



# Easy Fabric Management of VXLAN EVPN Networks with DCNM 11

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# Agenda

- **Introduction to DCNM 11**
- Greenfield VXLAN Deployment
- Brownfield - Revamp your VXLAN fabric
- DCNM Day-2 operations
- DCNM Demos
- Install and Licensing
- Conclusion

# Data Center Network Manager (DCNM)

## Single Management Solution for

- VXLAN-EVPN Programmable Fabric
- Classic LAN Deployments
- IP Media Network Controller (PMN)
- SAN (MDS & Nexus)

## Helps in Day 2 Operations

- Real-Time Topology
- Integrated Compute Visibility
- Performance Monitoring
- Fault Management
- Configuration Compliance
- Image Management, Upgrades and RMA
- Network Insights Suite

## Addresses End-to-End Network Provisioning

- GUI/API-based provisioning
- Multi-Fabric & Multi-Site
- Network Configuration Backup & Restore

# Network Architecture Deployment Models

## DCNM modes

### Fabric / Overlay Models

#### VXLAN + BGP-EVPN

- L2 over L3 overlay
- BGP-EVPN control plane
- VXLAN data plane

LAN Fabric Mode – Easy Fabric Template  
(Nexus 3k/9k)

### Traditional Models

#### Traditional L2 / L3

- L3 @ aggregation and L2 @ access
- L3 @ access
- 3-tier or spine-leaf model

LAN Fabric mode - External Fabric Template  
LAN Classic Mode  
(Nexus 2k-9k)

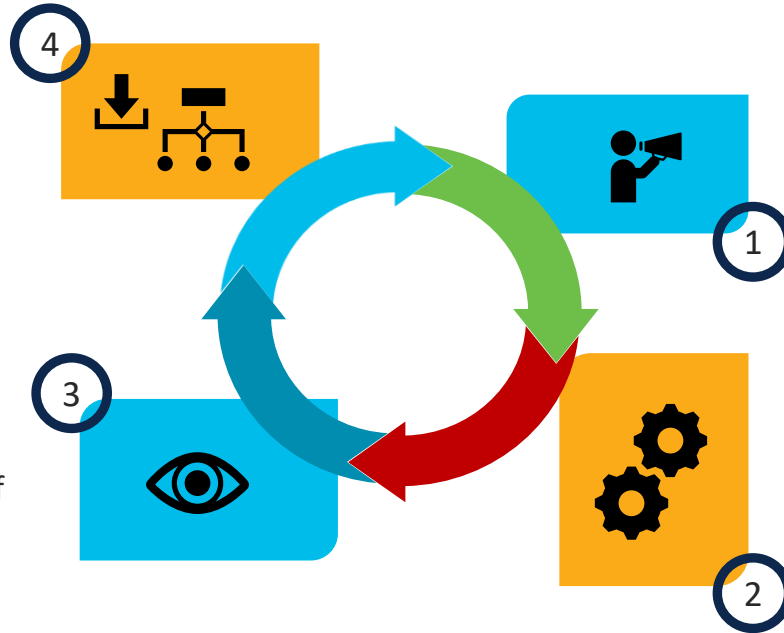
# Introducing LAN Fabric in DCNM 11

## Deploy

Centralized config push

## Preview

Side-by-side diff



## Define

Define Intent based on best practices

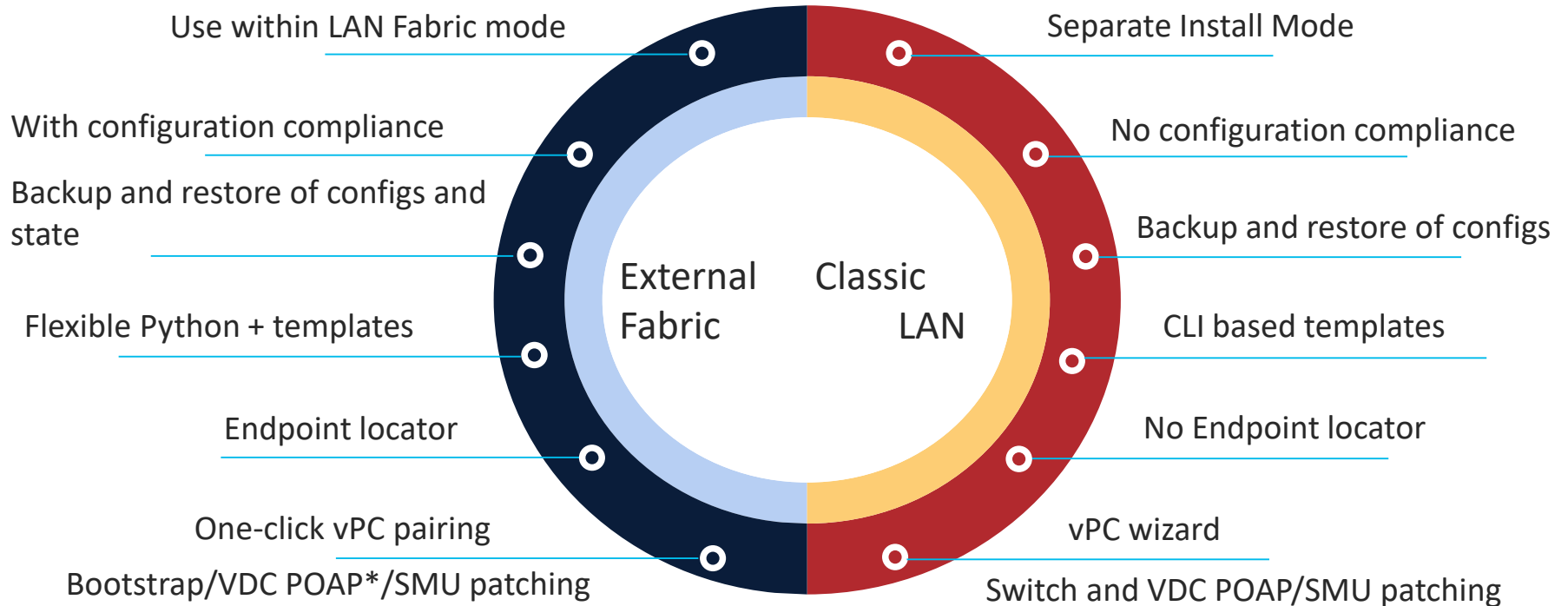
- Underlay
- Interfaces
- Overlay

## Save

Generates configuration based on intent

Viola! Your fabric is ready in a few minutes

# Classic LAN and External Fabric - Nexus 2k-9k



# External Fabrics – The Better LAN Classic

- External Fabrics can be Managed or Monitored
- Support for Nexus 2k – 9k for VXLAN/Traditional Fabrics
- Non-Nexus Device Support -
  - IOS-XE family devices: CSR1000v
  - IOS-XR family devices: ASR9000, NCS5500
  - 3rd Party Switches

DCNM 11.3(1) is now on [cisco.com](https://www.cisco.com)!



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# Greenfield VXLAN Deployment



Not on VXLAN today?



DCNM LAN fabric  
mode



Build VXLAN fabric in  
few minutes



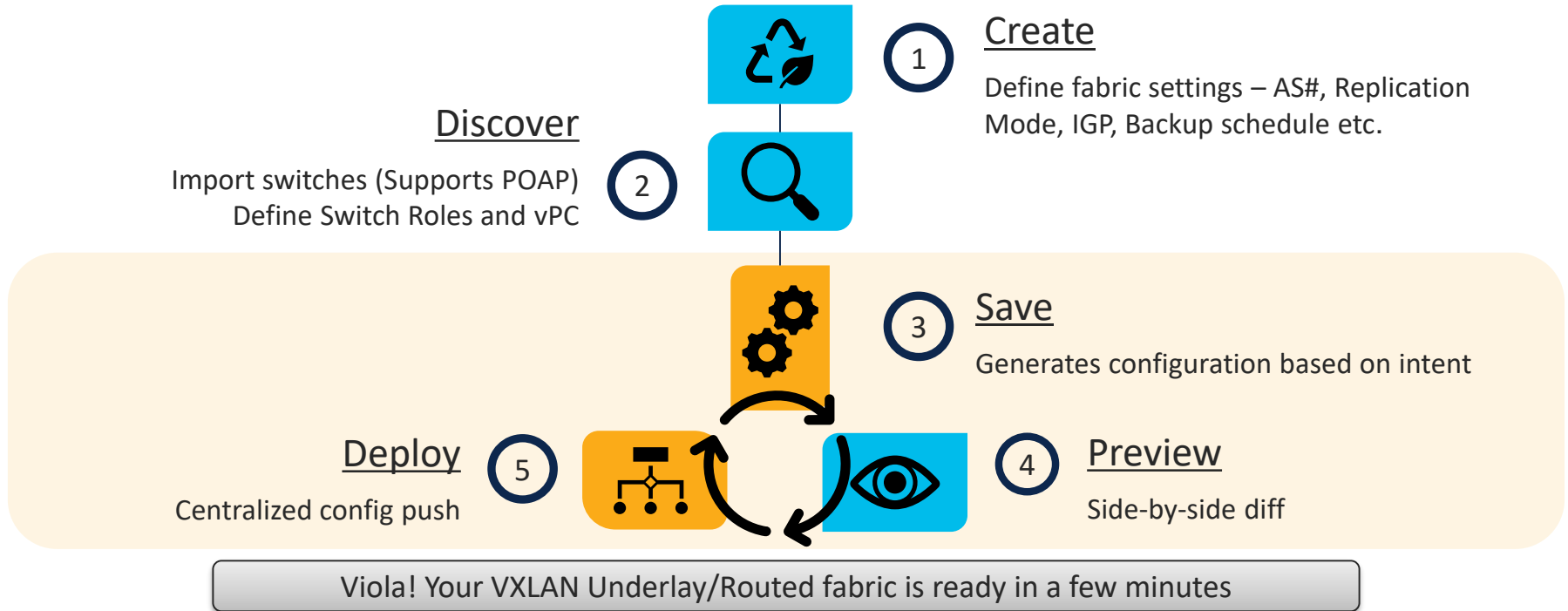
Templates already  
embed best practices



IP addresses, overlay  
pool, routing profiles,  
replication attributes –  
all taken care by DCNM

# Day in the Life of DCNM

## Underlay Using Fabric Builder



# Step 1 – Create

### Add Fabric

\* Fabric Name :

\* Fabric Template :

General | Replication | vPC | Advanced | Resources

\* BGP ASN :

Enable IPv6 Underlay  ? True if IPv6 is used in underlay

Enable Link-Local Address  ? True if IPv6 link-local address

\* Fabric Interface Numbering :

Underlay Subnet IP Mask :

Underlay Subnet IPv6 Mask :

\* Link-State Routing Protocol :

\* Route-Reflectors :

\* Anycast Gateway MAC :

NX-OS Software Image Version :

### Out-of-Box Best Practice

#### Add Fabric

\* Fabric Name :

\* Fabric Template :

Pick from pre-defined pool or input your own

General | Replication | vPC | Advanced | Resources | Manageability | Bootstrap | Config

Underlay Routing Loopback IP Range ? Typically Loopback0 IP Address Range

Underlay VTEP Loopback IP Range ? Typically Loopback1 IP Address Range

\* Underlay RP Loopback IP Range :  ? Anycast or Phantom RP IP Address Range

Underlay Subnet IP Range ? Address range to assign Numbered and Peer Link S

Underlay MPLS Loopback IP Range ? MPLS Loopback IP Address Range, used by VXLAN

\* Underlay Routing Loopback IPv6 Range :  ? Typically Loopback0 IPv6 Address Range

\* Underlay VTEP Loopback IPv6 Ra... :  ? Typically Loopback1 IPv6 Address Range

\* Underlay Anycast Loopback IPv6 Range :  ? Anycast Loopback IPv6 Address Range

Underlay Subnet IPv6 Range ? IPv6 Address range to assign Numbered and Peer L

\* Underlay BGP Router ID Range :  ? V6 Underlay only: Address range to assign BGP Ro.

\* Layer 2 VXLAN VNI Range :  ? Overlay Network Identifier Range (Min:1, Max:1677.

\* Layer 3 VXLAN VNI Range :  ? Overlay VRF Identifier Range (Min:1, Max:1677721.

\* Network VLAN Range :  ? Per Switch Overlay Network VLAN Range (Min:2, M

# Step 2 - Discover

Actions

- +
- 
- ↻
- ☁

Tabular view

Refresh topology

Save layout

Delete saved layout

Custom saved layout

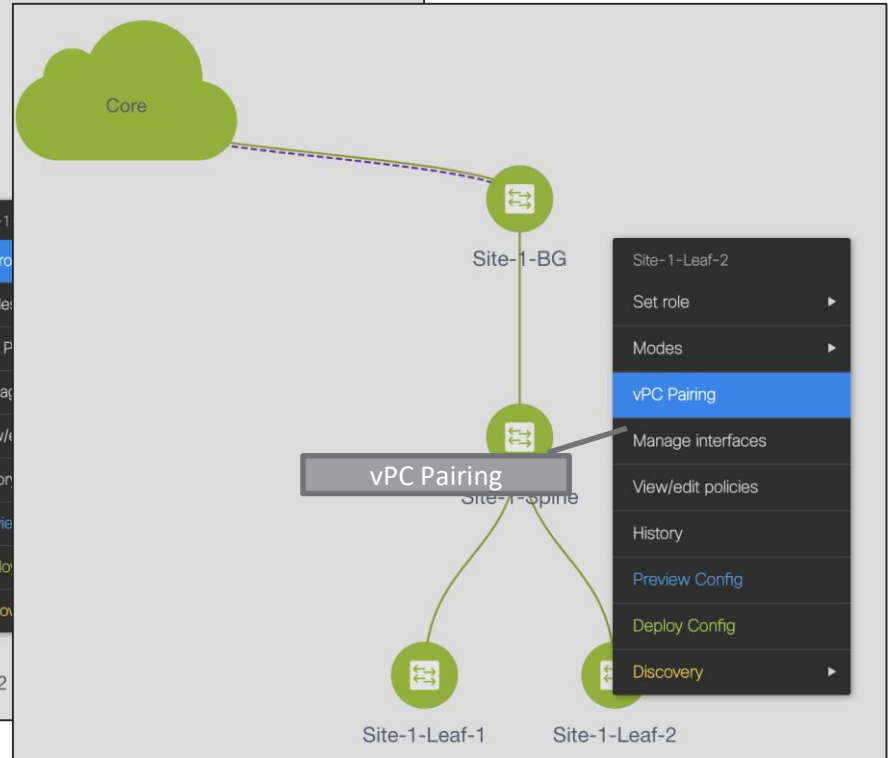
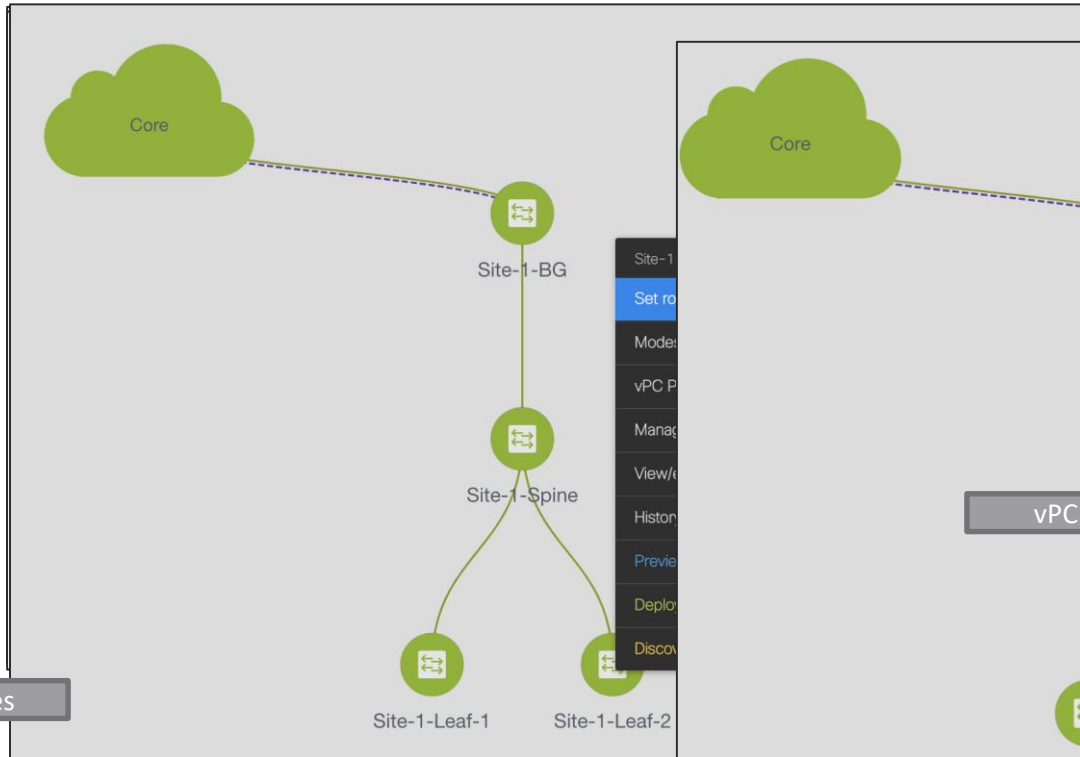
Restore Fabric

Backup Now

Re-sync Fabric

+ Add switches

Fabric Settings



Add Switches

# Step 3 - Save

Fabric Builder: VXLAN-EVPN-Site1

Save & Deploy

Changes are saved and express intent to push all configuration to the fabric.

Site1-BG1 Site1-BG2

Site1-Spine1 Site1-Spine2

Site1-Leaf1 Site1-Leaf2 Site1-Leaf3

■ Pending ■ In Sync/Success ■ Out-of-Sync/Failed ■ In Progress ■ Unknown/NA

Actions

- Tabular view
- Refresh topology
- Save layout
- Delete saved layout
- Custom saved layout
- Restore Fabric
- Backup Now
- Re-sync Fabric
- Add switches
- Fabric Settings

Save intent to generate configuration

# Step 4 - Preview

### Config Deployment

Step 1. Configuration Preview > Step 2. Configuration Deployment Status

Switch Name	IP Address	Switch Serial	Preview Config	Status	Re-sync	Pr
Site1-Leaf1	1.57.52.10	SAL1935NH8U	466 lin			
Site1-BG1	1.57.52.11	FDO21341FPK	291 lin			
Site1-BG2	1.57.52.14	FDO22130VL2	291 lin			
Site1-Leaf3	1.57.52.6	SAL1936NJ6J	444 lin			
Site1-Spine1	1.57.52.3	SAL1931L92P	311 lin			
Site1-Spine2	1.57.52.4	SAL1935NH8Y	311 lin			
Site1-Leaf2	1.57.52.8	SAL1935NHA1	466 lin			

### Config Preview - Switch 1.57.52.10

Pending Config | Side-by-side Comparison

To re-compute the *running config*, please click the Re-sync button on the previous screen. Lastly, to resolve unexpected diffs, please review the leading spaces and edit the appropriate policies to match show run outputs.

Running config	Expected config
1 !Command: show running-config	
2	!Command: Intent from DCNM Fabric Builder. Any Intent not captured in Pending Config are defaults
3 !Time: Sat May 25 17:57:39 2019	
4	aaa group server radius radius
5 boot nxos bootflash:/nxos.7.0.3.I7.2.bin	
6	use-vrf default
7	cfs eth distribute
8 copp profile strict	copp profile strict
9	fabric forwarding anycast-gateway-mac 2020.0000.00aa
10	feature bgp
11	feature dhcp
12	feature interface-vlan
13	feature lacp
14	feature lldp
15	feature ngoam
16	feature nv overlay
17	feature nxe

Preview configuration

DCNM running Configuration Compliance

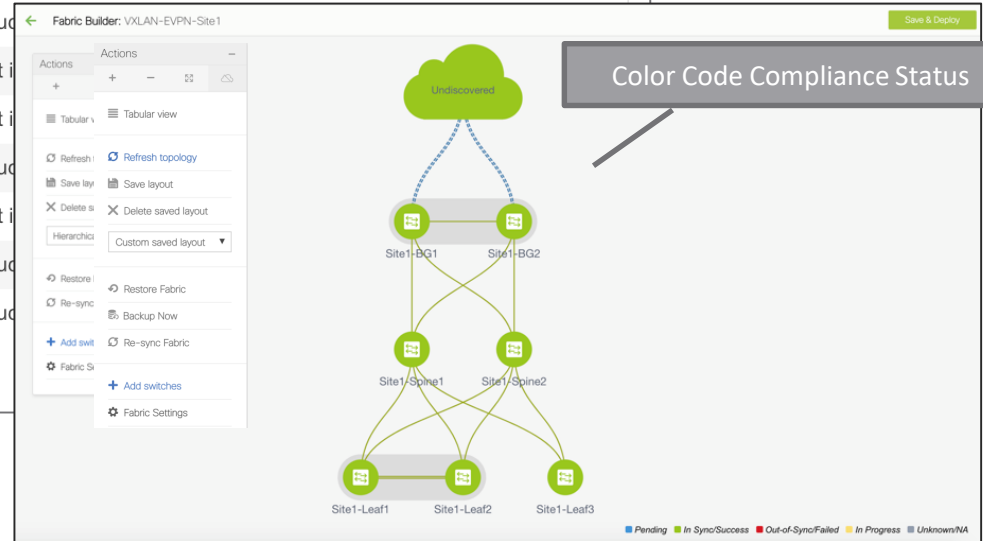
# Step 5 - Deploy

## Config Deployment

Step 1. Configuration Preview > Step 2. Configuration Deployment Status >

Switch Name	IP Address	Status	Status Description	Progress
Site1-Spine2	1.57.52.4	COMPLETED	Deployed successfully	
Site1-Leaf1	1.57.52.10	STARTED	Deployment in progress	
Site1-Leaf3	1.57.52.6	STARTED	Deployment in progress	
Site1-Spine1	1.57.52.3	COMPLETED	Deployed successfully	
Site1-Leaf2	1.57.52.8	STARTED	Deployment in progress	
Site1-BG2	1.57.52.14	COMPLETED	Deployed successfully	
Site1-BG1	1.57.52.11	COMPLETED	Deployed successfully	

Parallel deployment of configurations once approved by user





# Day in the Life of DCNM

## Interface Management

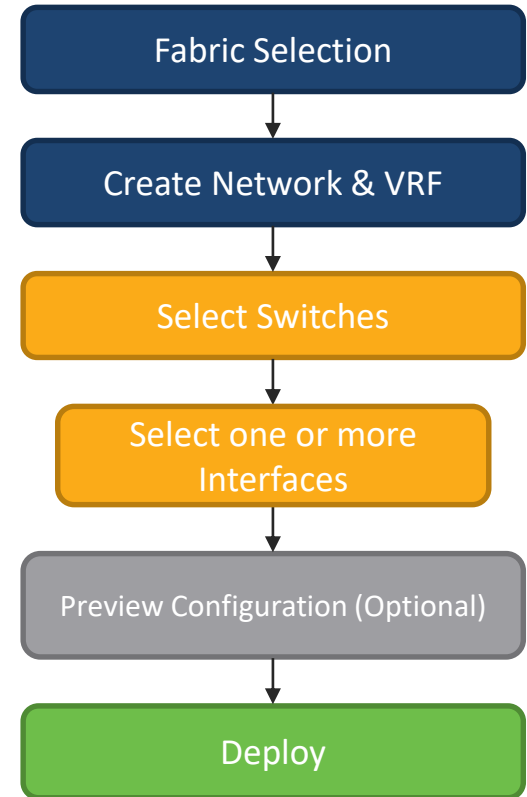
The screenshot displays the Cisco DCNM interface management page. On the left is a navigation sidebar with categories: Control (Dashboard, Topology, Control, Monitor, Administration, Applications), Fabrics (Fabric Builder, Interfaces, Networks & VRFs, Migration), Management (Resources, Virtual Machine Manager, Template Library, Image Management, Repositories, Endpoint Locator, Configure, LAN Telemetry, Configure, Health), and Control (Control, Fabrics, Interfaces, Networks & VRFs, Migration). The main content area is titled 'Control / Fabrics / Interfaces' and shows a table of interfaces. A search bar is located at the top right of the table. Below the table is a toolbar with icons for adding, editing, and managing interfaces. Callouts point to various features: '24hrs Performance Stats' points to the sidebar; 'Search Bar' points to the search input; 'Config Compliance Status' points to a green checkmark in the status column; 'Flexible customizable Policies' points to the 'Policy' column; 'Link Status' points to a red 'Link not connected' status; and 'Controls' points to the toolbar. Below the toolbar are six buttons: 'Add I/F' (blue), 'Edit' (green), 'Shut / No Shut' (grey), 'Show' (purple), 'Rediscover' (red), and 'Policy History' (orange).

Device Name	Name	Admin	Oper	Reason	Policy	Overlay Network	Status	PC	vPC ID
Leaf-1	mgmt0	↑	↑	ok	NA	NA	✓		
Leaf-1	Vlan1	↓	↓	Administratively down	NA	NA	✗		
Leaf-1	Vlan3600	↓	↓	ok	int_fabric_vlan	NA	✗		
Leaf-1	Loopback0	↑	↑	ok	int_fabric_loopback	NA	✓		
Leaf-1	Loopback1	↑	↑	ok	int_fabric_loopback	NA	✓		
Leaf-1	Port-channel500	↑	↑	ok	vpc_peer_link	NA	✓		
Leaf-1	Ethernet1/1	↑	↑	ok	int_fabric_p2p	NA	✓		
Leaf-1	Ethernet1/2	↑	↑	ok	int_fabric_p2p	NA	✓		
Leaf-1	Ethernet1/3	↑	↑	ok	trunk_host	NA	✓		
Leaf-1	Ethernet1/4	↑	↑	ok	trunk_host	NA	✓		
Leaf-1	Ethernet1/5	↑	↑	ok	vpc_peer_link_po...	NA	✓	500	
Leaf-1	Ethernet1/6	↑	↑	ok	vpc_peer_link_po...	NA	✓		
Leaf-1	Ethernet1/7	↑	↓	Link not connected	trunk_host	NA	✗		

# Day in the Life of DCNM

## Overlay Management

- Top-Down deployment via GUI or REST APIs
- Network/VRF Creation with custom Overlay Policies
- Deployment to switches and/or interfaces
- Per Network/Per Switch deployment history
- Overlay Resource Manager Tracking for VNIs, VLANs etc.
- Centralized tracking of all deployment including Overlays in Fabric Builder



# VXLAN-EVPN External Connectivity Deployment

## VRF Lite and Multi-Site

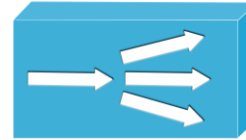
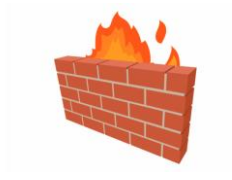
- Provisions external connectivity from Borders to WAN
  - VRF Lite using sub-interfaces
  - Devices in External fabrics can be any Nexus, Neighbor, or Meta
- Provisions Layer-2 and Layer-3 DCI Connectivity with EVPN Multi-Site via Border Gateways
  - Workflow for Multi-Site Underlay and Overlay external connection peering using a Multi-Site Domain (MSD)
  - MSD is a fabric of fabrics
    - One-time definition for Networks and VRFs
    - TRM support added

# DCNM L4-7 Services Integration

## What is it?

- Network orchestration of L4-7 service appliances attached to a VXLAN EVPN Fabric
- Service Appliance Attachment
- Service Policy Definition
- Topology Visualization
- Monitoring the Service Appliance Health
  - How much traffic is traversing Service Nodes
- No configuration will be done on the service appliances themselves

# Supported Use-Cases



Virtual & Physical Form Factor  
Static and Dynamic Peering  
vPC/Non-vPC Attachments

## Intra-tenant/Inter-tenant

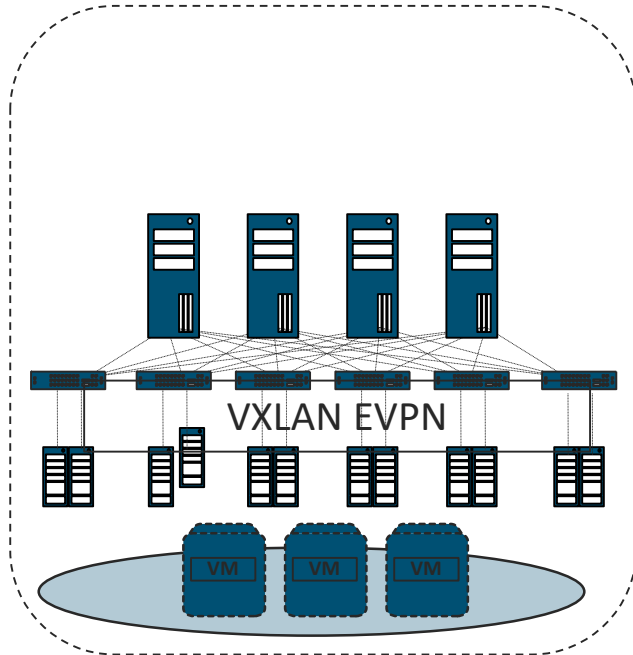
- PBR Use-cases
- Tenant-Edge Firewall

## One-armed/Two-armed

- PBR Use-case (No SNAT)

# DCNM - Tying On-Prem To Public Cloud

On-Prem



Public Cloud



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# Brownfield VXLAN Deployment



Already using VXLAN?  
Want to use DCNM for managing your existing fabrics?



DCNM fully supports  
Brownfield



Non-disruptive import  
of existing VXLAN  
EVPN deployments



Manage fabric as if  
provisioned from  
DCNM

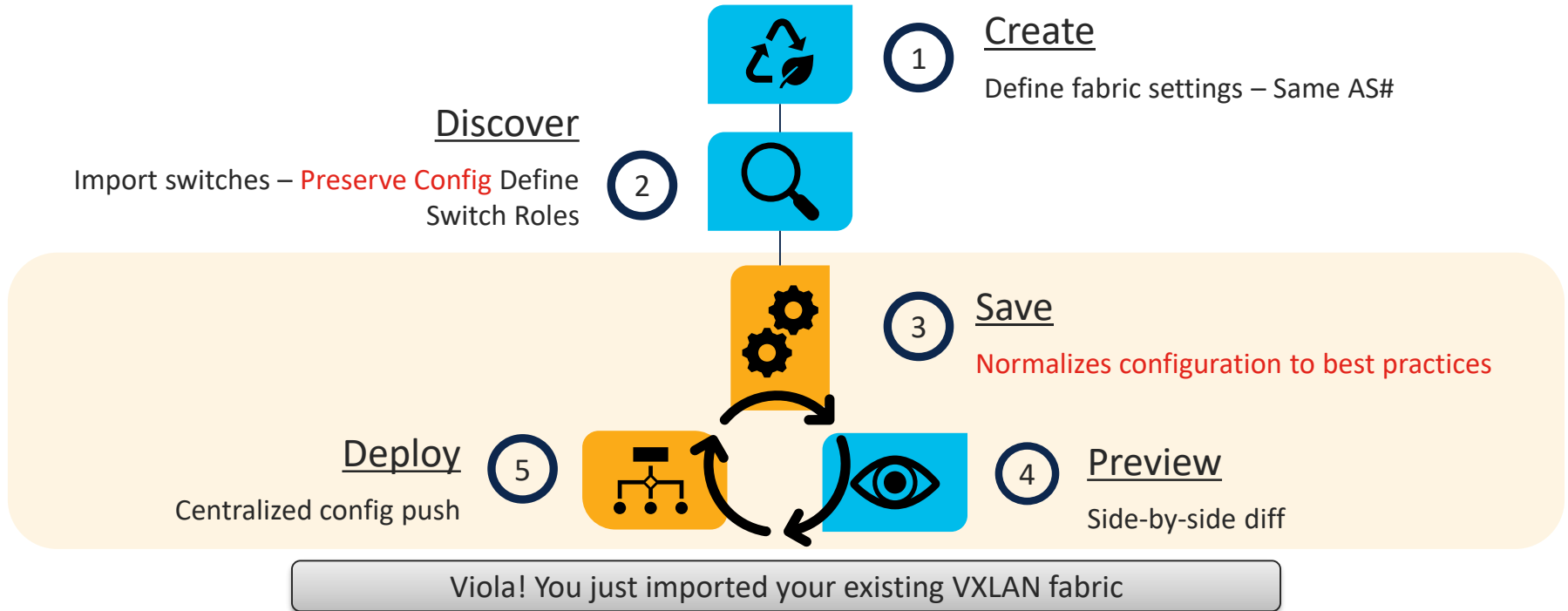


Learns topology, all  
configuration,  
associated resources, IP  
subnets, VNIs, VLANs  
etc.



# Day in the Life of DCNM

## Underlay Using Fabric Builder



# Import Switches – Preserve Config

Actions

- Tabular view
- Refresh topology
- Save layout
- Delete saved layout
- Custom saved layout
- Restore Fabric
- Backup Now
- Re-sync Fabric
- Add switches
- Fabric Settings

### Inventory Management

Discover Existing Switches | PowerOn Auto Provisioning (POAP)

Discovery Information > Scan Details >

Seed IP: 1.57.52.6  
Ex: \*2.2.2.20\*; \*10.10.10.40-60\*; \*2.2.2.20, 2.2.2.21\*

Authentication Protocol: MD5

Username: admin

Password: .....

Max Hops: 2 hop(s)

Preserve Config: no  yes  
Selecting 'no' will clean up the configuration on switch(es)

Start discovery

Add Switches

Device Discovery: Provide IP Address & Numbers of Hops OR Range of IPs

Brownfield: Preserve Config = 'Yes'

1

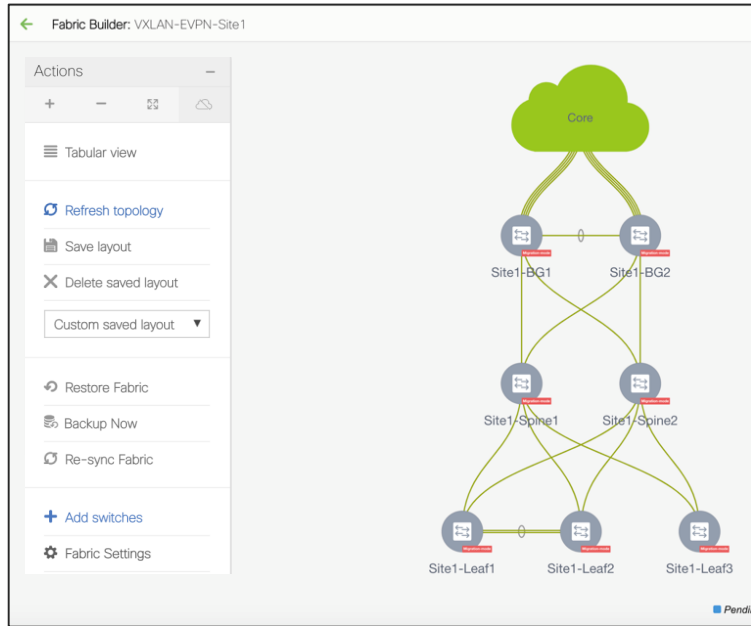
2

3

Import Existing VXLAN-EVPN Fabric

# Migration Mode

## Population and Calculation of Configurations



### Config Deployment

Step 1. Configuration Preview > Step 2. Configuration Deployment Status >

Switch Name	IP Address	Switch Serial	Preview Config	Status	Re-sync	Progress
Site1-Leaf1	1.57.52.10	SAL1935NH8U	57 lines	Out-of-sync		100%
Site1-BG1	1.57.52.11	FDO21341FPK	0 lines	In-sync		100%
Site1-Leaf3	1.57.52.6	SAL1936NJ6J	55 lines	Out-of-sync		100%
Site1-Spine1	1.57.52.3	SAL1931L92P	0 lines	In-sync		100%
Site1-Spine2	1.57.52.4	SAL1935NH8Y	0 lines	In-sync		100%
Site1-Leaf2	1.57.52.8	SAL1935NHA1	57 lines	Out-of-sync		100%
Site1-BG2	1.57.52.14	FDO22130VL2	0 lines	In-Sync		100%

Deploy Config

# Verification of Overlays

The image displays three overlapping screenshots of the Cisco Data Center Network Manager (DCNM) interface, illustrating the verification of overlays in a VXLAN-EVPN environment.

**Top Screenshot:** Shows the 'SCOPE: VXLAN\_EVPN...' dropdown menu and the 'admin' user profile. A 'Check & Publish' button is visible.

**Middle Screenshot:** Shows the 'Data Center Network Manager' interface with the 'Network / VRF Selection' breadcrumb. A 'VRF View' button is present. The 'Networks' section displays a table:

Network Name	Network ID
Auto_Net_VNI3000_VLAN...	30000
Auto_Net_VNI30001_VLAN...	30001

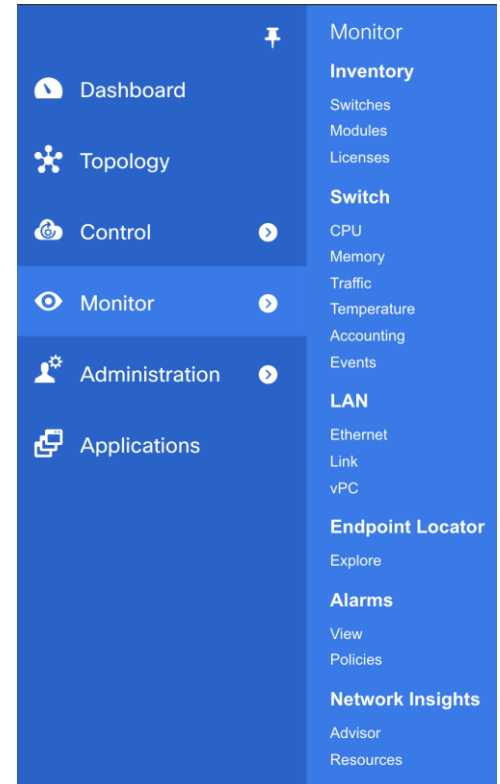
**Bottom Screenshot:** Shows the 'Data Center Network Manager' interface with the 'Network / VRF Deployment' breadcrumb. A 'Deploy' button and a 'Detected View' button are visible. The network diagram shows a multi-tier architecture with a CORE cloud at the top, connected to Site1-BG1 and Site1-BG2. Below are Site1-Spine1 and Site1-Spine2, and at the bottom are Site1-Leaf1, Site1-Leaf2, and Site1-Leaf3. A legend at the bottom indicates the status of various components: Pending (blue), In Sync/Success (green), Out-of-Sync/Failed (red), In Progress (yellow), and Unknown/NA (grey).

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# We Got Your Day 2 Needs Covered!

- Real-Time Network View
- Common Operations
  - Update Credentials, Policies, etc.
- Configuration Compliance
- Resync Fabric
- Backup and Restore
- Endpoint Locator
- Virtual Machine Manager (VMM) / Kubernetes Cluster Visualization
- VXLAN OAM
- Software Upgrades/RMA
- Network Insights



# Real Time Topology View

Multilayer  
Topology  
Views

The screenshot displays the Cisco Data Center Network Real Time Topology View. The interface includes a left-hand navigation menu with options: Dashboard, Topology, Control, Monitor, Administration, and Applications. The main area shows a network topology with nodes like RR2, Site1-BG2, Site1-Spine1, Site1-Spine2, Site1-Leaf1, Site1-Leaf2, Site1-Leaf3, Site2-BG1, Site2-Spine2, Site2-Spine1, Site2-Leaf3, Site2-Leaf2, and Site2-Leaf1. A search bar at the top left is labeled "Real-Time Search". A callout box labeled "Health Score (color)" points to a node. A callout box labeled "Link Pop-Up" points to a link between nodes. A callout box labeled "Layout Options" points to a button at the bottom. On the right, a "Pop-Up Switch Dashboard" for Site2-Leaf2 is shown, containing a summary, 24-hour traffic graph, and health status.

**Real-Time Search**

**Health Score (color)**

**Link Pop-Up**

**Layout Options**

**Pop-Up Switch Dashboard**

**Site2-Leaf2**  
1.57.52.9  
N9K-C9372PX

**Summary**

Status: ✔ ok

Serial number: SAL19361

CPU: 42%

Memory: 42%

**24 Hour Traffic**

	Avg	Max	Min
Rx	32.3 Bytes	46 Bytes	4 Bytes
Tx	32.8 Bytes	50 Bytes	4 Bytes

**Health**

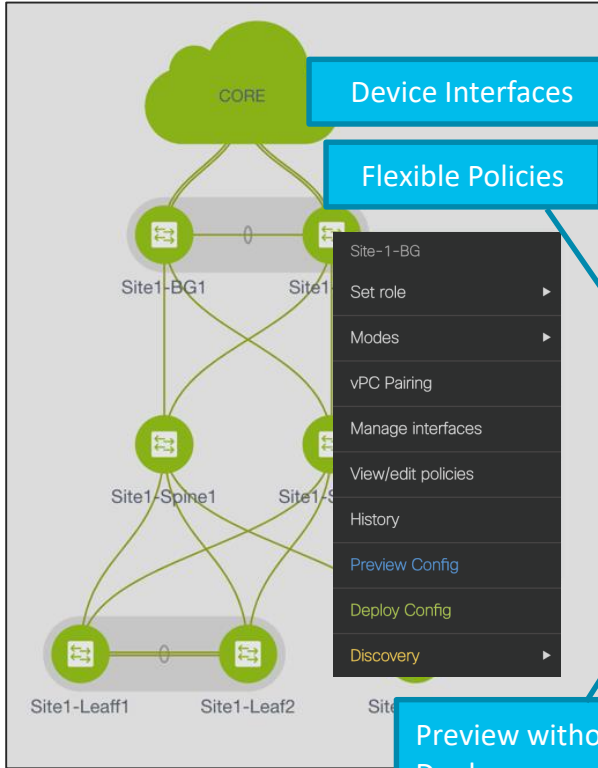
96%

- Modules in warning: 1/13
- Switch ports in warning: 0/63
- Events marked in warning or higher: 1/1000

**Tags**

System Tags

# Device Options



Device Interfaces

Flexible Policies

- Site-1-BG
- Set role
- Modes
- vPC Pairing
- Manage interfaces
- View/edit policies
- History
- Preview Config
- Deploy Config
- Discovery

Preview without  
Deploy

Device Options

- Site-1-BG
- Set role
- Modes
- vPC Pairing
- Manage interfaces
- View/edit policies
- History
- Preview Config
- Deploy Config
- Discovery

Device-Level  
Deployment

Device Roles

- Roles
- Spine (current)
- Leaf
- Border
- Border Spine
- Border Gateway
- Border Gateway Spine
- Super Spine
- Border Super Spine
- Border Gateway Super Spine

Configuration Status  
& History

Device Modes

- Maintenance Mode
- Active/Operational Mode

RMA

Discovery



- Update device credentials
- Reload
- Rediscover
- Remove from fabric










# View Operational Status









Fabric Builder -> Fabric -> Tabular View -> Operational View

Switches Links **Operational View**

Selected 0 / Total 8  

Show All  

	<input type="checkbox"/>	Fabric Name	Name	isPresent?	Link State	Link Type
1	<input type="checkbox"/>	shyam-fx2<->terry-fx2	leaf1~Ethernet1/48 --- terry-spine~Ethernet1/47	true	 FULL	OSPF
2	<input type="checkbox"/>	shyam-fx2	bg~Loopback0 --- spine~Loopback0	true	 Established	BGP
3	<input type="checkbox"/>	shyam-fx2	bg~Ethernet1/45 --- spine~Ethernet1/45	true	 FULL	OSPF
4	<input type="checkbox"/>	shyam-fx2	spine~Loopback0 --- leaf3~Loopback0	true	 Established	BGP
5	<input type="checkbox"/>	shyam-fx2	spine~Loopback0 --- leaf1~Loopback0	true	 Established	BGP
6	<input type="checkbox"/>	shyam-fx2	leaf1~mgmt0 --- leaf2~mgmt0	true	 peer-alive	VPC_KEEPALIVE
7	<input type="checkbox"/>	shyam-fx2	spine~Loopback0 --- leaf2~Loopback0	true	 Established	BGP
8	<input type="checkbox"/>	shyam-fx2<->terry-fx2	leaf1~Vlan3600 --- terry-leaf2~Vlan3600	true	 FULL	OSPF

# Template Library – Customize or Create New

The screenshot displays the Cisco Data Center Network Manager interface. The left sidebar shows navigation options: Dashboard, Topology, Control, Monitor, Administration, and Applications. The main area is titled "Control / Template Library" and shows a list of templates on the left and a "Template Content" editor on the right. The "Easy\_Fabric\_11\_1" template is selected, showing its content in a code editor. Two callout boxes highlight "Content Type: Python Template" and "Template Content".

```
1 ##template variables
2
3 # Copyright (c) 2018 by Cisco Systems, Inc.
4 # All rights reserved.
5
6 @(IsMandatory=true, IsFabricType=true, DisplayName="Fabric Type", ReadOnly=true, Section="Hidden")
7 string FABRIC_TYPE
8 {
9   defaultValue=Switch_Fabric;
10 };
11
12 @(IsMandatory=true, IsFabricName=true, DisplayName="Fabric Name", Description="Please provide the fabric name to be used for the fabric")
13 string FABRIC_NAME{
14   minLength = 1;
15   maxLength = 32;
16 };
17
18 @(IsMandatory=true, IsAsn=true, Description="3-4294967295 | 1-65535[.0-65535]", DisplayName="BGP ASN")
19 string BGP_ASN{
20   minLength=1;
21   maxLength=11;
22 };
23
24 @(IsMandatory=true, Enum="p2p,unnumbered", DisplayName="Fabric Interface Numbering", Description="Numbered(Point-to-Point) or Unnumbered")
25 string FABRIC_INTERFACE_TYPE
26 {
27   defaultValue=p2p;
28 };
29
30 @(IsMandatory=true, Enum="30,31", Description="Mask for Underlay Subnet IP Range", DisplayName="Underlay Subnet IP Mask")
31 integer SUBNET_TARGET_MASK
32 = {
33   min = 30;
34   max = 31;
35   defaultValue=30;
36 };
37
```

Fabric Templates

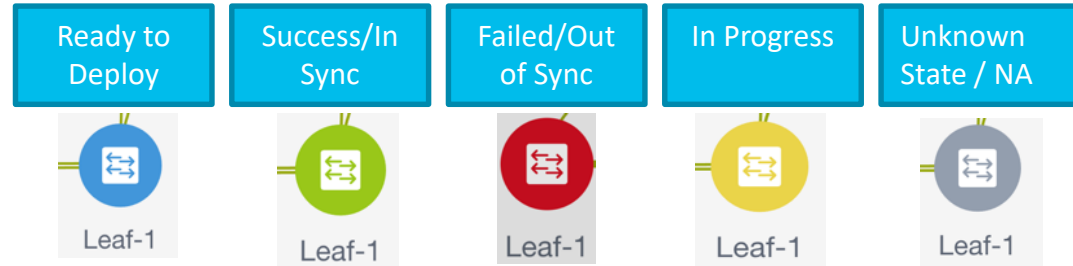
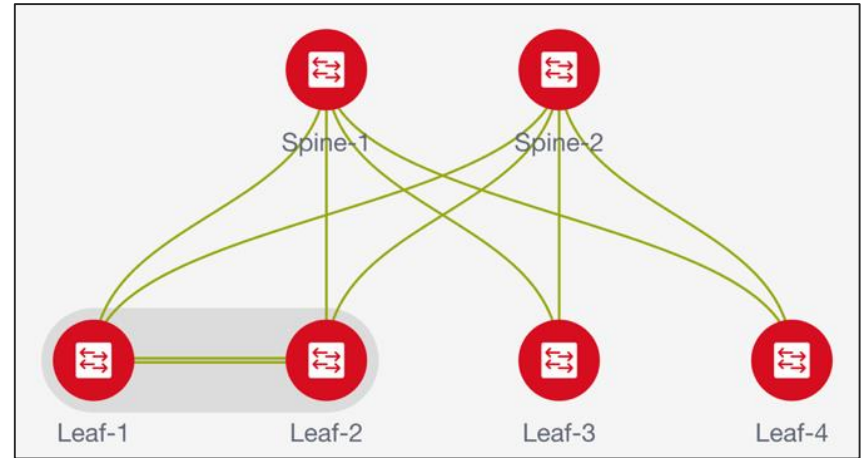
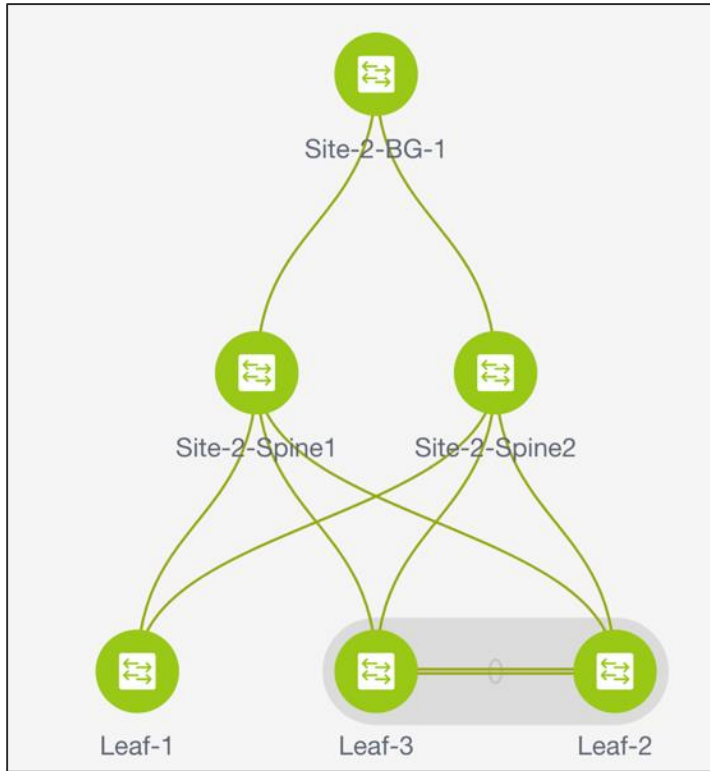
Policy Templates

Interface Templates

Profile Templates

Show Templates

# Configuration Compliance



# Network Backup and Restore

The screenshot displays the Cisco Fabric Builder interface for a fabric named 'Easy\_Fabric\_11\_1'. The 'Actions' menu on the left includes options like 'Restore Fabric', 'Backup Now', and 'Re-sync Fabric'. A 'Restore Fabric' dialog box is open, showing a calendar for selecting a backup date. A 'View Backup Summary' dialog box is also visible, displaying a table of switch configurations.

**Manual backups – Black**  
**Scheduled backups - Blue**

**Backup now**

**Tag backups**

**View Delta Config**

Switch Name	Switch Serial	Ip Address	Delta Config
N9K-44	FOX2203PE0S	10.127.117.44	3 lines
N9K-40	FDO222419B7	10.127.117.40	20 lines
N9K_41	FDO222425SE	10.127.117.41	65 lines
N9K_42	FDO22240HJP	10.127.117.42	54 lines

# DCNM Keeps Track – Resource Manager

The screenshot displays the Cisco Data Center Network Manager (DCNM) interface, specifically the Resource Allocation section. The interface is divided into several panels:

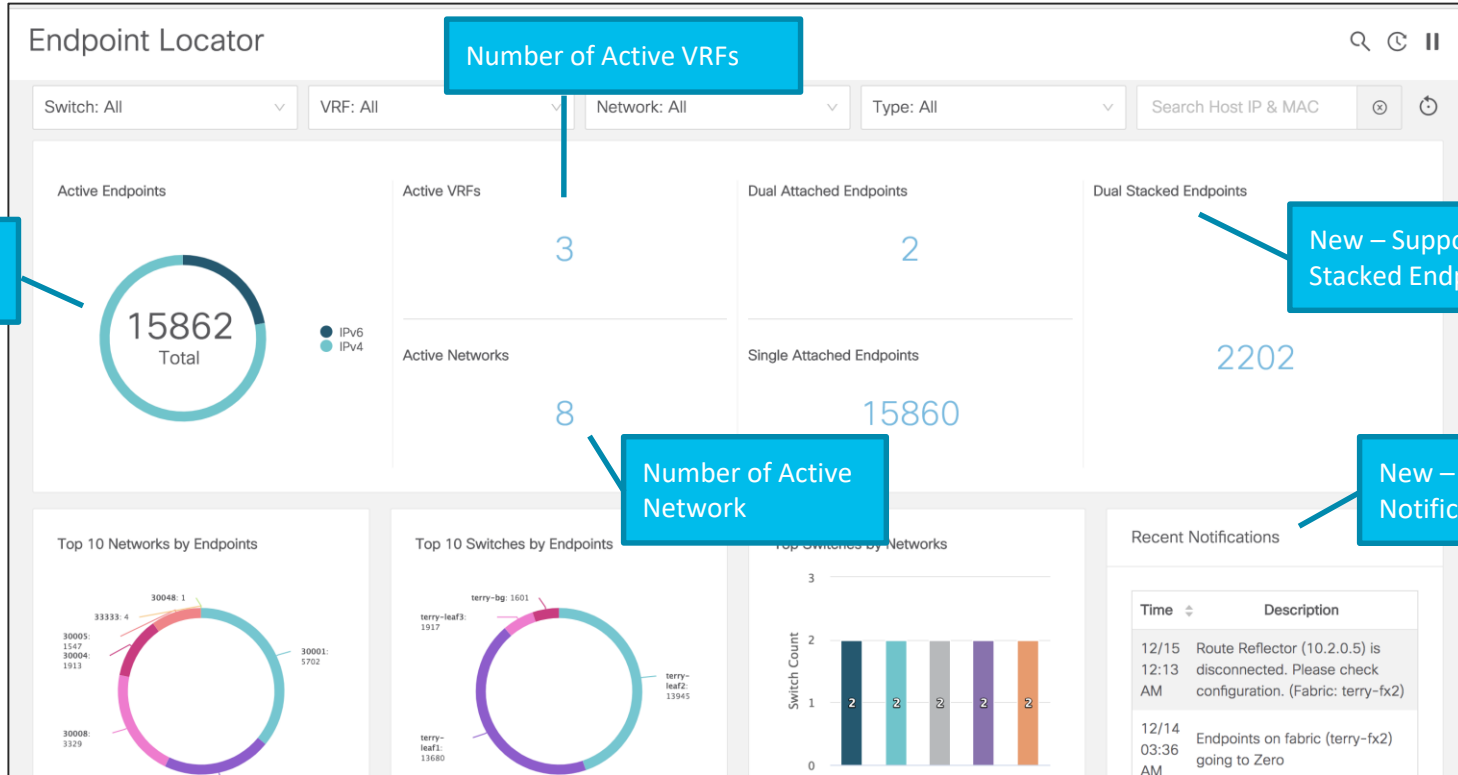
- Left Panel:** A navigation menu with options: Dashboard, Topology, Control, Monitor, Administration, and Applications.
- Top Panel:** Shows the current scope as 'MSD-1' and the user as 'admin'.
- Table:** A table listing resource allocation details. The columns are: Scope Type, Scope, Allocated To, Resource Type, Is Allocated?, and Allocated On. The table contains 20 rows of data for various devices and resource types.
- Right Panel:** A secondary view of the Resource Allocation section, showing the scope as 'fab1' and the user as 'admin'. It includes a 'Show' dropdown set to 'All'.

Callouts highlight specific elements:

- L2/L3 VNI:** Points to the 'Resource Type' column in the table.
- MSD:** Points to the 'SCOPE: MSD-1' dropdown in the top panel.
- FABRIC:** Points to the 'SCOPE: fab1' dropdown in the right panel.
- Devices:** Points to the 'Device' entries in the table.
- Deployment Type:** Points to the 'Resource Type' column in the table.
- Serial Number:** Points to the 'Allocated To' column in the table.

Scope Type	Scope	Allocated To	Resource Type	Is Allocated?	Allocated On	
Device	SAL18432P4S	2003	Beer_Corona	TOP_DOWN_VRF_VLAN	Yes	6/12/2018, 8:51:52 AM
Device	SAL18432P4X	10	MyNetwork_30003	TOP_DOWN_NETWORK_VLAN	Yes	6/3/2018, 11:30:12 PM
Device	SAL18432P4X	301	MyNetwork_30002	TOP_DOWN_NETWORK_VLAN	Yes	6/3/2018, 10:20:05 PM
Device	SAL18432P4X	400	MyNetwork_30006	TOP_DOWN_NETWORK_VLAN	Yes	6/3/2018, 11:30:29 PM
Device	SAL18432P4X	401	MyNetwork_30007	TOP_DOWN_NETWORK_VLAN	Yes	6/3/2018, 11:30:37 PM
Device	SAL18432P4X	500	MyNetwork_30008	TOP_DOWN_NETWORK_VLAN	Yes	6/3/2018, 11:30:46 PM
Device	SAL18432P4X	500	port-channel500	PORT_CHANNEL_ID	Yes	6/2/2018, 2:14:21 PM
Device	SAL18432P4X	501	MyNetwork_30009	TOP_DOWN_NETWORK_VLAN	Yes	6/3/2018, 11:30:46 PM
Device	SAL18432P4X	600	MyNetwork_30000	TOP_DOWN_NETWORK_VLAN	Yes	6/3/2018, 11:30:46 PM
Device	SAL18432P4X	601	MyNetwork_30001	TOP_DOWN_NETWORK_VLAN	Yes	6/3/2018, 11:30:46 PM
Device	SAL18432P4X	2000	MyVRF_50000	TOP_DOWN_VRF_VLAN	Yes	6/3/2018, 11:30:46 PM
Device	SAL18432P4X	2001	for	TOP_DOWN_VRF_VLAN	Yes	6/3/2018, 11:30:46 PM
Device	SAL18432P4X	2002	for	TOP_DOWN_VRF_VLAN	Yes	6/3/2018, 11:30:21 PM
Device	SAL18432P4X	2003	for	TOP_DOWN_VRF_VLAN	Yes	6/3/2018, 11:30:29 PM
Device	SAL18432P4X	2004	for	TOP_DOWN_VRF_VLAN	Yes	6/3/2018, 11:30:46 PM
Device	SAL18432P4X	2005	for	TOP_DOWN_VRF_VLAN	Yes	6/4/2018, 4:07:05 PM
Device	SAL18432P4S	114	MyNetwork_30014	TOP_DOWN_NETWORK_VLAN	Yes	6/9/2018, 10:37:52 AM
Device	SAL18432P4S	115	MyNetwork_30015	TOP_DOWN_NETWORK_VLAN	Yes	6/9/2018, 11:05:57 AM
Device	SAL18432P4S	301	MyNetwork_30002	TOP_DOWN_NETWORK_VLAN	Yes	6/3/2018, 10:20:05 PM
Device	SAL18432P4S	600	MyNetwork_30000	TOP_DOWN_NETWORK_VLAN	Yes	6/3/2018, 10:10:48 PM
Device	SAL18432P4S	601	MyNetwork_30001	TOP_DOWN_NETWORK_VLAN	Yes	6/3/2018, 10:18:51 PM

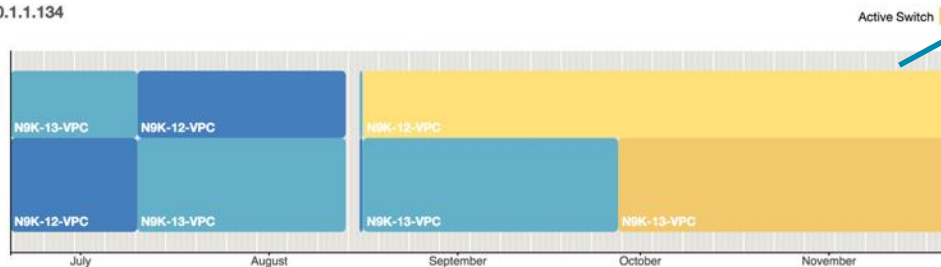
# Endpoint Locator (EPL)



# Endpoint Locator (EPL)

- How many hosts on vlan 10 on eth1/1 on Leaf10 at 11/01/2020 between 2am - 3am?
- How many networks and VRFs are active on leafs 1-10?
- Network activity heat-map

IP: 60.1.1.134

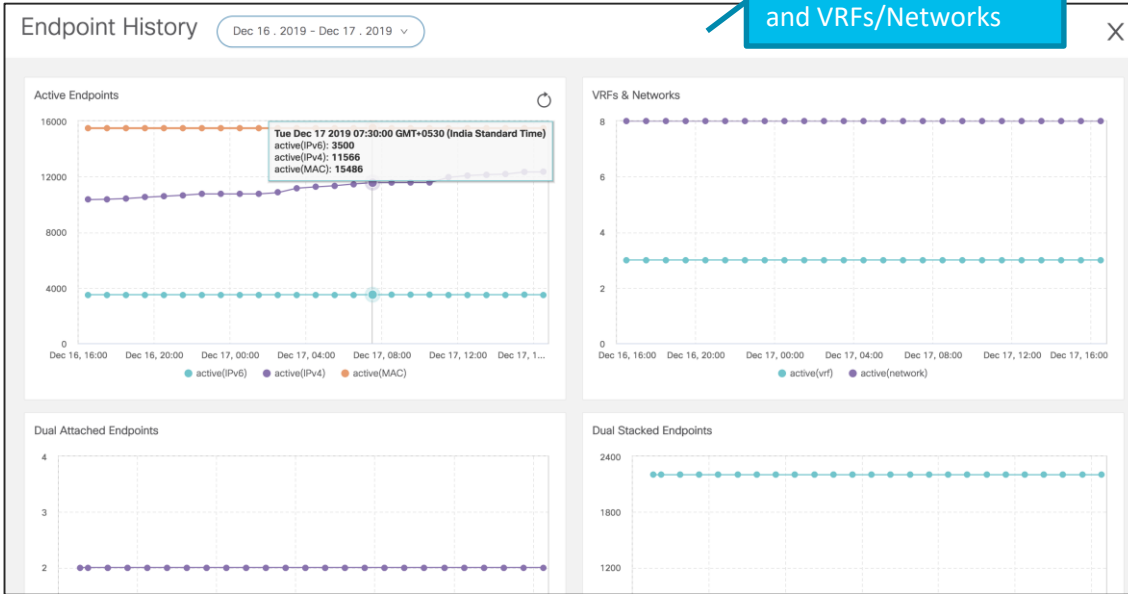


Graphical view of host life-cycle on the network

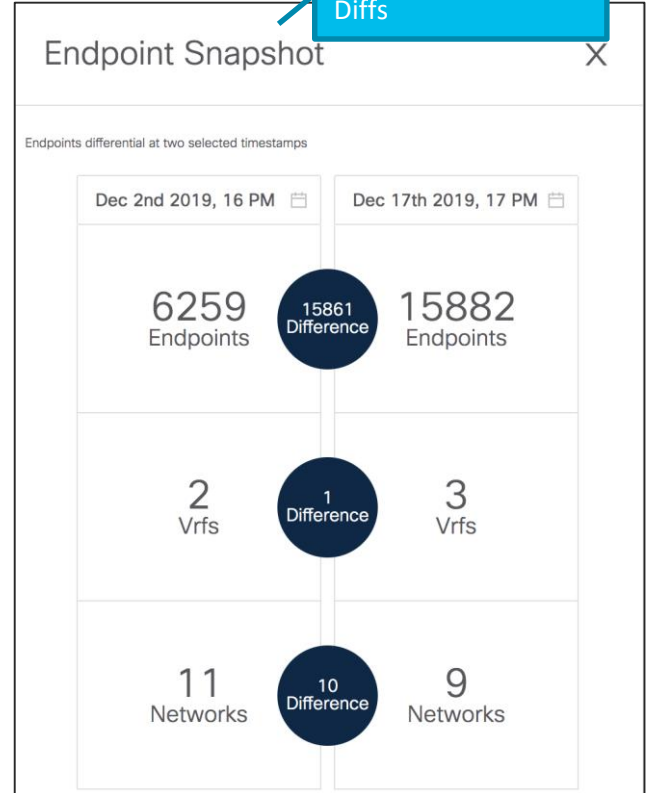
Endpoint Locator (EPL)

# Endpoint Locator (EPL)

History of Endpoints and VRFs/Networks

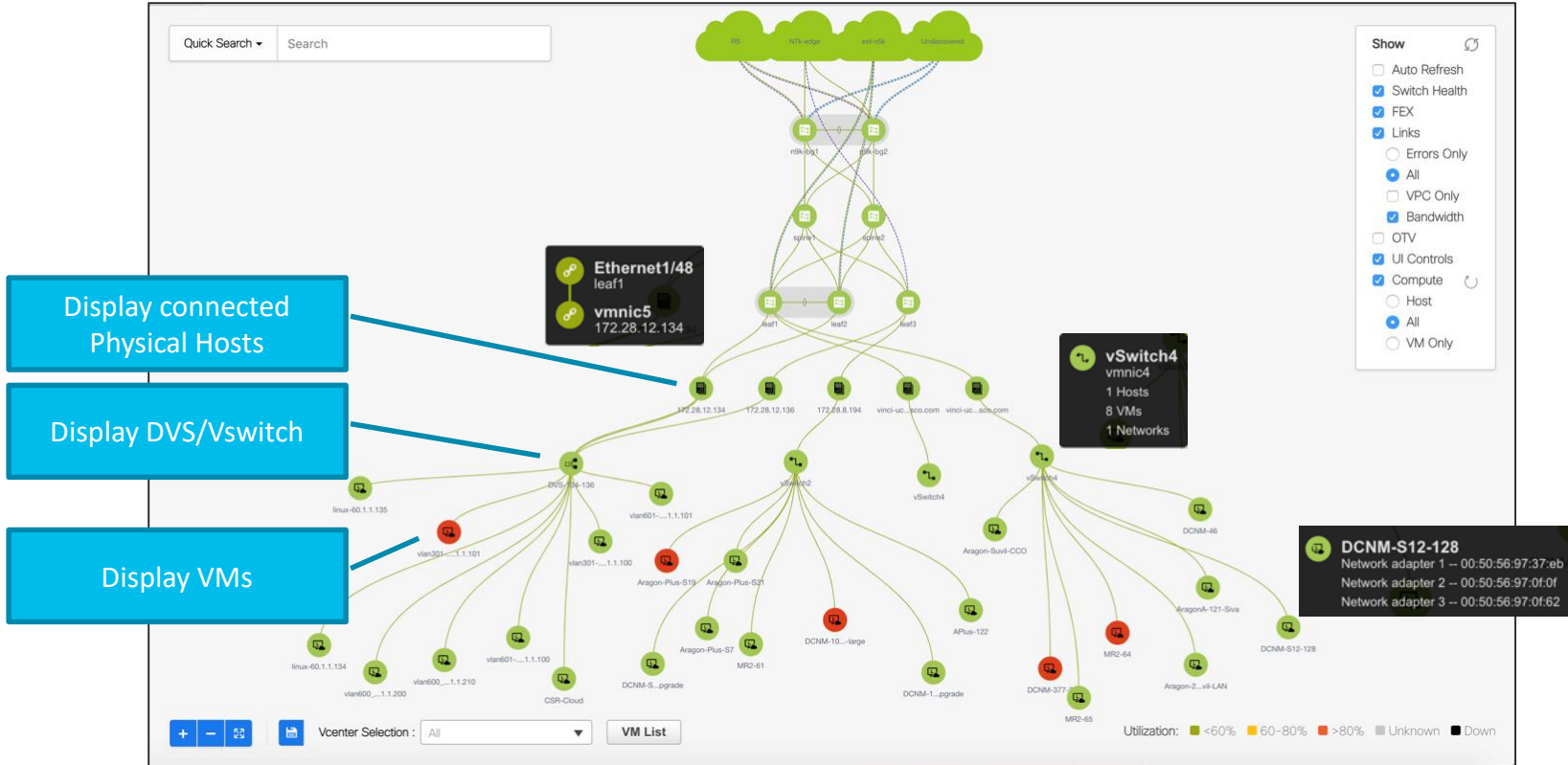


Ability to Generate Diffs





# Virtual Machine Manager – Compute Visibility

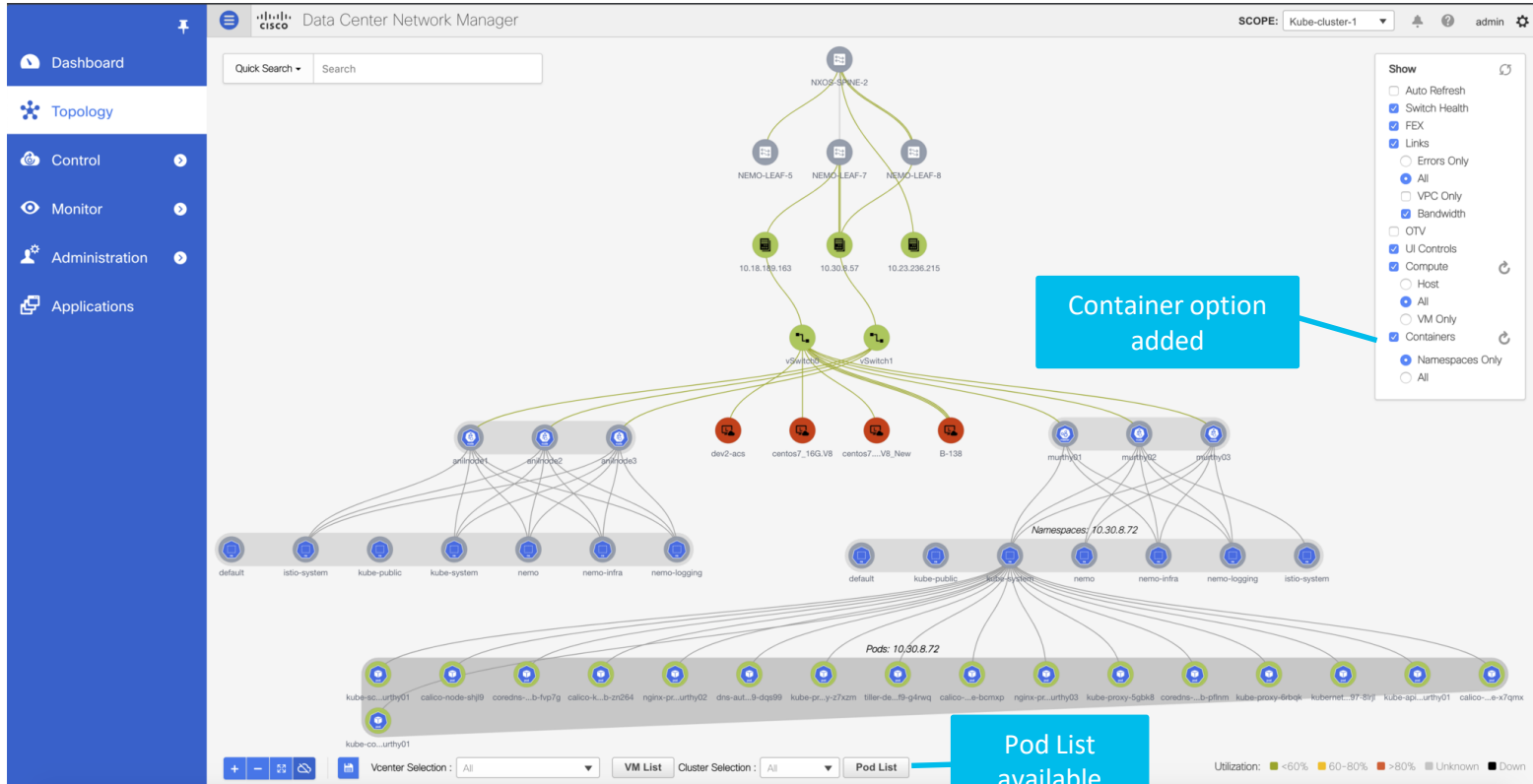


Display connected Physical Hosts

Display DVS/Vswitch

Display VMs

# Kubernetes Cluster Visualization in Topology



# VXLAN OAM

The screenshot displays the Cisco Data Center Network Manager interface for configuring VXLAN OAM. The configuration form on the left includes the following fields:

- Layer 2 Only
- \* Source IP: 60.1.1.200
- \* Destination IP: 61.1.1.100
- \* VRF: myvrf\_50000
- Source Port: 5000
- Destination Port: Http 80
- Protocol: TCP 6

Red callout boxes with arrows point to these fields with the following labels:

- Source IP (points to 60.1.1.200)
- Destination IP (points to 61.1.1.100)
- VRF (points to myvrf\_50000)
- Payload Information (Optional) (points to Source Port, Destination Port, and Protocol)

The network topology on the right shows a multi-tiered structure:

- site2 (cloud icon)
- n9k-bg1 and n9k-bg2 (border gateways)
- spine1 and spine2 (spine switches)
- leaf1, leaf2, and leaf3 (leaf switches)

At the bottom right, a utilization legend is provided: Utilization: <60% (green), 60-80% (yellow), >80% (red), Unknown (grey), Down (black).

# VXLAN OAM

The screenshot displays the Cisco Data Center Network Manager interface. On the left is a navigation sidebar with options: Dashboard, Topology, Control, Monitor, Administration, and Applications. The main area is titled 'VXLAN OAM' and includes a search bar and a 'Switch to switch' dropdown set to 'Host to host'. Below this are configuration fields for Source IP (60.1.1.200), Destination IP (61.1.1.100), VRF (myvrf\_50000), Source Port (5000), Destination Port (Http 80), and Protocol (TCP 6). There are 'Details', 'Clear Data', and 'Submit' buttons.

A modal window titled 'Host to Host OAM Details' is open, showing statistics for two interfaces:

Ingress Interface	
Index	1
Switch Name	spine1
IP address	11.4.0.29
if_name	Eth1/45
if_state	UP
rx_len	84
rx_bytes	174011548
rx_pkt_rate	0
rx_byte_rate	104
rx_load	10
rx_ucast	533211
rx_mcast	1194326
rx_bcast	3
rx_discards	0
rx_errors	0
rx_unknown	0
rx_bandwidth	10000000
tx_len	76
tx_bytes	133952753
tx_pkt_rate	0
tx_byte_rate	60
tx_load	10
tx_ucast	533207
tx_mcast	801855
tx_bcast	2
tx_discards	0
tx_errors	0
tx_bandwidth	10000000

Egress Interface	
if_name	Eth1/43
if_state	UP
rx_len	84
rx_bytes	165781024
rx_pkt_rate	0
rx_byte_rate	44
rx_load	10
rx_ucast	635682
rx_mcast	905918
rx_bcast	1
rx_discards	0
rx_errors	0
rx_unknown	0
rx_bandwidth	10000000

The background shows a network topology with a cloud labeled 'site2' connected to spine2, which is connected to leaf1, leaf2, and leaf3. A legend at the bottom right indicates utilization levels: <60% (green), 60-80% (yellow), >80% (red), Unknown (grey), and Down (black).

# Install RPM/SMU

Click + to start

Select devices to install RPM/SMU

Select packages from default repository or external system

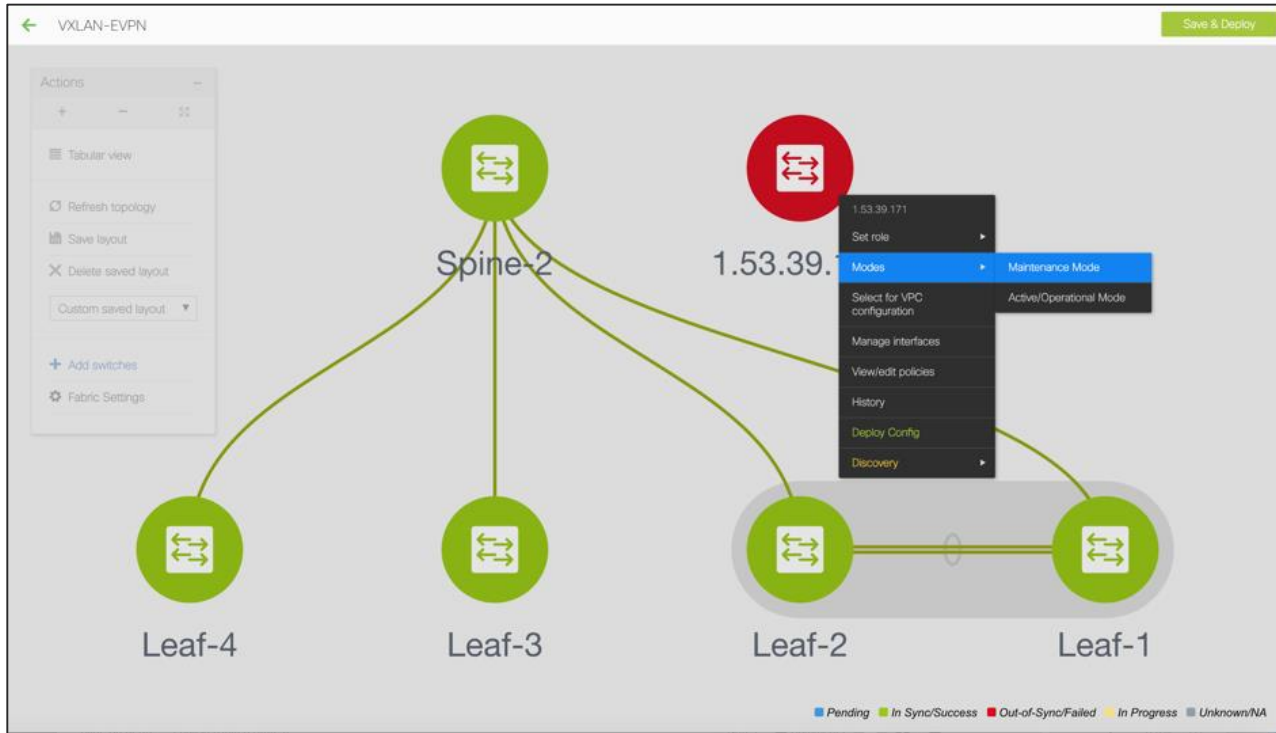
Finish install

1 Select Devices ✓ → 2 Specify Packages ✓

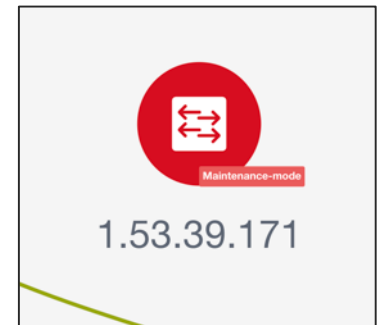
Switch Name	Packages/Patches	IP Address	Version
leaf2	/var/lib/dcnm/upload/N9K/ios.CSCvg6193...	192.168.126.157	9.3(1)

Previous Next Finish Cancel

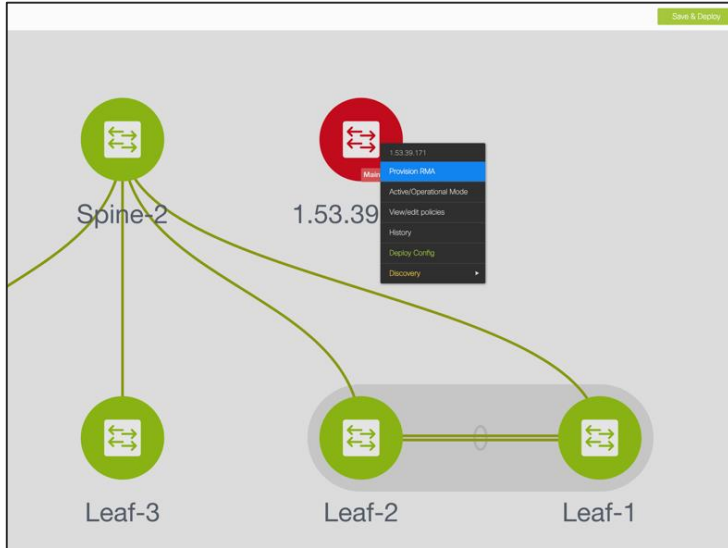
# Switch Maintenance Mode



- Put the device in maintenance mode
- Physically replace the device in the network



# Provision RMA



### Return Merchandise Authorization (RMA)

*Please make sure switch is replaced and rewiring is complete before you proceed!*

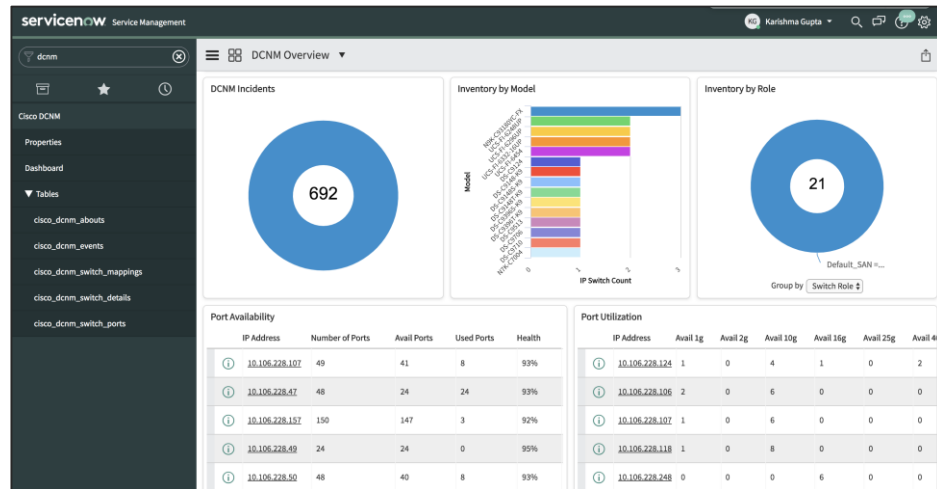
Swap Switch

	Serial Number	Model	Version	Model Match?
<input type="radio"/>	FDO21332E6X	N9K-93180YC-EX	7.0(3)I7(3)	No
<input type="radio"/>	ABCDEFG	N9K-93180YC-EX	7.0(3)I7(1)	No

- 1 Choose the Provision RMA option and select the replacement device
- 2 DCNM will provision the device using POAP with the expected configuration for the node.
- 3 Once the new device is online move the device back into Normal Mode.

# DCNM Integration with ServiceNow

- Inventory imported on DCNM Instance Import
- Alarms collected periodically
- Auto creation of Incidents supported for each critical Alarm

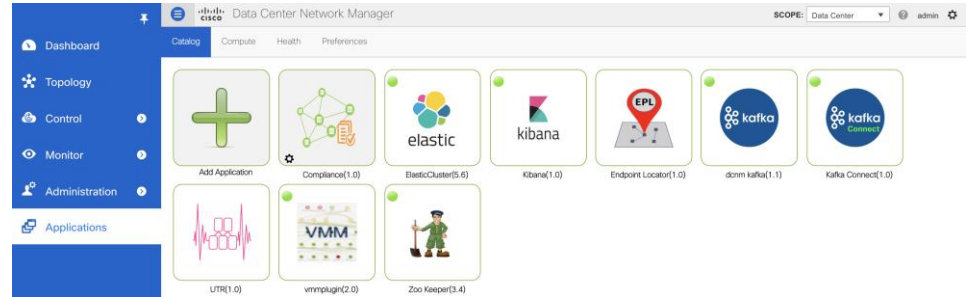




# DCNM Application Hosting Framework

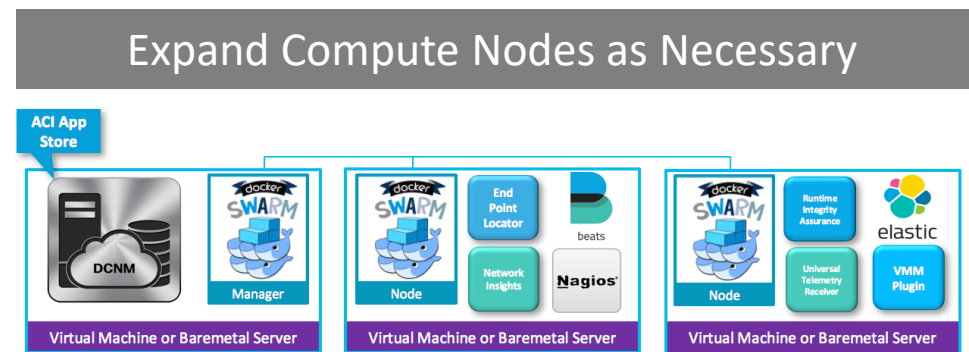
- Extensible Framework
- Applications can run on the framework instead of core S/W
  - “Future Proof” – new apps on existing framework
- Separation between apps
- Extensible
- Examples: Telemetry, Analytics Apps, Reporting, Automation
- Uses Worker-Nodes for expansion

Make All the Apps into Containers



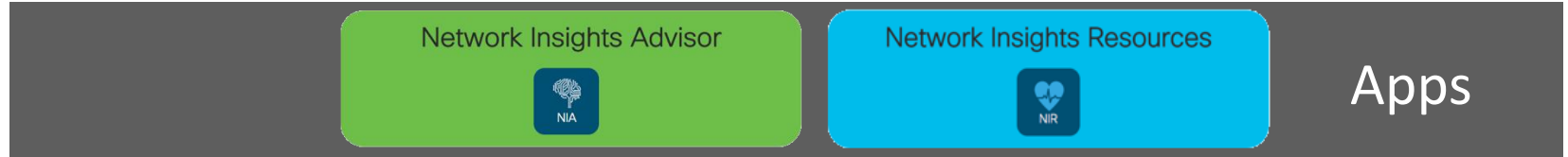
The screenshot shows the DCNM web interface with a navigation menu on the left and a main area displaying a grid of application tiles. The tiles include: 'Add Application' (green plus icon), 'Compliance(1.0)', 'ElasticCluster(5.6)', 'Kibana(1.0)', 'Endpoint Locator(1.0)', 'dcnm kafka(1.1)', 'Kafka Connect(1.0)', 'UTR(1.0)', 'vmmplugin(2.0)', and 'Zoo Keeper(3.4)'.

Expand Compute Nodes as Necessary



The diagram illustrates the architecture of DCNM applications. It shows three 'Virtual Machine or Baremetal Server' boxes. The first box contains the 'DCNM' application. The second box, labeled 'Manager', contains 'docker SWARM' and 'End Point Locator'. The third box, labeled 'Node', contains 'docker SWARM', 'Runtime Integrity Assurance', 'Universal Telemetry Receiver', 'Network Insights', 'beats', 'Nagios', and 'elastic'. A callout box labeled 'ACI App Store' points to the DCNM application.

# Network Insights Applications



Data collection and ingestion

Data correlation and analysis

Data visualization and action



## Visibility

Learn from your network and recognize anomalies



## Insights

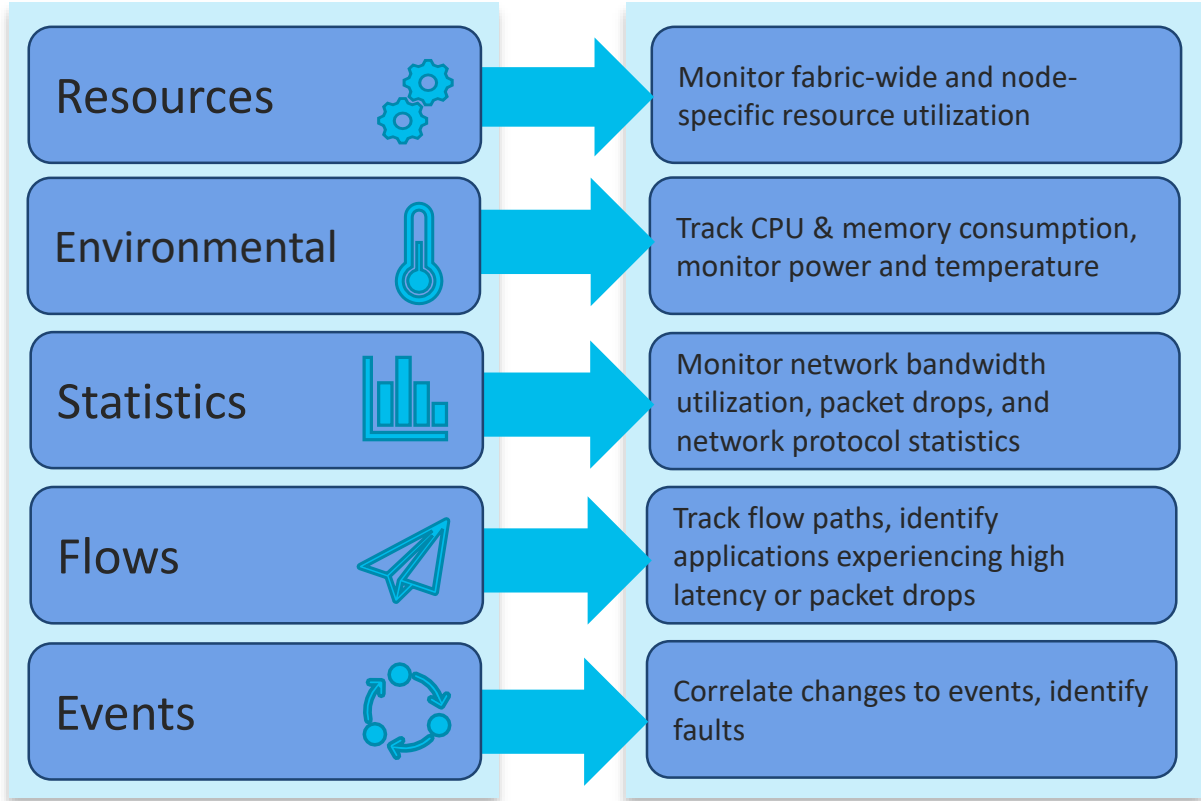
See problems before your end users do



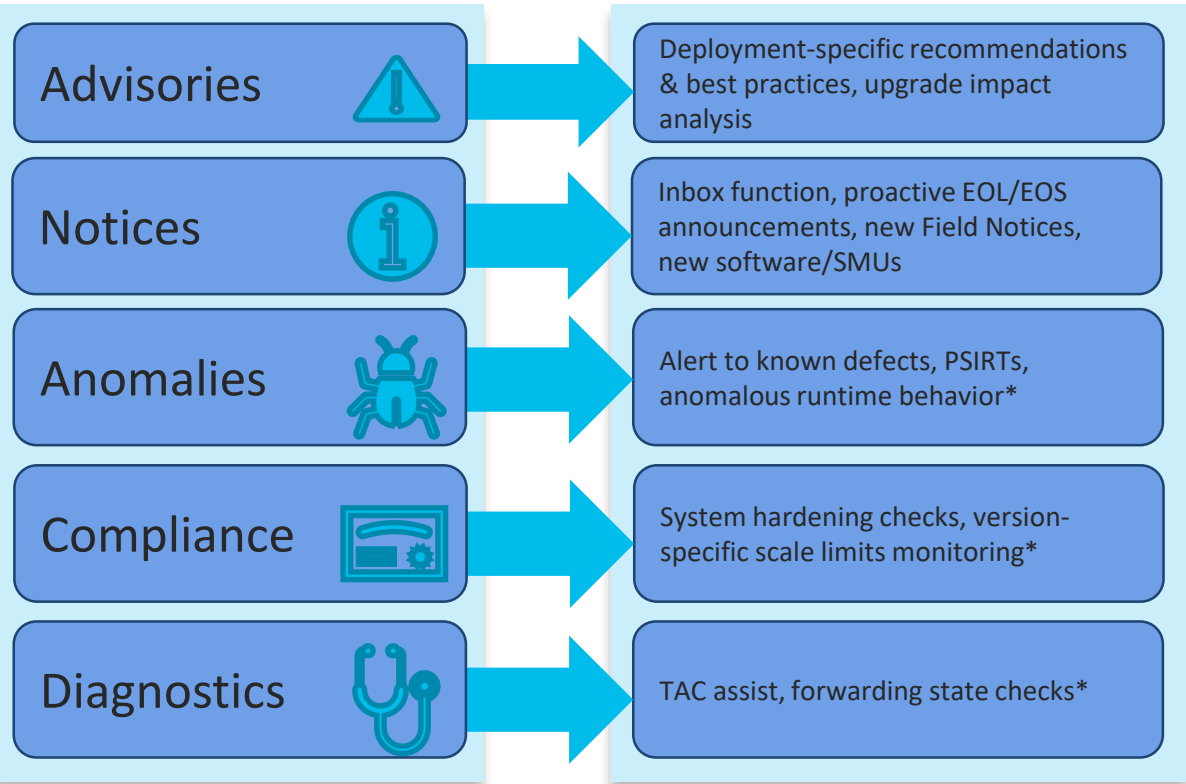
## Proactive Troubleshooting

Find root cause faster with granular details

# How Can NIR Help with Day 2 Operations?



# How Can NIA Help with Day 2 Operations?



# Want to Automate or Deploy at Bulk?

## REST Away!

DCNM RestFul API Documentation			
Alarms	Show/Hide	List Operations	Expand Operations
Cloud Extension	Show/Hide	List Operations	Expand Operations
Control - DCNM Tracker	Show/Hide	List Operations	Expand Operations
Control - Fabrics	Show/Hide	List Operations	Expand Operations
Control - Interface Service	Show/Hide	List Operations	Expand Operations
Control - Inventory	Show/Hide	List Operations	Expand Operations
Control - Links	Show/Hide	List Operations	Expand Operations
Control - Policies	Show/Hide	List Operations	Expand Operations
Control - Switches	Show/Hide	List Operations	Expand Operations
Customization	Show/Hide	List Operations	Expand Operations
DCNM Image Policy Management	Show/Hide	List Operations	Expand Operations
DCNM Package Management	Show/Hide	List Operations	Expand Operations
DCNM session management	Show/Hide	List Operations	Expand Operations
Image Management	Show/Hide	List Operations	Expand Operations
Progress Tracker	Show/Hide	List Operations	Expand Operations
Resource Manager operations	Show/Hide	List Operations	Expand Operations
Service Network Operations	Show/Hide	List Operations	Expand Operations
Top Down LAN Network Operations	Show/Hide	List Operations	Expand Operations
Top Down LAN VRF Operations	Show/Hide	List Operations	Expand Operations

DCNM GUI uses REST APIs

1:1 parity with UI

Automate

Deploy at Bulk

Interface with 3<sup>rd</sup> party tools

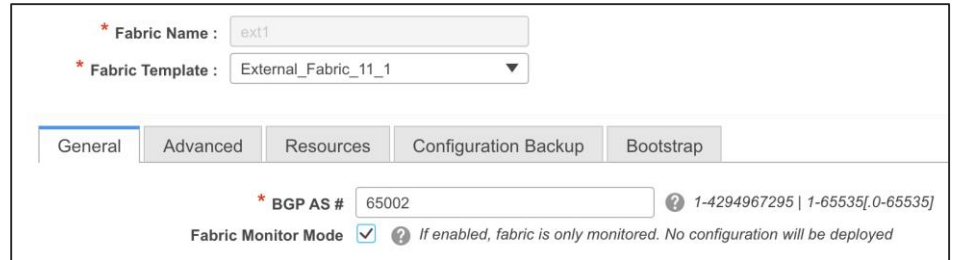
<https://<dcnm-server-IP>/api-docs>

# API Inspector

The screenshot displays the Cisco Data Center Network Manager (DCNM) interface. On the left, a navigation menu includes Dashboard, Topology, Control, Monitor, Administration, and Applications. A user profile dropdown shows 'admin' with options: Logged in as admin, Change Password..., About, REST API Tool (highlighted), and Log out. A blue callout box points to the REST API Tool option, stating: 'To access API tool, on Each Page of DCNM UI'. The main area shows a network topology with nodes like LEAF-1, LEAF-2, LEAF-3, SPINE-1, and SPINE-2, and fabrics like 'shyam-fx2', 'karthik-fab', and 'Non-Nexus'. An 'API Trace Tool' window is open in the foreground, displaying REST API calls and responses. A blue callout box points to this window, stating: 'Opens another window with corresponding API calls'. The API trace tool shows several requests, including GET and POST calls to various endpoints like /fw/forest/san/getVirtualCenters, /fw/apl/afw/service/dcm-elasticsearch-api, and /fw/integrated/http\_33500/dcm-elasticsearch-api/DataCenter/kcv\_access\_info\_index/\_search.

# DCNM Monitor Mode

- External Fabrics can be in Monitor mode
  - DCNM still generates configs to be pushed to the switches
    - Available via APIs
- Day 2 Operations
  - Network Insights (NIR/NIA)
  - Monitoring Environmental data
  - Events, Alarms
  - Real time Topology View, VMM, K8s viewer
  - EPL



The screenshot shows a configuration page for a fabric. At the top, there are two fields: '\* Fabric Name' with the value 'ext1' and '\* Fabric Template' with a dropdown menu showing 'External\_Fabric\_11\_1'. Below these is a horizontal tab bar with five tabs: 'General' (selected), 'Advanced', 'Resources', 'Configuration Backup', and 'Bootstrap'. Under the 'General' tab, there is a field for '\* BGP AS #' with the value '65002' and a help icon with the text '1-4294967295 | 1-65535[.0-65535]'. At the bottom, there is a checkbox for 'Fabric Monitor Mode' which is checked, followed by a help icon and the text 'If enabled, fabric is only monitored. No configuration will be deployed'.

# Agenda

- Introduction to DCNM 11
- Greenfield VXLAN Deployment
- Brownfield - Revamp your VXLAN fabric
- DCNM Day-2 operations
- **DCNM Demos**
- Install and Licensing
- Conclusion



# Demos



You make networking **possible**

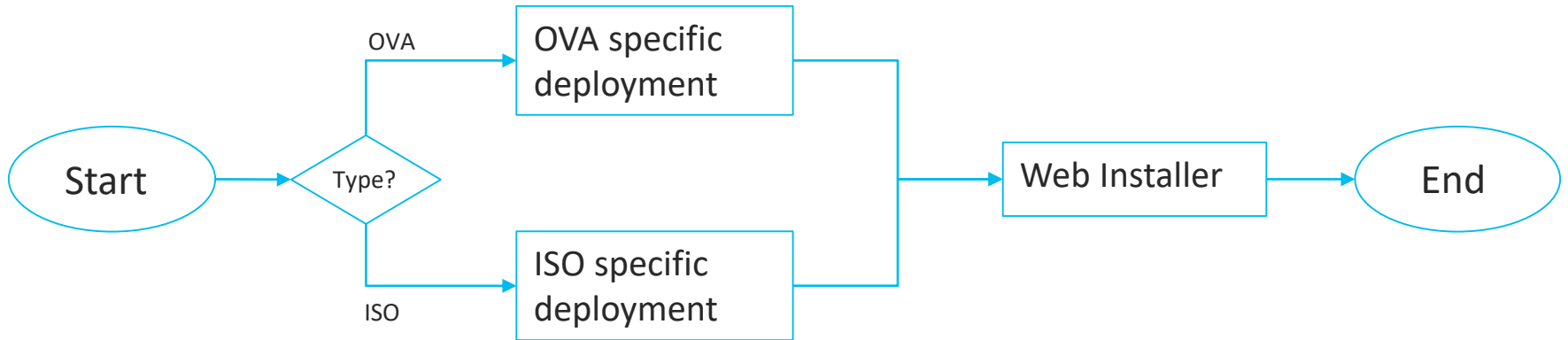
# Agenda

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- Conclusion

# DCNM11 Installation

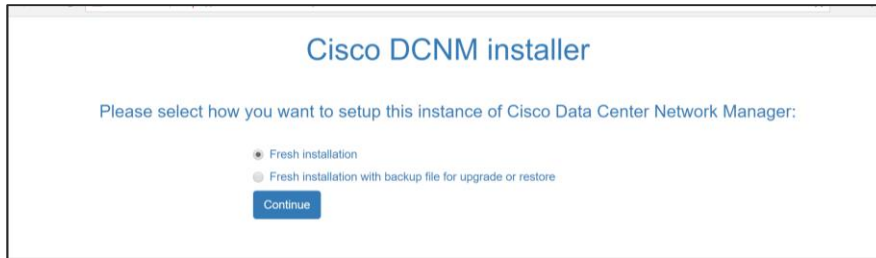
## New Installation Mechanism

Full support for DCNM HA nodes

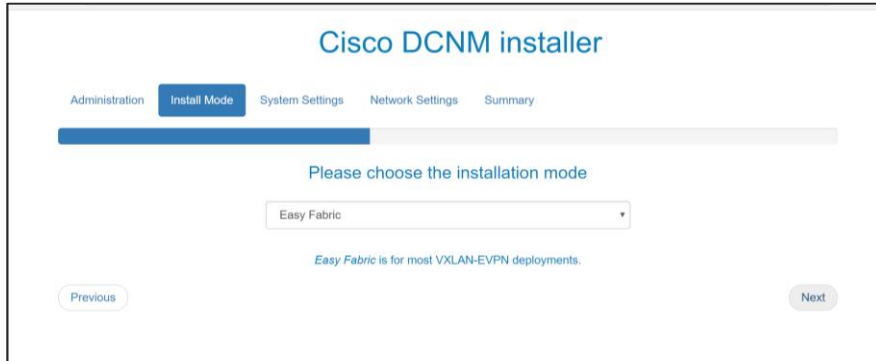


# DCNM11 Installation

## DCNM11 Web Installer (common to OVA and ISO)



Fresh Installation if it's the first time DCNM is installed (e.g. new user installation)



Select mode when installing:

- Easy Fabric/LAN fabric
- Classic LAN
- IP Fabric for Media
- Compute

# DCNM 11.3(1) Verified Scale



## LAN Fabric Installation Mode

Feature	Scale
Physical Interfaces	30,000
Switch Scale	350 – In Managed Mode 750 – In Monitor Mode
L3 Scenario: Networks and VRFs per Fabric	1000 Networks/500 VRFs
L2 Scenario: Networks per Fabric	1500 Networks
Endpoint Locator	100K Endpoints across 4 Fabrics
Virtual Machine Manager End Points	5k
Maximum vCenter Instances per DCNM	4

# DCNM 11.3 LAN Deployment

## Without Network Insights

Up to 80 Switches					
Node	Deployment Mode	CPU	Memory	Storage	Network
DCNM	OVA/ISO	16 vCPUs	32G	500G HDD	3xNIC
Computes	NA				

81-350 Switches					
Node	Deployment Mode	CPU	Memory	Storage	Network
DCNM	OVA/ISO	16 vCPUs	32G	500G HDD	3xNIC
Computes x 3	OVA/ISO	16 vCPUs	64G	500G HDD	3xNIC



## OS Compute Requirements for Network Insights

### Hardware Recommendations for Deployments up to 80 Switches and 2000 Flows

Node	Deployment Mode	CPU	Memory	Storage	Network
Cisco DCNM	OVA/ISO	16 vCPUs	32G	500G HDD	3x NIC
Computes (x3)	OVA/ISO	32 vCPUs	64G	500G HDD	3x NIC

### Hardware Recommendations for Deployments from 81 to 250 Switches and 10000 Flows

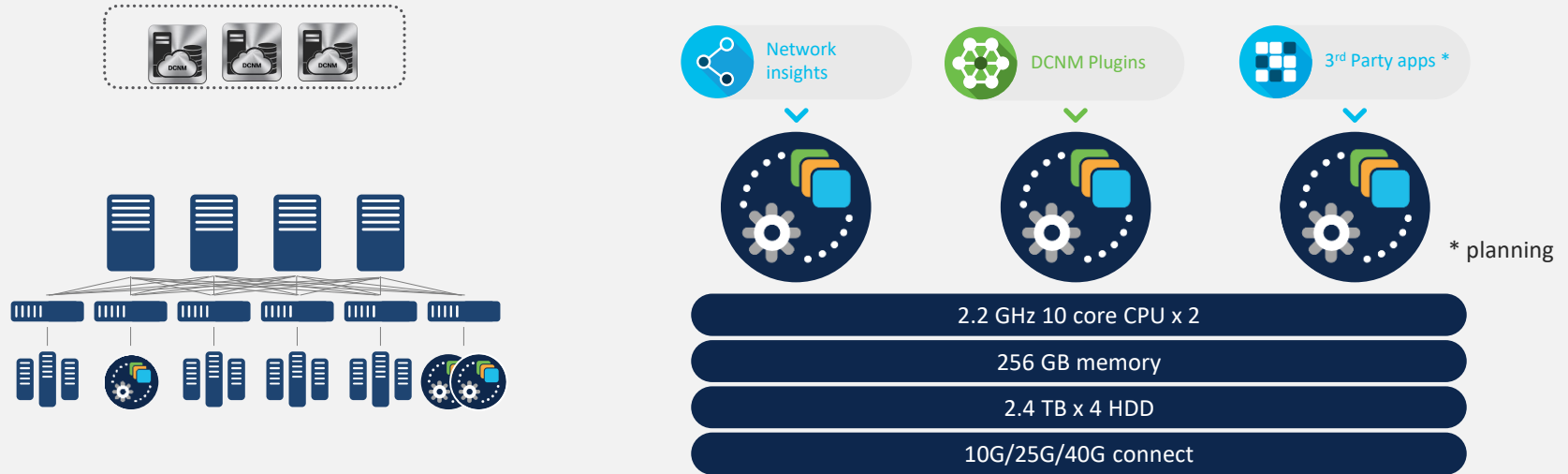
Node	Deployment Mode	CPU	Memory	Storage	Network
Cisco DCNM	OVA/ISO	16 vCPUs	32G	500G HDD	3x NIC
Computes (x3)	ISO	40 vCPUs	256G	2.4TB HDD	3x NIC*

DCNM HA SUPPORTED AND RECOMMENDED

\* Network card: Quad-port 10/25G

# Cisco Application Services Engine

Modern Scale-out Application Services stack to host Day-2 Operations applications



Network automation

Scale-out cluster

SE-CL-L3



# Licensing

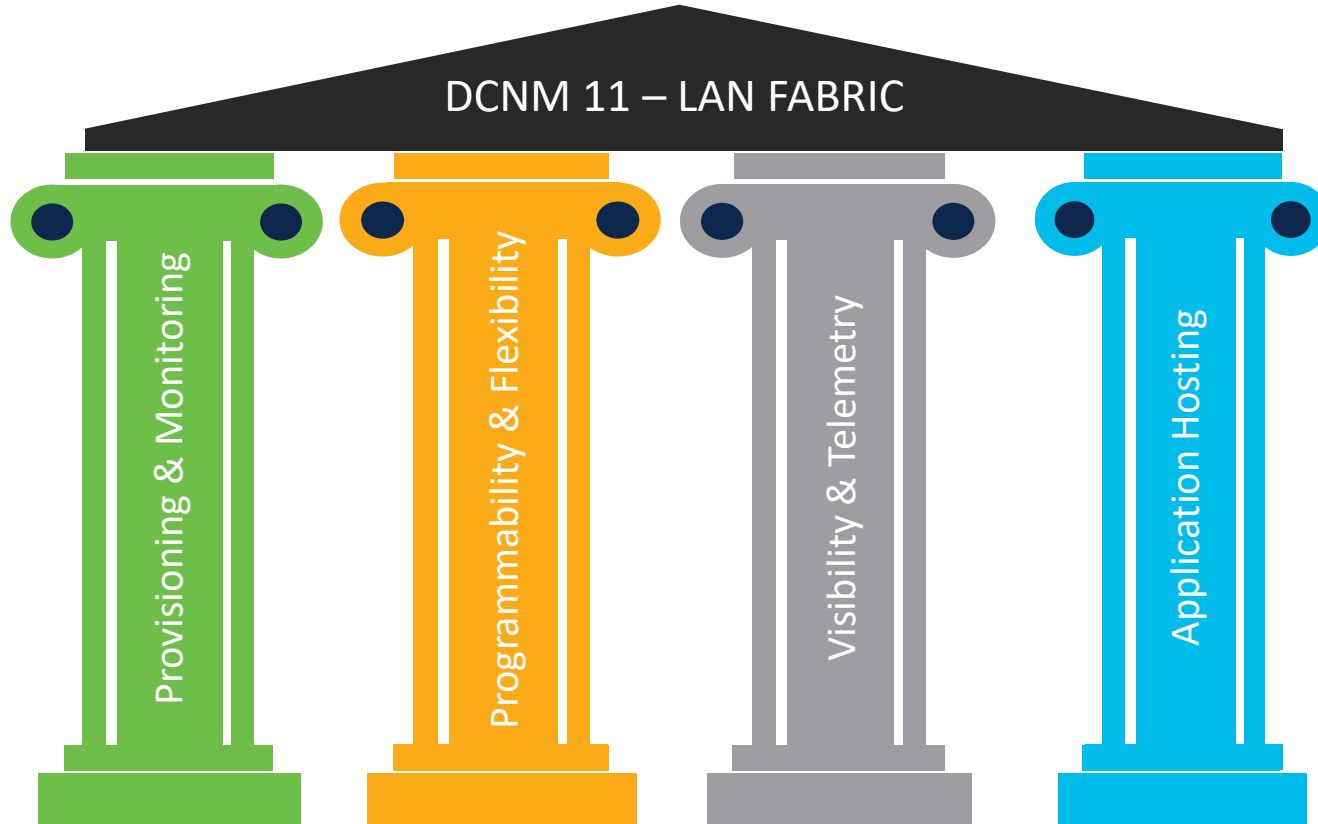
(Trial now for 60 days, Honor Based)

Feature	Data Center Network Manager (DCNM)
DCNM-SVR-11-K9 DCNM-SVR-11-K9=	DCNM Server License per server instance
Switch Licenses	
DCNM LAN for Fixed Switch: e.g. DCNM-LAN-N93-K9= DCNM-LAN-N3K-K9=	Perpetual Fixed Chassis RTM Advanced feature license License for DCNM for one Switch
DCNM LAN for Modular Switch: e.g. DCNM-LAN-N95-K9=	Perpetual Modular Chassis RTM Advanced feature license License for DCNM for one Switch
OR	
NX-OS Essentials, Advantage, Premier Licenses include DCNM Right-to-Manage (RTM) licenses for LAN / LAN Fabric	

# Agenda

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- **Conclusion**

# Conclusion



# Reference Sessions

## Part 2 of this session

Easy deployment and management of NXOS Fabrics ( VXLAN ) with DCNM -  
BRKDCN-2939

Tuesday, Jan 28th, 5:00 PM – 06:30 PM

## Related sessions

- Day-2 Telemetry better - Network Insights for ACI/NX-OS – BRKDCN-2712
- Overlay Management and Visibility with VXLAN - BRKDCN-2125
- Building DataCenter Networks with VXLAN BGP EVPN - BRKDCN-3378
- Introduction to VXLAN: The future path of your datacenter - BRKDCN-164



Thank you



