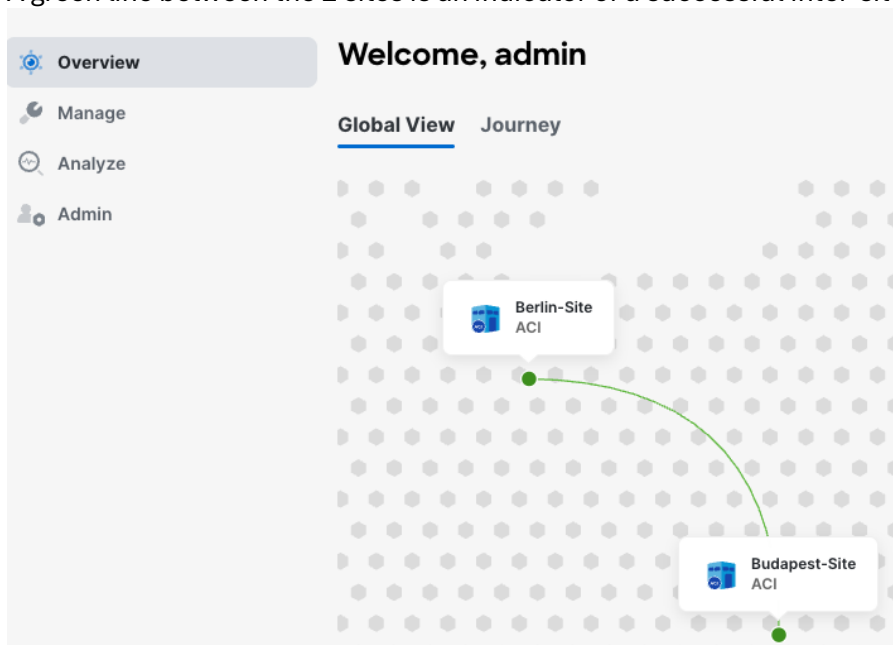
SPINE – Site-2

```
Spine209# show ip ospf neighbor vrf overlay-1
OSPF Process ID default VRF overlay-1
Total number of neighbors: 2
Neighbor ID      Pri State           Up Time  Address      Interface
172.16.1.34      1 FULL/ -         00:46:01 172.16.2.38  Eth1/31.31
172.16.1.34      1 FULL/ -         00:45:57 172.16.2.34  Eth1/32.32
```

Fabric Inter-Connectivity Verification

Navigate to the **Orchestrator >> Overview >> Global View**.

A green line between the 2 sites is an indicator of a successful inter-site connectivity.



Berlin-Site (Site 1) has a successful BGP-EVPN peering to the Budapest-Site (Site 2)

Berlin-Site Connected to On-Premises Fabrics

Filter by attributes

Status	Fabrics	Connection Type	Protocol	Connecting Routers/Services
Ok	Budapest-Site	N/A	BGP EVPN	1

Budapest-Site (Site 2) has a successful BGP-EVPN peering to the Berlin-Site (Site 1)

Budapest-Site Connected to On-Premises Fabrics

Filter by attributes

Status	Fabrics	Connection Type	Protocol	Connecting Routers/Services
Ok	Berlin-Site	N/A	BGP EVPN	1

Navigate to **Manage >> Fabric To Fabric Connectivity**
Verify that the BGP EVPN Status is Up along with the Tunnel Status

Manage > Fabric To Fabric Connectivity

Fabric To Fabric Connectivity

RefreshConfigure

Berlin-Site

Pods1

Spines1

ACI Multi-FabricOn

APIC Fabric ID1

Overlay Multicast TEP172.16.1.2

BGP ASN65001

OSPF Area ID0

OSPF Area Typeregular

External Routed Domainuni/I3dom-PROD_L3DOM

Hide Connectivity Status

Inter-Fabric Connections

Overlay StatusUnderlay Status

Fabric Name	Deployment Status	Operational Status	BGP EVPN Status	Tunnel Status
Budapest-Site	OK	OK	1 1 0 N/A	2 2 0

Budapest-Site

Pods1

Spines1

ACI Multi-FabricOn

APIC Fabric ID2

Overlay Multicast TEP172.16.2.2

BGP ASN65002

OSPF Area ID0

OSPF Area Typeregular

External Routed Domainuni/I3dom-TEST-L3DOM

Hide Connectivity Status

Inter-Fabric Connections

Overlay StatusUnderlay Status

Fabric Name	Deployment Status	Operational Status	BGP EVPN Status	Tunnel Status
Berlin-Site	OK	OK	1 1 0 N/A	2 2 0

Verify that all Spines interfaces connected to the ISN are up and the OSPF peering status is up.



Berlin-Site

Pods
1

Spines
1

ACI Multi-Fabric
On
OSPF Area ID
0

APIC Fabric ID
1
OSPF Area Type
regular

Overlay Multicast TEP
172.16.1.2
External Routed Domain
uni/l3dom-PROD_L3DOM

BGP ASN
65001

Hide Connectivity Status ^

Inter-Fabric Connections

Overlay Status Underlay Status

Device	Device Status	Interface Status	Peering Status	BGP Peer
Spine109	↑ Up	1/32 ↑ Up	OSPF ↑ Up	-
Spine109	↑ Up	1/31 ↑ Up	OSPF ↑ Up	-

Budapest-Site

Pods
1

Spines
1

ACI Multi-Fabric
On
OSPF Area ID
0

APIC Fabric ID
2
OSPF Area Type
regular

Overlay Multicast TEP
172.16.2.2
External Routed Domain
uni/l3dom-TEST-L3DOM

BGP ASN
65002

Hide Connectivity Status ^

Inter-Fabric Connections

Overlay Status Underlay Status

Device	Device Status	Interface Status	Peering Status	BGP Peer
Spine209	↑ Up	1/32 ↑ Up	OSPF ↑ Up	-
Spine209	↑ Up	1/31 ↑ Up	OSPF ↑ Up	-

Verify the MP-BGP L2VPN EVPN peering between the sites via the Spines CLI.

SPINE – Site-1

```
Spine109# show bgp l2vpn evpn summary vrf overlay-1
BGP summary information for VRF overlay-1, address family L2VPN EVPN
BGP router identifier 172.16.1.3, local AS number 65001
BGP table version is 70, L2VPN EVPN config peers 1, capable peers 1
0 network entries and 0 paths using 0 bytes of memory
BGP attribute entries [0/0], 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
172.16.2.3    4 65002      61      61       70    0    0 00:52:33 0
```

SPINE – Site-2

```
Spine209# show bgp l2vpn evpn summary vrf overlay-1
BGP summary information for VRF overlay-1, address family L2VPN EVPN
BGP router identifier 172.16.2.3, local AS number 65002
BGP table version is 5, L2VPN EVPN config peers 1, capable peers 1
0 network entries and 0 paths using 0 bytes of memory
BGP attribute entries [0/0], 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
172.16.1.3    4 65001      62      62        5    0    0 00:53:20 0
```



Verify the overlay-1 interfaces on the Spines.

```
Spine109# show ip interface vrf overlay-1
lo17, Interface status: protocol-up/link-up/admin-up, iod: 82, mode: dci-ucast
  IP address: 172.16.1.1, IP subnet: 172.16.1.1/32
  IP broadcast address: 255.255.255.255
  IP primary address route-preference: 0, tag: 0
lo18, Interface status: protocol-up/link-up/admin-up, iod: 83, mode: dci-mcast-hrep
  IP address: 172.16.1.2, IP subnet: 172.16.1.2/32
  IP broadcast address: 255.255.255.255
  IP primary address route-preference: 0, tag: 0
lo19, Interface status: protocol-up/link-up/admin-up, iod: 84, mode: mscp-etep
  IP address: 172.16.1.3, IP subnet: 172.16.1.3/32
  IP broadcast address: 255.255.255.255
  IP primary address route-preference: 0, tag: 0
```

```
Spine109# show ip interface vrf overlay-1
lo12, Interface status: protocol-up/link-up/admin-up, iod: 87, mode: dci-ucast
  IP address: 172.16.2.1, IP subnet: 172.16.2.1/32
  IP broadcast address: 255.255.255.255
  IP primary address route-preference: 0, tag: 0
lo13, Interface status: protocol-up/link-up/admin-up, iod: 88, mode: dci-mcast-hrep
  IP address: 172.16.2.2, IP subnet: 172.16.2.2/32
  IP broadcast address: 255.255.255.255
  IP primary address route-preference: 0, tag: 0
lo14, Interface status: protocol-up/link-up/admin-up, iod: 89, mode: mscp-etep
  IP address: 172.16.2.3, IP subnet: 172.16.2.3/32
  IP broadcast address: 255.255.255.255
  IP primary address route-preference: 0, tag: 0
```

Interfaces Definitions:

dci-unicast

Anycast address that is unique per each ACI site. This IP address is assigned to all the spines connected to the ISN and it is used for intersite unicast traffic. #data traffic only

dci-mcast-hrep

Anycast address unique per each ACI site. This IP address is assigned to all the spines connected to the ISN and it is used for intersite BUM traffic.

mscp-etep

This is the BGP-EVPN router id assigned to the spine in each site. It is used for inter-site BGP EVPN peering. #control plane traffic only

BGP EVPN Router-ID advertisement from Site-1 to Site-2 Example

The steps below show-cases how the Router-ID is advertised from one site to the other. This example uses Site-1 BGP-EVPN Router-ID (172.16.1.3) as an example.

172.16.1.3 is a directly connected loopback interface on Spine109

```
Spine109# show ip route vrf overlay-1 | grep 172.16.1.3/32
172.16.1.3/32, ubest/mbest: 2/0, attached, direct
```



The ISN learns of this prefix via OSPF.

```
ISN# show ip route 172.16.1.3 vrf ISN
IP Route Table for VRF "ISN"
'-' denotes best ucast next-hop
'-' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>

172.16.1.3/32, ubest/mbest: 2/0
  *via 172.16.1.35, Eth1/49.4, [110/2], 1d00h, ospf-ISN, intra
  *via 172.16.1.39, Eth1/51.4, [110/2], 1d00h, ospf-ISN, intra
```

The ISN advertises this route to Spine209 via OSPF. Site-2 spine receives this prefix as an OSPF intra-area route

```
Spine209# show ip route vrf overlay-1
172.16.1.3/32, ubest/mbest: 2/0
  *via 172.16.2.38, eth1/31.31, [110/3], 1d00h, ospf-default, intra
  *via 172.16.2.34, eth1/32.32, [110/3], 1d00h, ospf-default, intra
```

Spine209 (Site-2) injects this route from OSPF into the ISIS routing process, which is the routing process that runs in the ACI fabric underlay.

The following route-map is used to distribute OSPF routes into ISIS
interleak_rtmap_infra_prefix_remote_pod_teps

This route map contains several prefix-lists. In this use case our prefix-list of interest is
infra_prefix_ipn_remote_subnets

```
Spine209# 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_ipn_remote_subnets infra_prefix_remote_msite_teps
  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
```

A look into this prefix-list shows us the redistributed route from OSPF into ISIS

```
Spine209# show ip prefix-list infra_prefix_ipn_remote_subnets
ip prefix-list infra_prefix_ipn_remote_subnets: 1 entries
  seq 1 permit 172.16.1.3/32
```

All leafs in this fabric will now be aware of this route under the ISIS routing process. This can be observed from the Leaf switch's routing table.

```
Leaf201# show ip route vrf overlay-1
172.16.1.3/32, ubest/mbest: 1/0
  *via 10.2.224.65, eth1/49.9, [115/64], 1d00h, isis-isis_infra, isis-l1-ext
```



References

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