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The bridge to possible

How to Setup an ACI Multi-Site with Single Pod and Multi-Pod

Part 1

Max Ardica – Distinguished Engineer
Ramses Smeyers – Distinguished Engineer
BRKDCN-2391a

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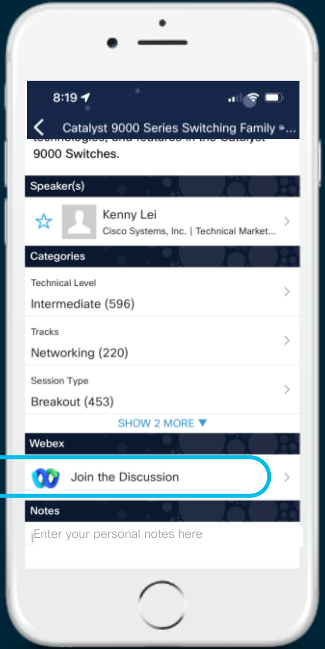

8:19

Catalyst 9000 Series Switching Family ...

9000 Switches.

Speaker(s)

Kenny Lei
Cisco Systems, Inc. | Technical Market...

Categories

Technical Level: Intermediate (596)

Tracks: Networking (220)

Session Type: Breakout (453)

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Webex

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Notes

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Agenda

- Part 1 (BRKDCN-2391a)
  - Brief Multi-Pod/Multi-Site Review and Positioning
  - Prerequisites
  - Hardware Inspection and Installation
  - Installing the First Site
  - Expanding the Single Pod into a Multi-Pod Fabric
- Part 2 (BRKDCN-2391b, today at 2.30 pm)
  - Simplified Tenant Management through Nexus Dashboard Orchestrator (NDO)
  - Adding the DR Site on NDO
  - NDO Additional Functionalities

Brief Multi-Pod / Multi-Site Review and Positioning

Multi-Pod or Multi-Site?

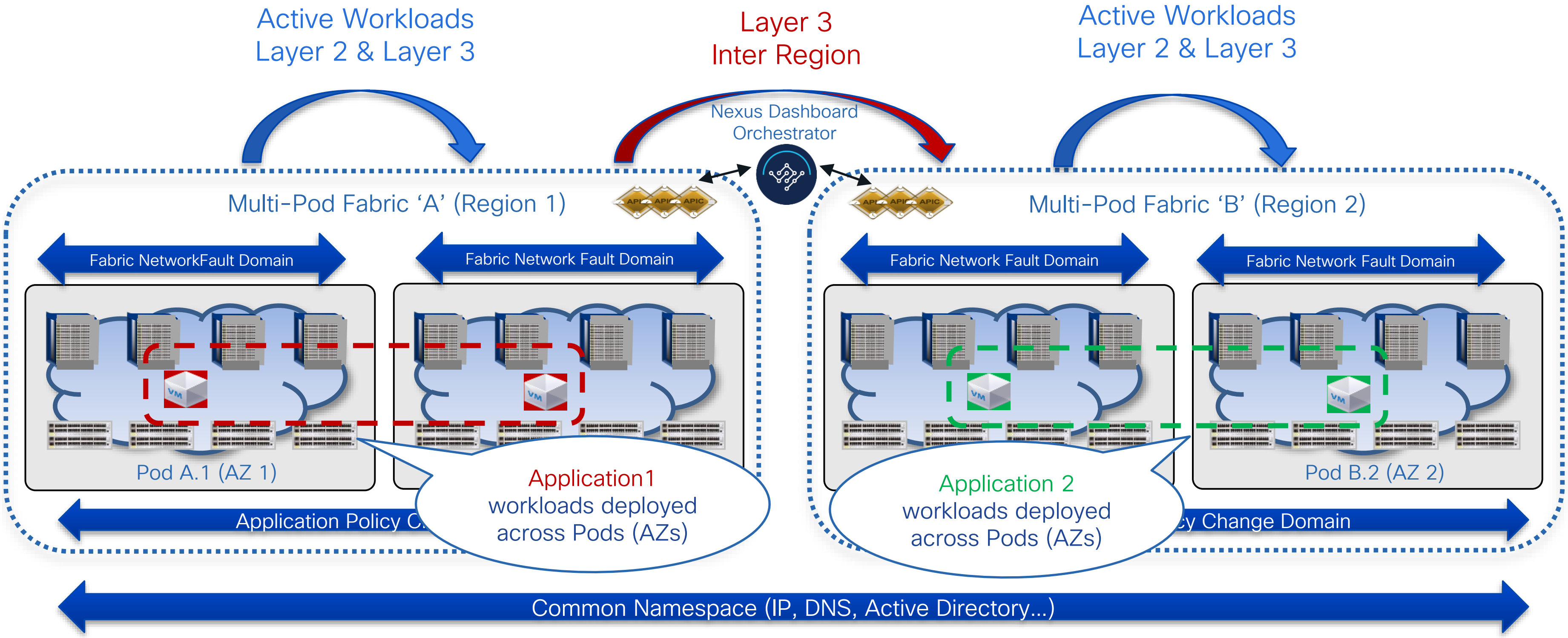
That is the question…

And the answer is...

BOTH!

Systems View (How do these things relate)

Change and Network Fault Domain Isolation

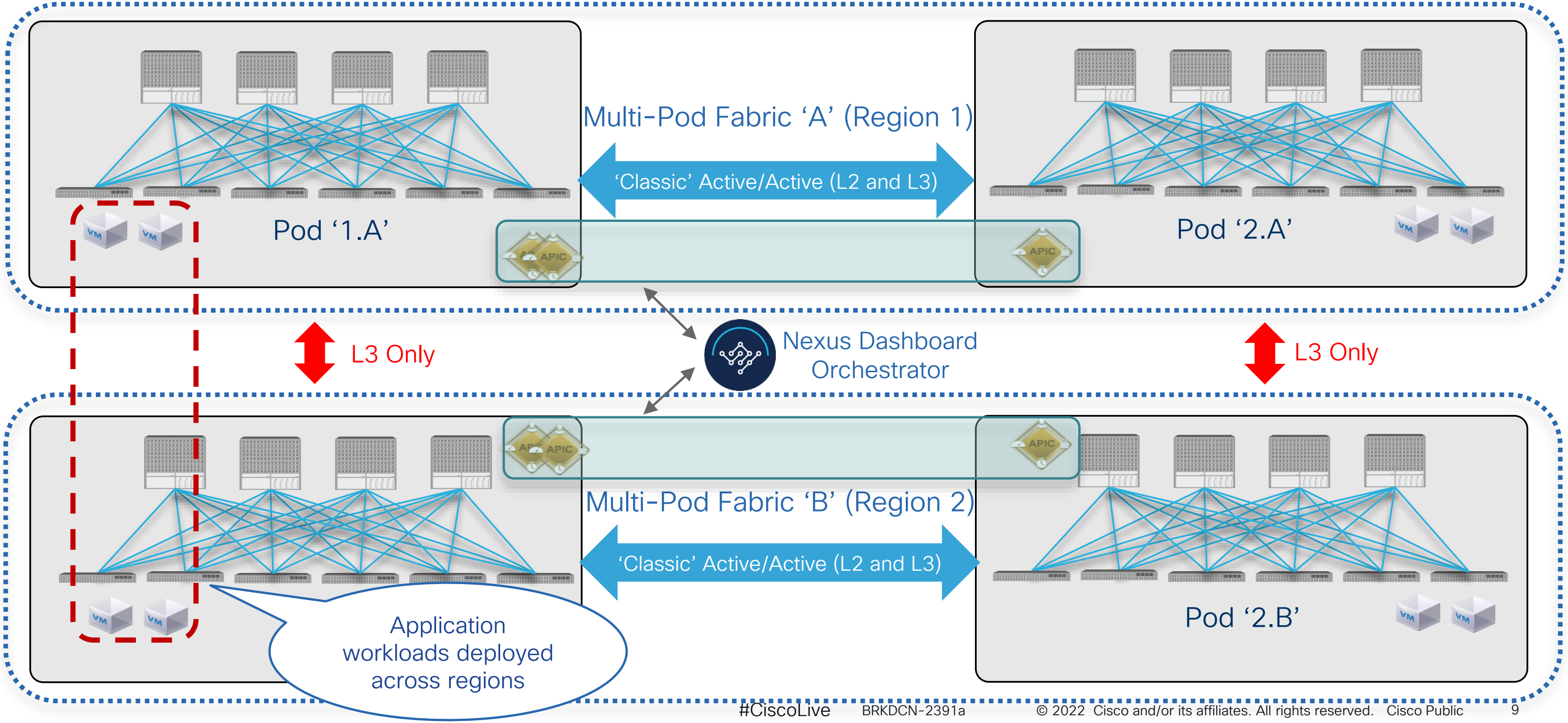

Active Workloads
Layer 2 & Layer 3
Layer 3
Inter Region
Active Workloads
Layer 2 & Layer 3
Nexus Dashboard
Orchestrator
Multi-Pod Fabric 'A' (Region 1)
APIC APIC APIC
APIC APIC APIC
Multi-Pod Fabric 'B' (Region 2)
Fabric NetworkFault Domain
Fabric Network Fault Domain
Fabric Network Fault Domain
Fabric Network Fault Domain
VM
VM
VM
VM
Pod A.1 (AZ 1)
Pod B.2 (AZ 2)
Application Policy C
cy Change Domain
Common Namespace (IP, DNS, Active Directory…)

Application1
workloads deployed
across Pods (AZs)

Application 2
workloads deployed
across Pods (AZs)

Typical Requirement

Creation of Two Independent Fabrics/AZs

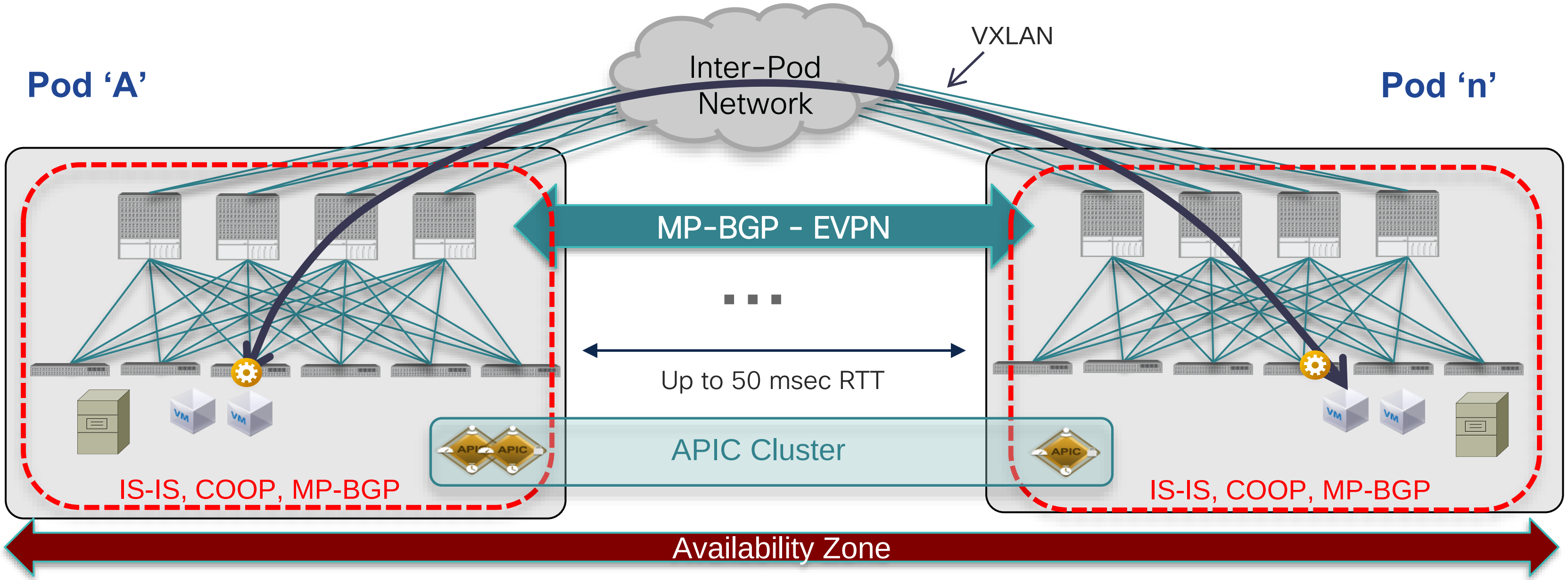


Multi-Pod Fabric 'A' (Region 1)
'Classic' Active/Active (L2 and L3)
Pod '1.A'
Pod '2.A'
APIC
L3 Only
Nexus Dashboard Orchestrator
L3 Only
APIC
Multi-Pod Fabric 'B' (Region 2)
'Classic' Active/Active (L2 and L3)
Pod '2.B'
VM

Application workloads deployed across regions

ACI Multi-Pod

Overview

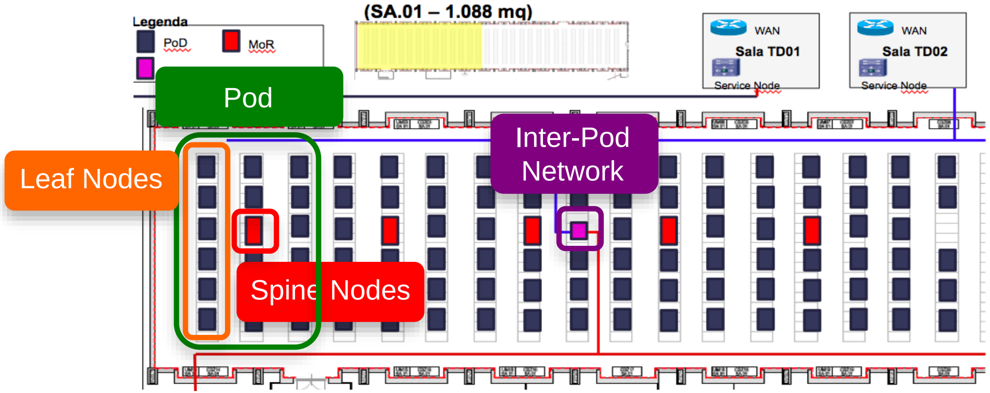

VXLAN
Inter-Pod Network
Pod 'A'
Pod 'n'
MP-BGP - EVPN
...
Up to 50 msec RTT
APIC Cluster
APIC
APIC
APIC
VM
VM
VM
VM
IS-IS, COOP, MP-BGP
IS-IS, COOP, MP-BGP
Availability Zone

- Multiple ACI Pods connected by an IP Inter-Pod L3 network, each Pod consists of leaf and spine nodes
- Up to 50 msec RTT supported between Pods
- Managed by a single APIC Cluster
- Single Management and Policy Domain

- Forwarding control plane (IS-IS, COOP) fault isolation
- Data Plane VXLAN encapsulation between Pods
- End-to-end policy enforcement

ACI Multi-Pod
Most Common Use Cases

- Need to scale up a single ACI fabric above 200 leaf nodes supported in a single Pod
- Handling 3-tiers physical cabling layout (for example traditional N7K/N5K/N2K deployments)

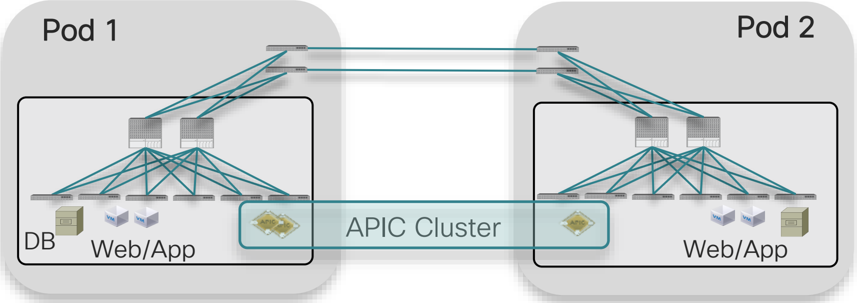

Legenda
PoD
MoR
(SA.01 – 1.088 mq)
WAN
Sala TD01
Service Node
WAN
Sala TD02
Service Node
Pod
Leaf Nodes
Inter-Pod Network
Spine Nodes

- True Active/Active DC deployments

  Single VMM domain across DCs (stretched ESXi Metro Cluster, vSphere HA/FT, DRS initiated workload mobility,…)

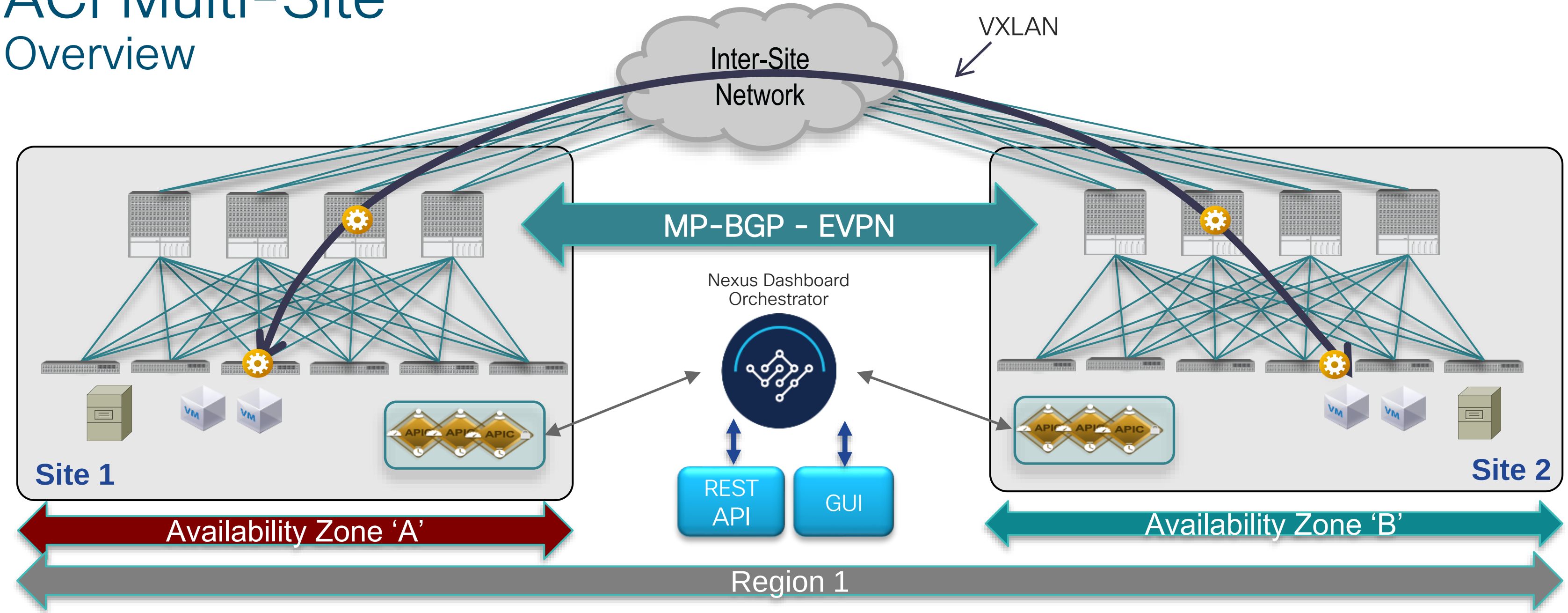
  Deployment of Active/Standby or Active/Acive clustered network services (FWs, SLBs) across DCs

  Application clustering (L2 BUM extension across Pods)


Pod 1
Pod 2
DB
Web/App
APIC Cluster
Web/App

ACI Multi-Site

Overview

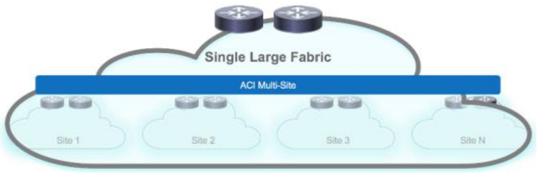

VXLAN
Inter-Site Network
MP-BGP - EVPN
Nexus Dashboard Orchestrator
APIC
APIC
APIC
VM
VM
Site 1
Site 2
REST API
GUI
Availability Zone 'A'
Availability Zone 'B'
Region 1

- Separate ACI Fabrics with independent APIC clusters
- No latency limitation between Fabrics
- ACI Multi-Site Orchestrator pushes cross-fabric configuration to multiple APIC clusters providing scoping of all configuration changes
- MP-BGP EVPN control plane between sites
- Data Plane VXLAN encapsulation across sites
- End-to-end policy definition and enforcement

ACI Multi-Site

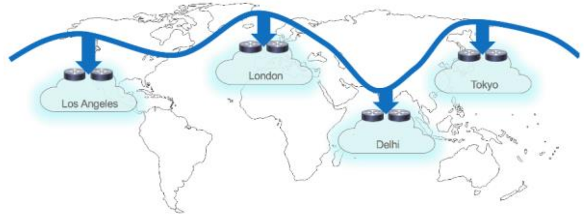
Most Common Use Cases

- Scale-up DC network model
  - Building a very large intra-DC network (above 500* leaf nodes)

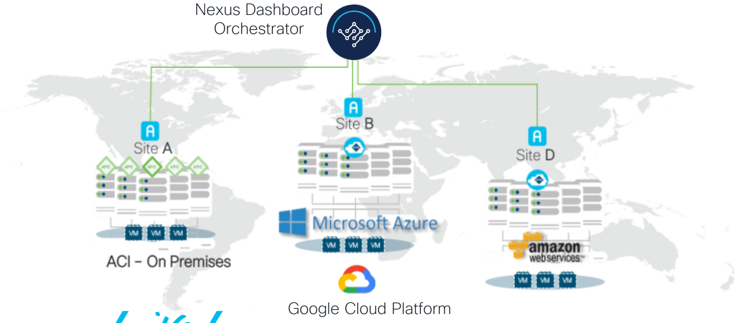

Single Large Fabric
ACI Multi-Site
Site 1
Site 2
Site 3
Site N

*500 leaf nodes supported in a Multi-Pod fabric starting with ACI 4.2(4) release

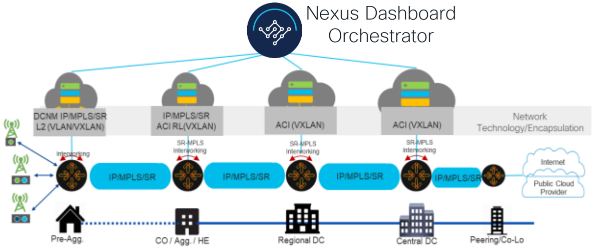
- Data Center Interconnect (DCI)
  - Extend connectivity/policy between 'loosely coupled' DC sites
  - Disaster Recovery and IP mobility use cases


Los Angeles
London
Delhi
Tokyo

- Cloud ACI
  - Integration between on-prem and public clouds


Nexus Dashboard
Orchestrator
Site A
Site B
Site D
ACI – On Premises
Microsoft Azure
amazon web services
Google Cloud Platform
VM

- SP 5G Telco DC/Cloud
  - Centralized DC Orchestration for "Isolated Fabrics"
  - SR-MPLS/MPLS Handoff on Border Leaf nodes

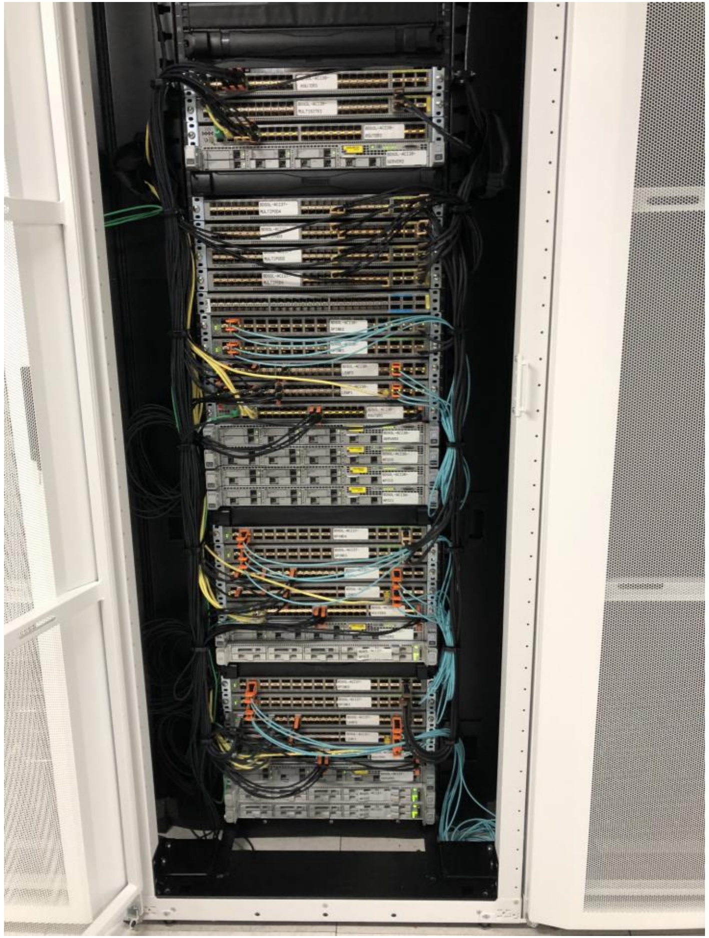

Nexus Dashboard
Orchestrator
DCNM IP/MPLS/SR L2 (VLAN/VXLAN)
IP/MPLS/SR ACI RL(VXLAN)
ACI (VXLAN)
ACI (VXLAN)
Network Technology/Encapsulation
Interworking
SR-MPLS Interworking
SR-MPLS Interworking
SR-MPLS Interworking
IP/MPLS/SR
IP/MPLS/SR
IP/MPLS/SR
IP/MPLS/SR
Internet
Public Cloud Provider
Pre-Agg.
CO / Agg. / HE
Regional DC
Central DC
Peering/Co-Lo

Prerequisites

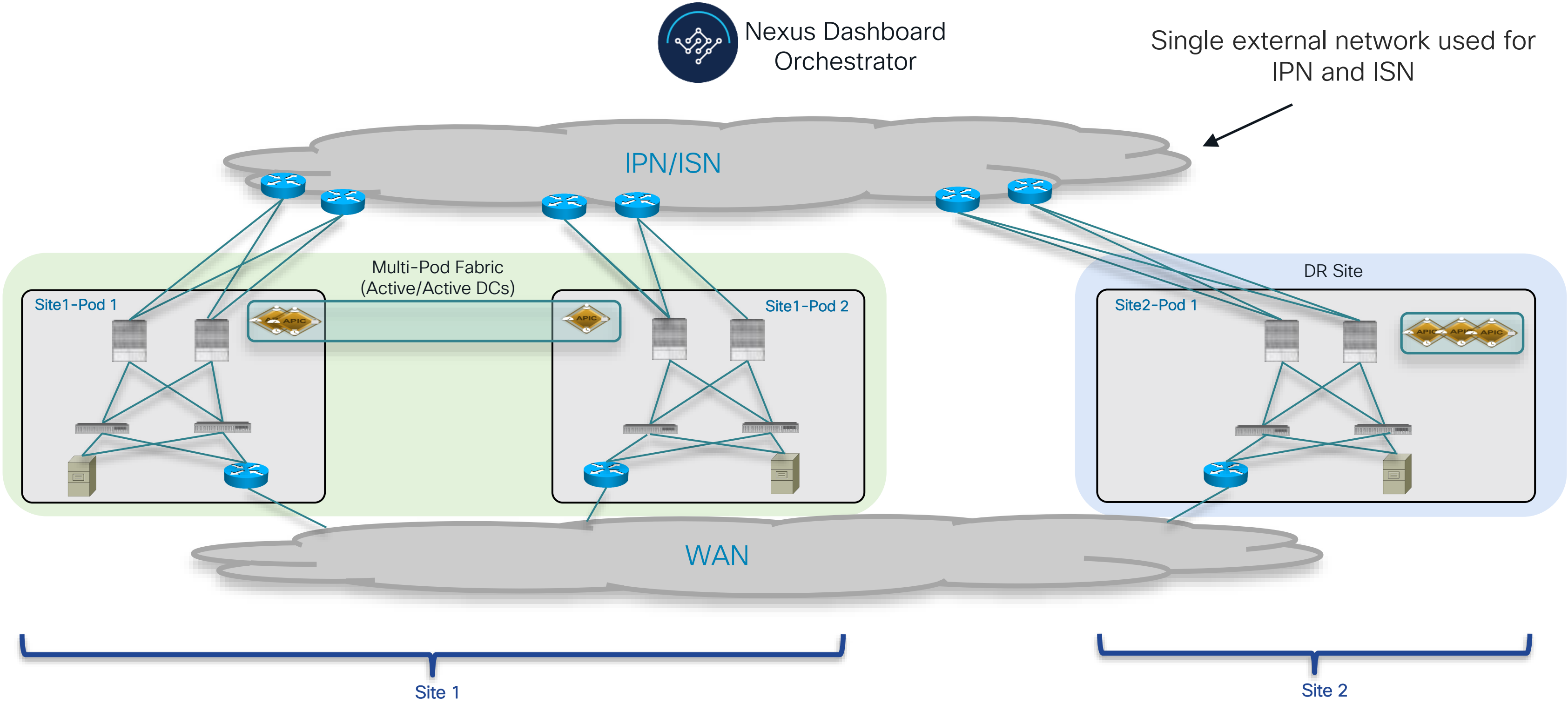
Prerequisites

- Before starting, you should have:
  - For each APIC a routable IP addresses for OOB mgmt and CIMC
  - Functional NTP server
  - Serial number of all leaf and spine nodes
  - Optionally but recommended:
    - 1 IP per leaf and spine for OOB
    - SCP / FTP / HTTP server (software)
    - Console / serial server
  - Infrastructure VLAN / VTEP pool
  - vCenter IP address and credentials

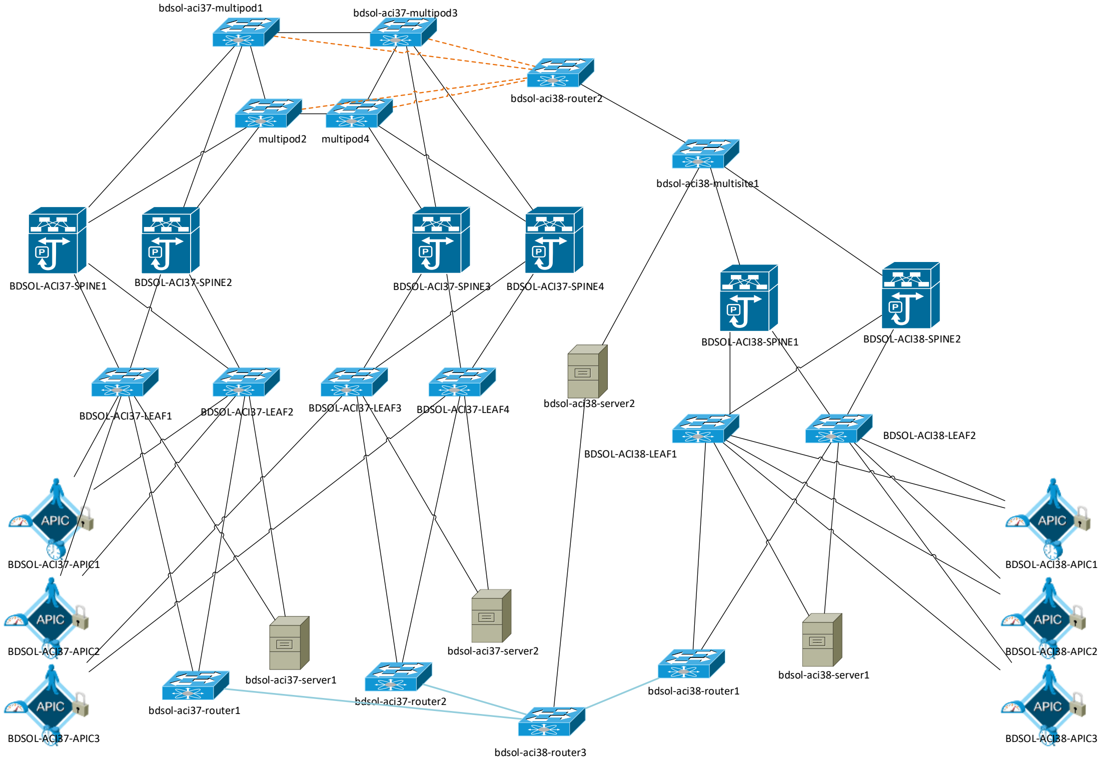
Hardware Inspection and Installation



Our Setup for Today (High Level View)


Nexus Dashboard Orchestrator
Single external network used for IPN and ISN
IPN/ISN
Multi-Pod Fabric (Active/Active DCs)
Site1-Pod 1
APIC
Site1-Pod 2
DR Site
Site2-Pod 1
WAN
Site 1
Site 2

Our Setup for Today (Detailed View)



Bru ACI Fabric POD 37 & 38

bdsol-aci37-multipod1
bdsol-aci37-multipod3
bdsol-aci38-router2
multipod2
multipod4
bdsol-aci38-multisite1
BDSOL-ACI37-SPINE1
BDSOL-ACI37-SPINE2
BDSOL-ACI37-SPINE3
BDSOL-ACI37-SPINE4
BDSOL-ACI38-SPINE1
BDSOL-ACI38-SPINE2
bdsol-aci38-server2
BDSOL-ACI37-LEAF1
BDSOL-ACI37-LEAF2
BDSOL-ACI37-LEAF3
BDSOL-ACI37-LEAF4
BDSOL-ACI38-LEAF1
BDSOL-ACI38-LEAF2
APIC
BDSOL-ACI37-APIC1
APIC
BDSOL-ACI37-APIC2
APIC
BDSOL-ACI37-APIC3
bdsol-aci37-server1
bdsol-aci37-server2
bdsol-aci37-router1
bdsol-aci37-router2
bdsol-aci38-router3
bdsol-aci38-router1
bdsol-aci38-server1
APIC
BDSOL-ACI38-APIC1
APIC
BDSOL-ACI38-APIC2
APIC
BDSOL-ACI38-APIC3

Installing the First Site

Site1-Pod1 Configuration

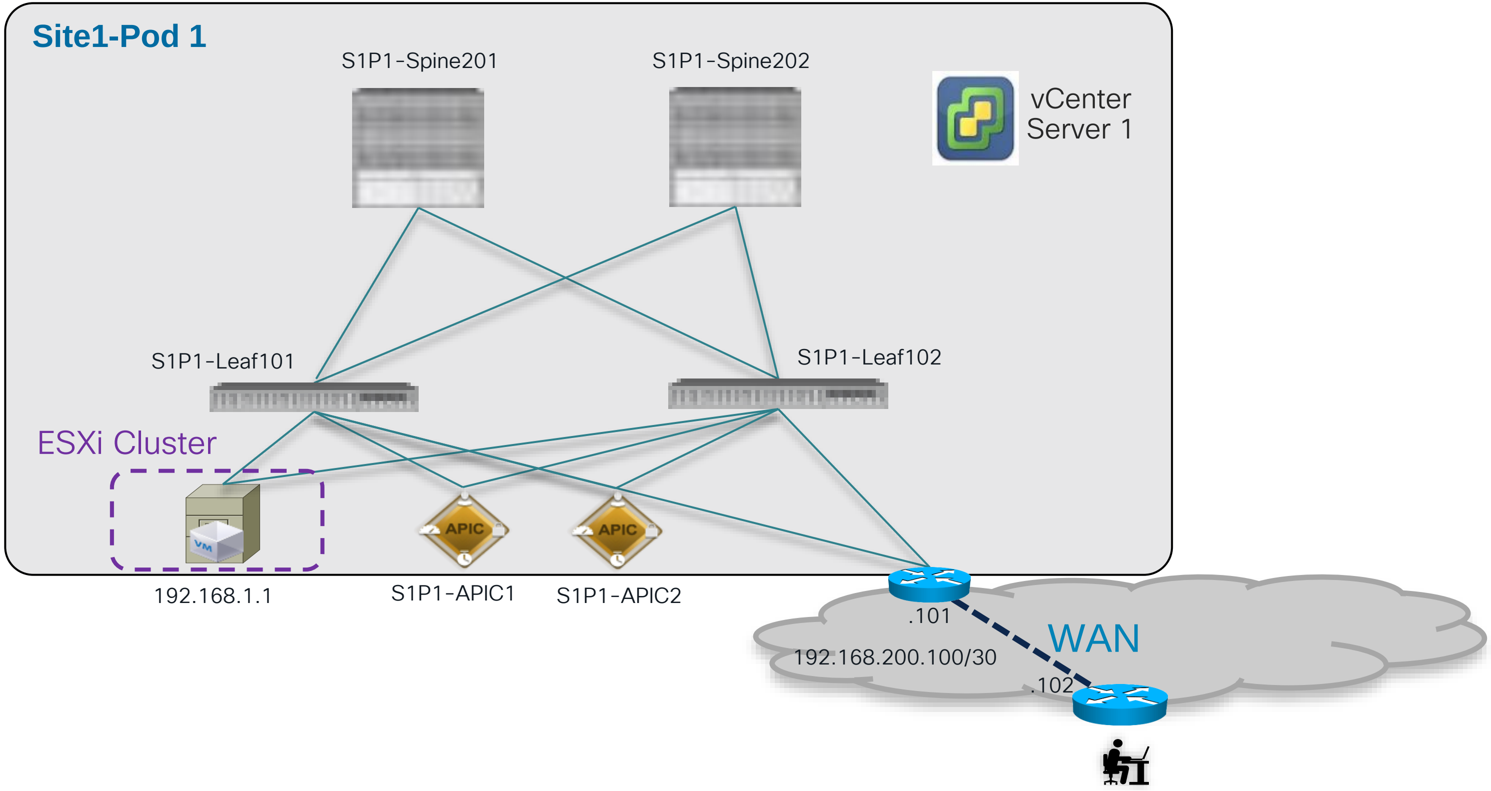
Installing the First Site

Site1-Pod1: Initial Fabric Setup (Already Done)

- APIC initial configuration (S1P1-APIC1) [only the 1st one for now]
- 1st leaf discovery
- Spines discovery
- 2nd leaf discovery
- S1P1-APIC2 configuration
- Verification
- OOB mgmt → IPs for leaf and spine nodes

Installing the First Site

Site1-Pod1 Fabric


Site1-Pod 1
S1P1-Spine201
S1P1-Spine202
vCenter Server 1
S1P1-Leaf101
S1P1-Leaf102
ESXi Cluster
VM
APIC
APIC
192.168.1.1
S1P1-APIC1
S1P1-APIC2
.101
192.168.200.100/30
WAN
.102

Installing the First Site
Parameters for the APIC Initial Setup Script

	S1P1-APIC1	S1P1-APIC2
Fabric name	Fabric1	Fabric1
Fabric ID	1	1
Active controllers	3	3
Pod ID	1	1
Controller ID	1	2
TEP Pool	10.0.0.0/16	10.0.0.0/16
Infra VLAN	3937	3937

Installing the First Site

Site1-Pod1: Remaining Configuration Steps to Do

- NTP configuration
- Route Reflector for intra-BGP VPNv4 sessions
- VMM integration
- Tenant configuration with ‘Ecommerce’ running application
- ‘Ecommerce’ app connectivity verification
- L3Out creation and external connectivity verification

Demo 1

NTP, VMM, L3Out Configuration and Pod Verification

Expanding the Single Pod into a Multi-Pod Fabric

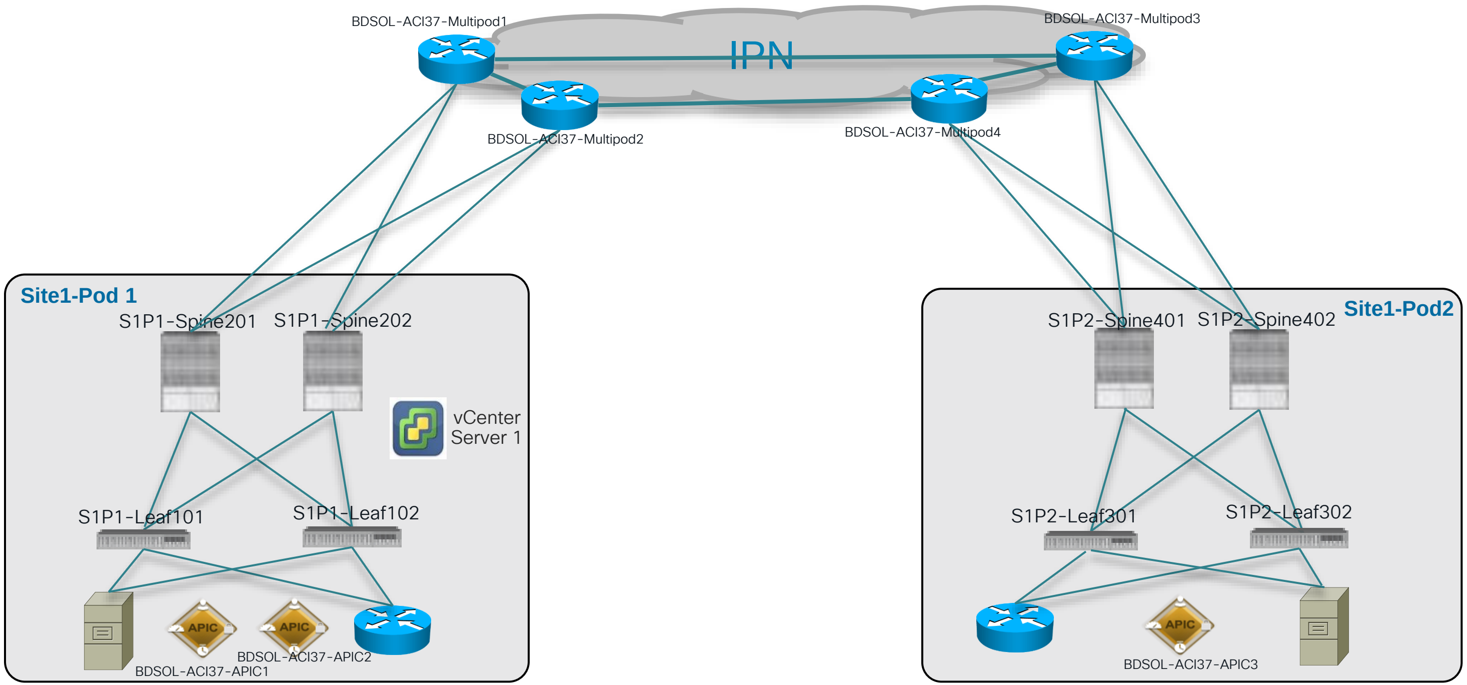
Expanding the Single Pod into a Multi-Pod Fabric

Adding the IPN and Site1-Pod2

- Step 1: verify the Inter-Pod Network (IPN) configuration
- Step 2: create the Multi-Pod fabric using the APIC Wizard
  - ➢ Add Site1-Pod1
  - ➢ Add Site1-Pod2
  - ➢ Discovery of Pod2's leaf and spines nodes
- Step 3: S1P2-APIC3 in Pod2 joins the APIC cluster
- Step 4: extend 'Ecommerce' Tenant to Pod2 (L3Out, ESXi host, access policies)
- Verification Steps:
  - Verify that the existing tenant configuration is extended into the Multi-Pod fabric
  - Verify East-West and North-South connectivity

Expanding the Single Pod into a Multi-Pod Fabric

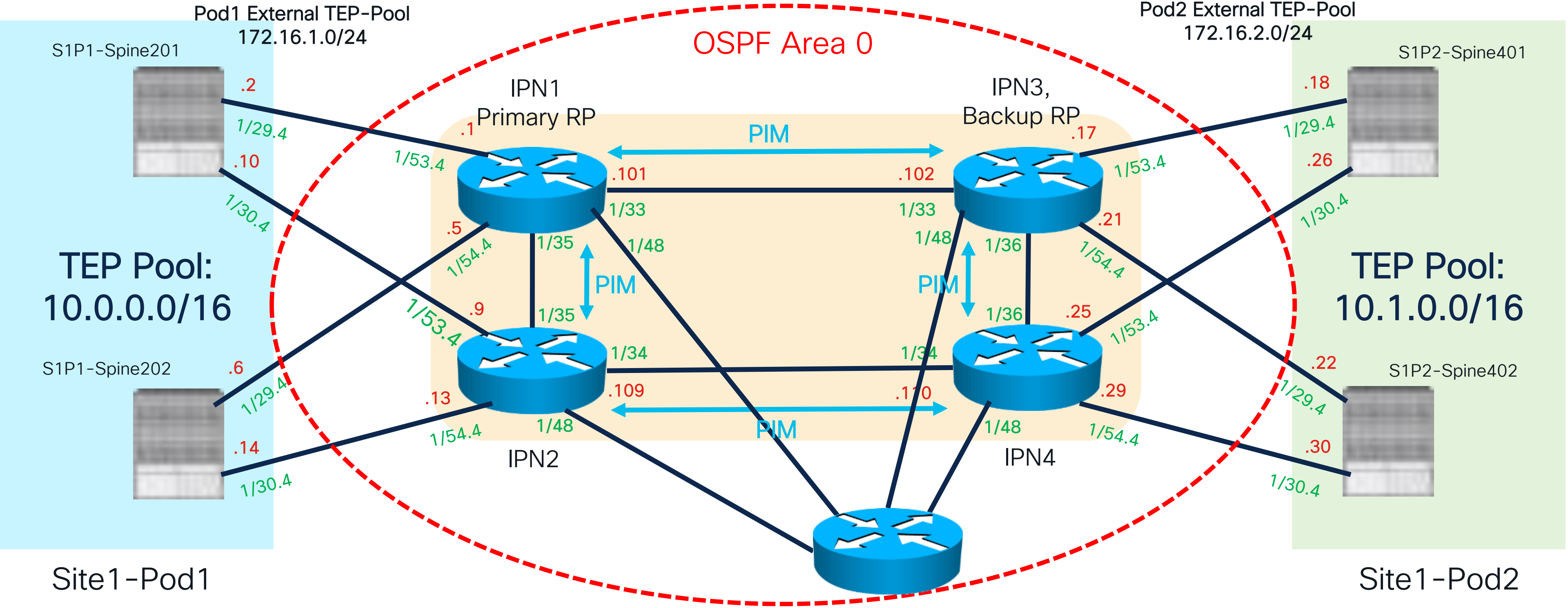
Adding the IPN and Site1-Pod2



BDSOL-ACI37-Multipod1
IPN
BDSOL-ACI37-Multipod3
BDSOL-ACI37-Multipod2
BDSOL-ACI37-Multipod4
Site1-Pod 1
S1P1-Spine201
S1P1-Spine202
vCenter Server 1
S1P1-Leaf101
S1P1-Leaf102
APIC
APIC
BDSOL-ACI37-APIC2
BDSOL-ACI37-APIC1
Site1-Pod2
S1P2-Spine401
S1P2-Spine402
S1P2-Leaf301
S1P2-Leaf302
APIC
BDSOL-ACI37-APIC3

Expanding the Single Pod into a Multi-Pod Fabric

Step 1: Verify the Inter-Pod Network (IPN) Configuration


Pod1 External TEP-Pool
172.16.1.0/24
Pod2 External TEP-Pool
172.16.2.0/24
OSPF Area 0
S1P1-Spine201
.2
1/29.4
.10
1/30.4
IPN1
Primary RP
.1
1/53.4
.5
1/54.4
.101
1/33
1/35
1/48
PIM
IPN3,
Backup RP
.17
1/53.4
.102
1/33
1/48
1/36
.21
1/54.4
S1P2-Spine401
.18
1/29.4
.26
1/30.4
TEP Pool:
10.0.0.0/16
PIM
PIM
TEP Pool:
10.1.0.0/16
.9
1/53.4
1/35
1/36
.25
1/53.4
S1P1-Spine202
.6
1/29.4
1/34
1/34
.22
S1P2-Spine402
1/29.4
.13
.109
.110
.29
.14
1/30.4
1/54.4
1/48
PIM
1/48
1/54.4
.30
1/30.4
IPN2
IPN4
Site1-Pod1
Site1-Pod2

IPN Infra Address Space: 172.16.101.0/24

Demo 2

Verify the Inter-Pod Network (IPN) Configuration

Expanding the Single Pod into a Multi-Pod Fabric

Step 2: Create the Multi-Pod Fabric Using the APIC Wizard and import Pod2 Spine and Leaf Nodes

Nodes automatically discovered in Site1-Pod2 that need to be added to the APIC fabric membership table

Node ID	Pod ID	Name	S/N
301	2	S1P2-Leaf301	FDO224702ET
302	2	S1P2-Leaf302	FDO223007J4
401	2	S1P2-Spine401	FDO22472FCV
402	2	S1P2-Spine402	FDO22391NP2

Demo 3

Create the Multi-Pod Fabric Using the APIC Wizard

Expanding the Single Pod into a Multi-Pod Fabric

Step 3: S1P2-APIC3 in Pod2 Joins the APIC Cluster

	S1P1-APIC1	S1P1-APIC2	S1P2-APIC3
Fabric name	Fabric1	Fabric1	Fabric1
Fabric ID	1	1	1
Active controllers	3	3	3
Pod ID	1	1	2
Controller ID	1	2	3
TEP Pool	10.0.0.0/16	10.0.0.0/16	10.0.0.0/16
Infra VLAN	3937	3937	3937

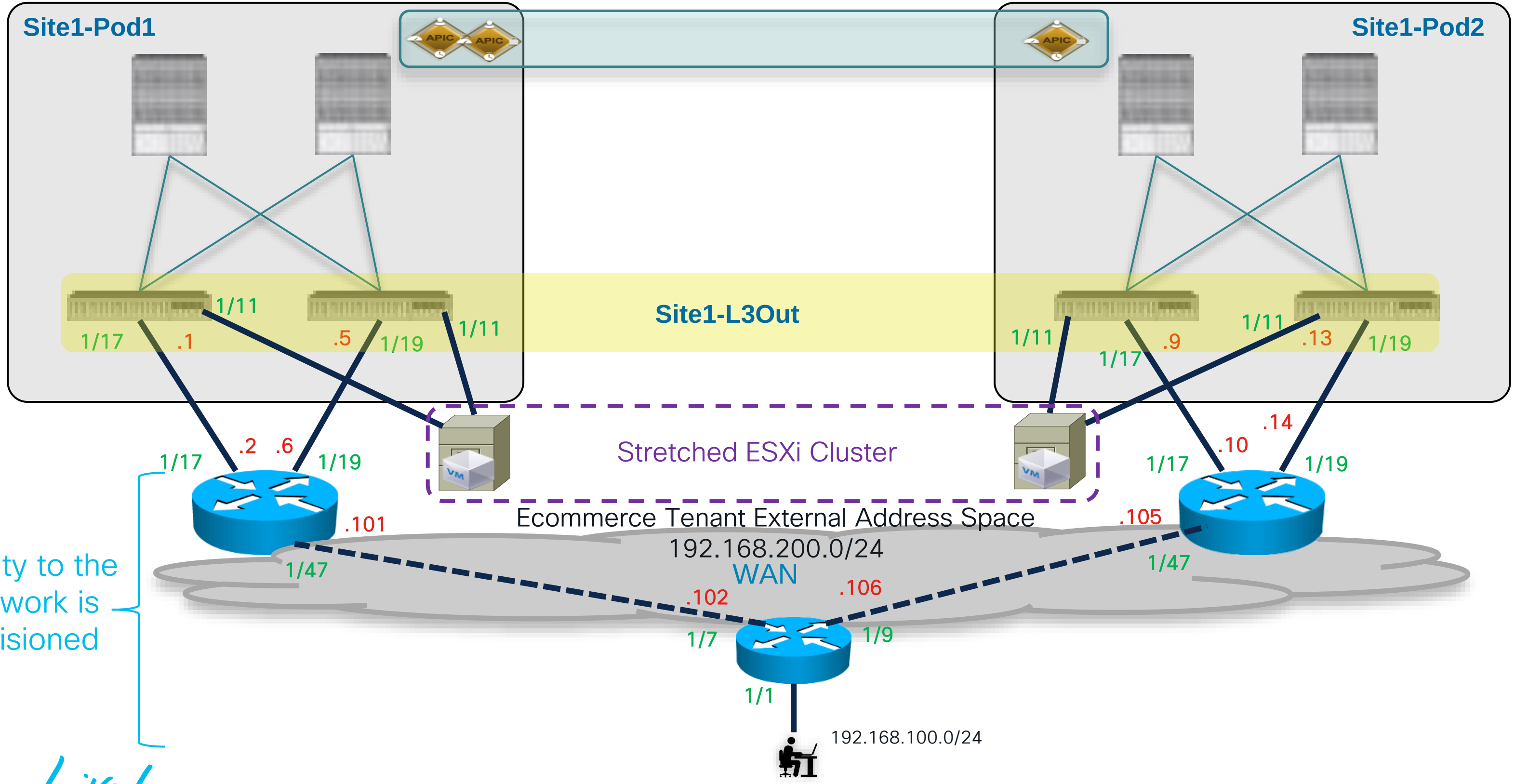
Pod2 uses TEP Pool 10.1.0.0/16 but S1P2-APIC3 resides in TEP Pool of Pod1

Demo 4

S1P2-APIC3 in Pod2 Joins the APIC Cluster

Expanding the Single Pod into a Multi-Pod Fabric

Step 4: Extend ‘Ecommerce’ Tenant to Pod2 (L3Out, ESXi Host to VDS, etc.)



Site1-Pod1
Site1-Pod2
APIC
APIC
APIC
Site1-L3Out
1/11
1/17
.1
.5
1/19
1/11
1/11
1/17
.9
1/11
.13
1/19
Stretched ESXi Cluster
VM
VM
.2
.6
1/17
1/19
.14
.10
1/17
1/19
.101
.105
Ecommerce Tenant External Address Space
192.168.200.0/24
WAN
1/47
1/47
.102
.106
1/7
1/9
1/1
192.168.100.0/24

Connectivity to the WAN network is pre-provisioned

Demo 5

Extend ‘Ecommerce’ tenant configuration to Pod2

Technical Session Surveys

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- These points help you get on the leaderboard and increase your chances of winning daily and grand prizes.

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- Book your one-on-one Meet the Engineer meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
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Thank you

See you for BRKDCN-2391b (today @ 2.30 pm) cisco Live!

ALL IN

#CiscoLive