Easy Fabric Management of VXLAN EVPN Networks with DCNM 11

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Intent Based Networking Group

BRKDCN-2609

Agenda

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

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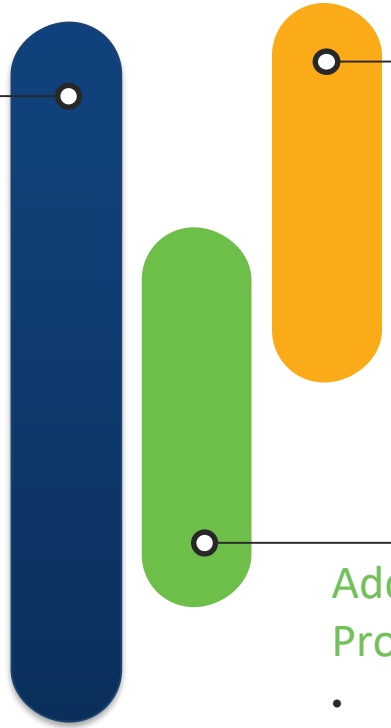
Data Center Network Manager (DCNM)

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

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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)

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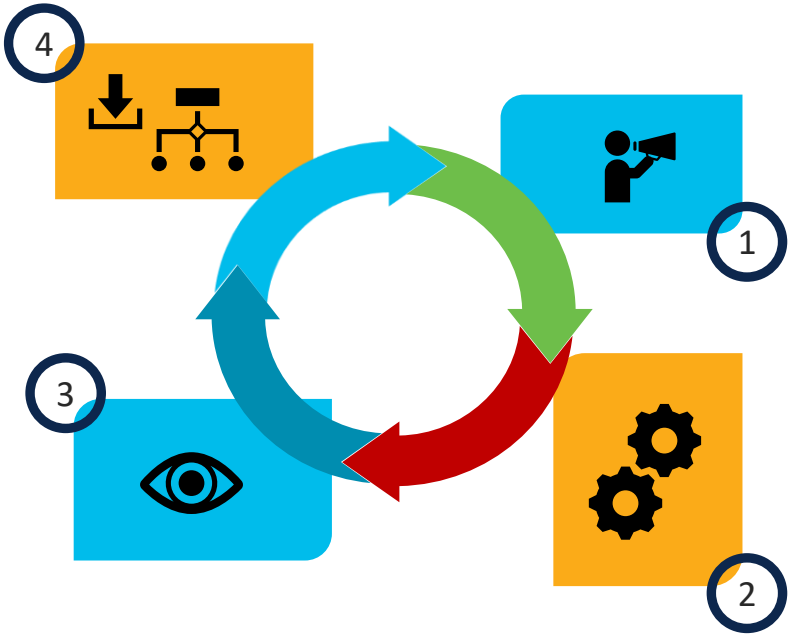
Introducing LAN Fabric in DCNM 11



Deploy

Centralized config push

Define

Define Intent based on best practices

- Underlay
- Interfaces
- Overlay

Preview

Side-by-side diff

Save

Generates configuration based on intent

Viola! Your fabric is ready in a few minutes

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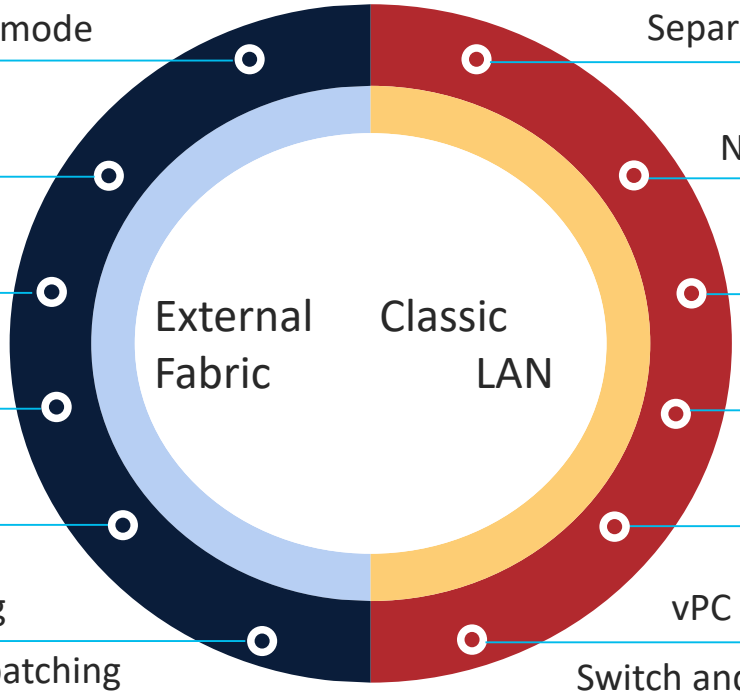
Classic LAN and External Fabric - Nexus 2k-9k



Use within LAN Fabric mode

With configuration compliance

Backup and restore of configs and state

Flexible Python + templates

Endpoint locator

One-click vPC pairing

Bootstrap/VDC POAP*/SMU patching

Separate Install Mode

No configuration compliance

Backup and restore of configs

CLI based templates

No Endpoint locator

vPC wizard

Switch and VDC POAP/SMU patching

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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

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DCNM 11.3(1) is now on 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

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Day in the Life of DCNM

Underlay Using Fabric Builder

1 **Create**

Define fabric settings – AS#, Replication Mode, IGP, Backup schedule etc.

Discover

Import switches (Supports POAP)
Define Switch Roles and vPC

2

3 **Save**

Generates configuration based on intent

Deploy

5

Centralized config push

4 **Preview**

Side-by-side diff

Viola! Your VXLAN Underlay/Routed fabric is ready in a few minutes

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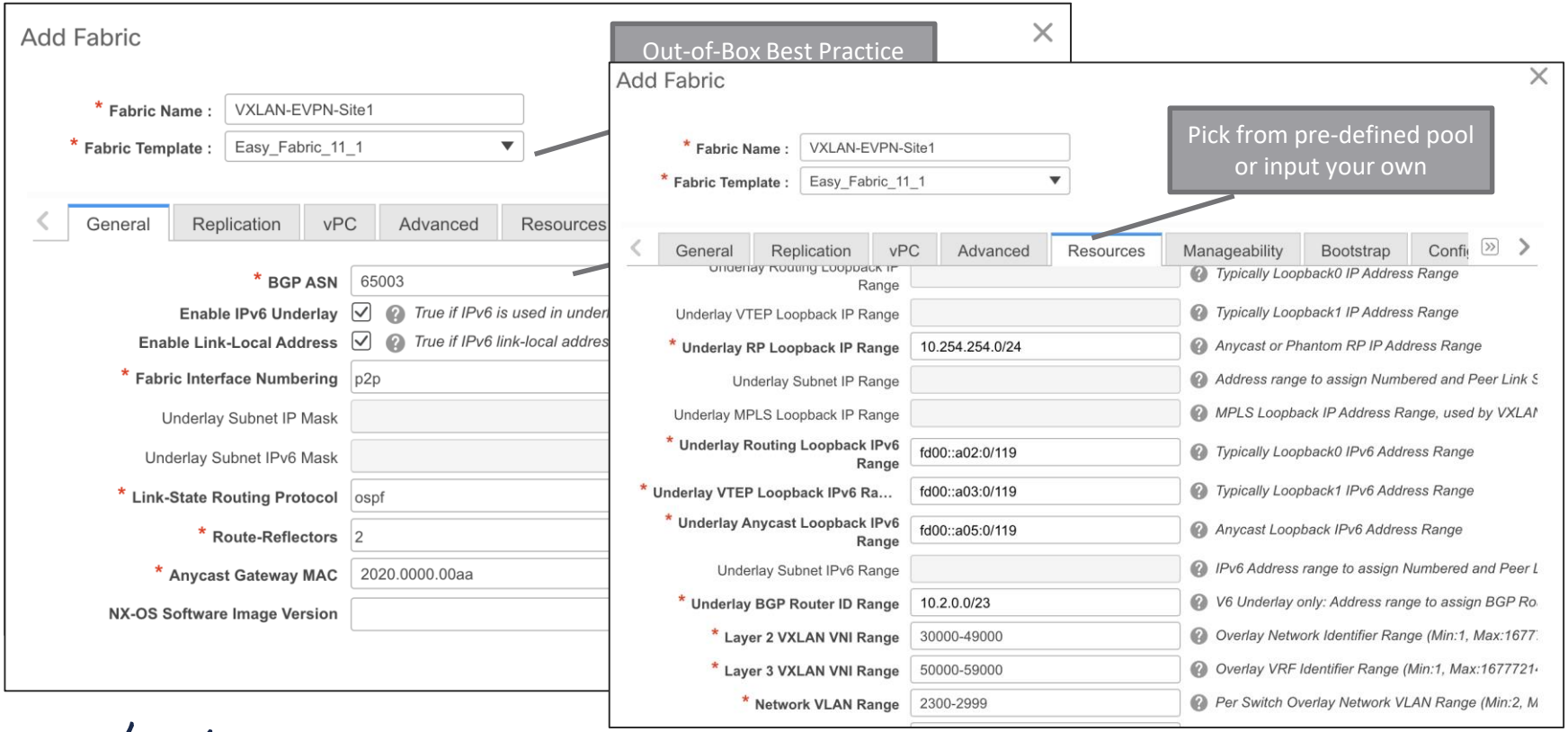
Step 1 – Create



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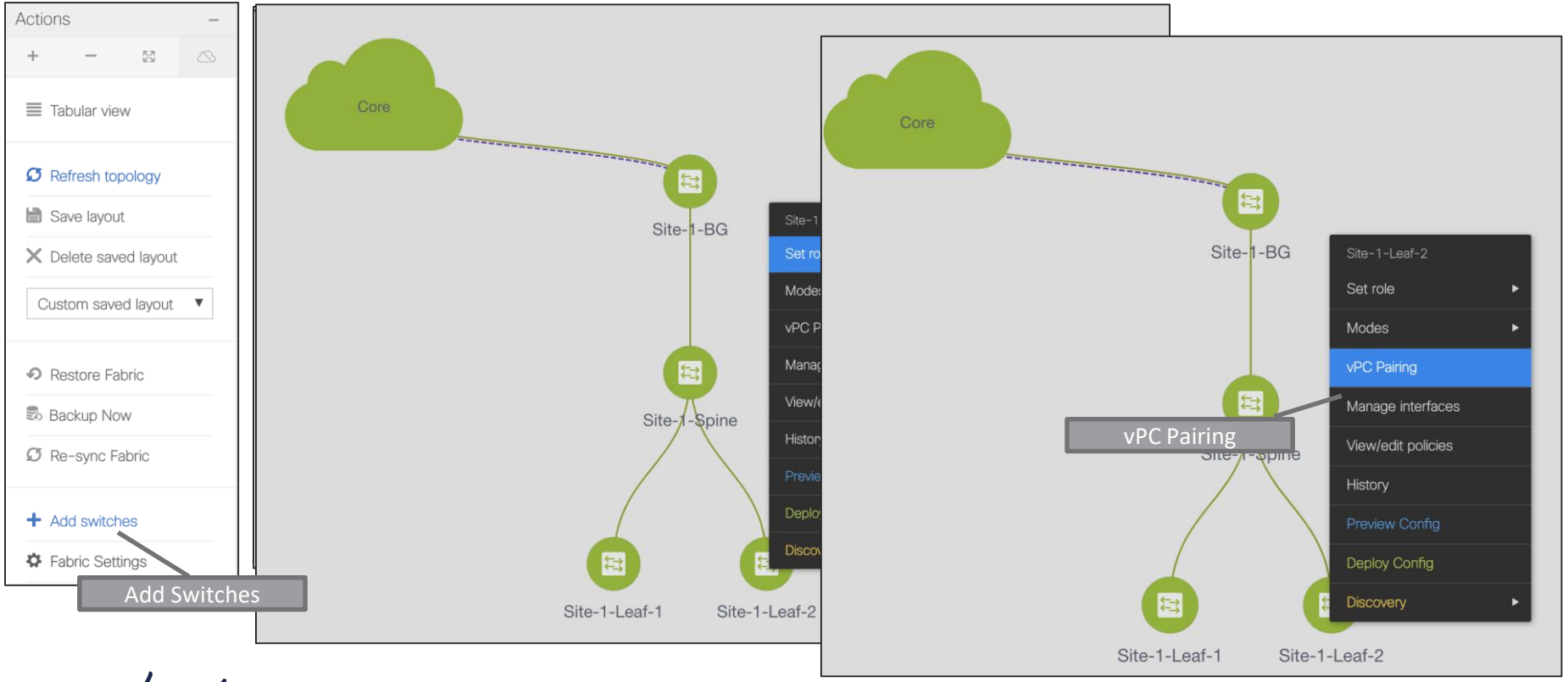
Step 2 - Discover



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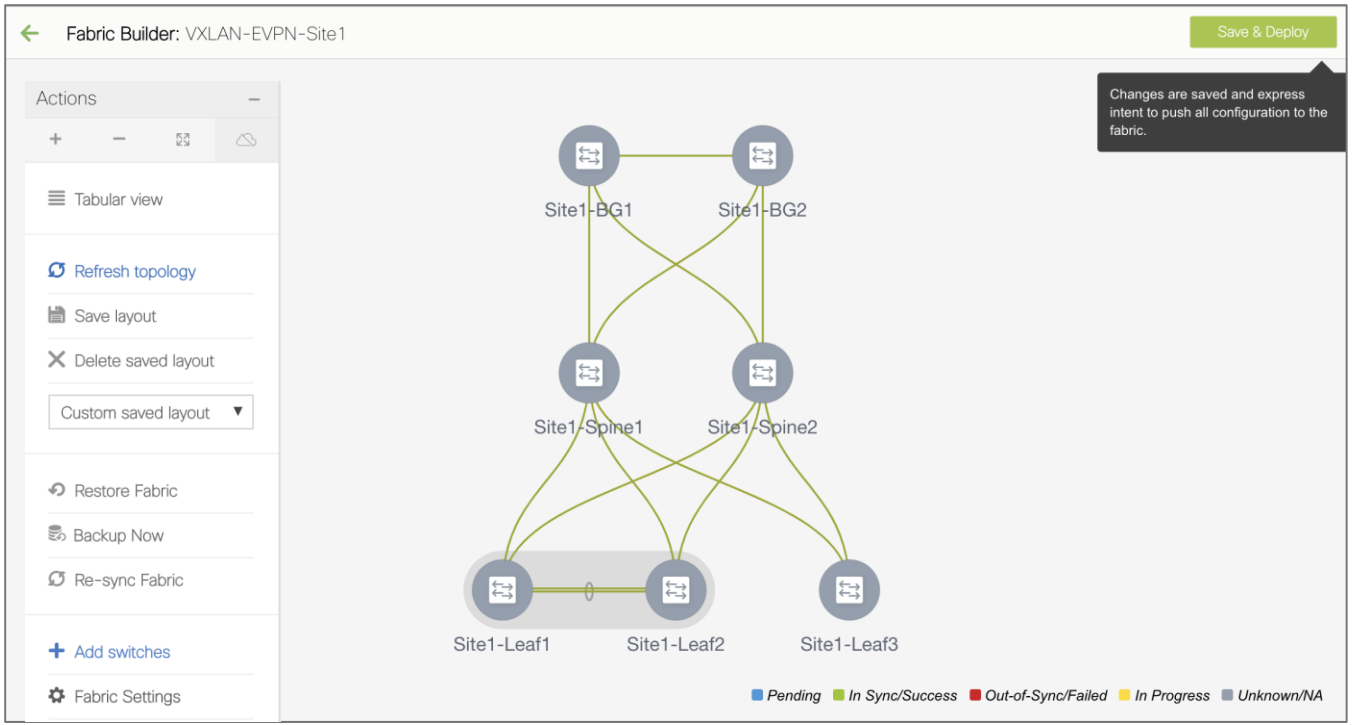
Step 3 - Save



Save intent to generate configuration

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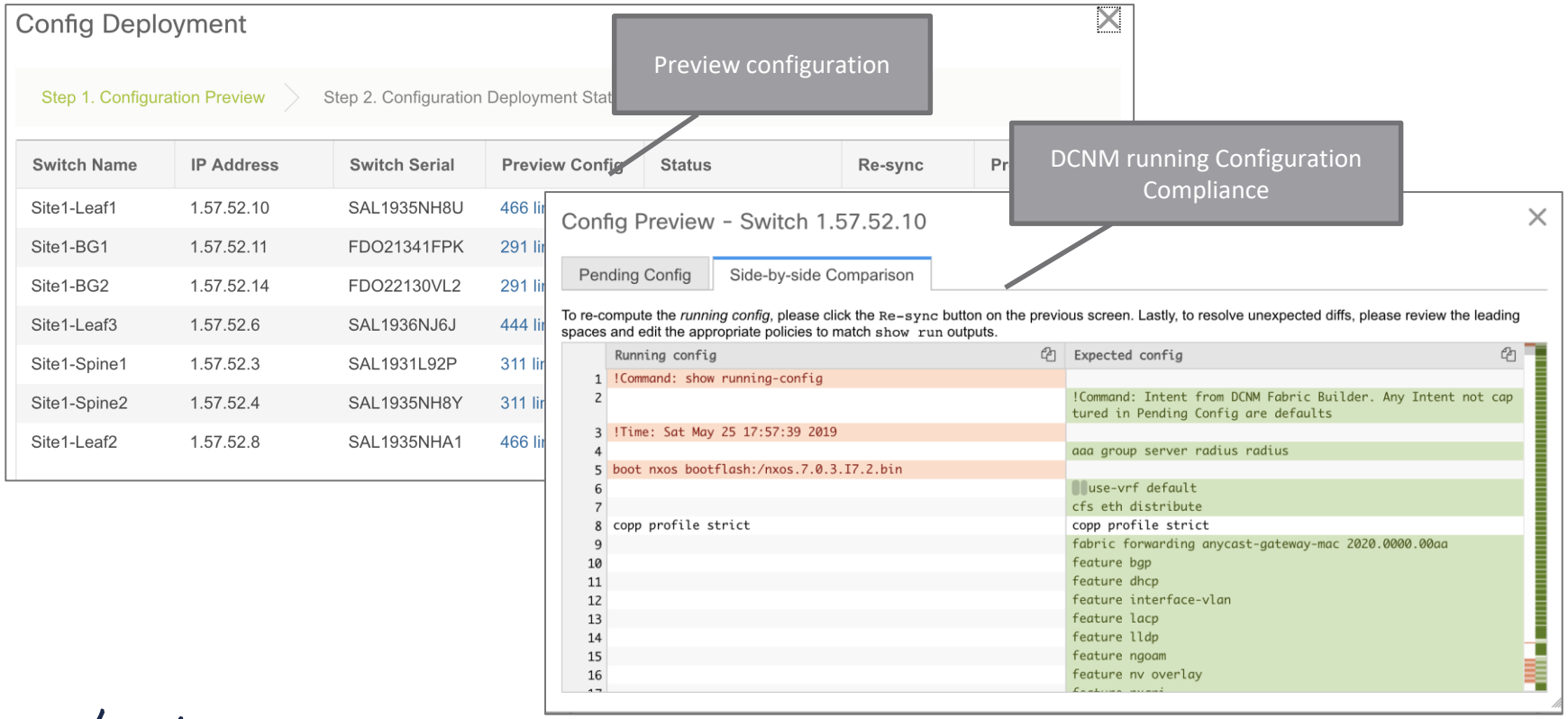
Step 4 - Preview



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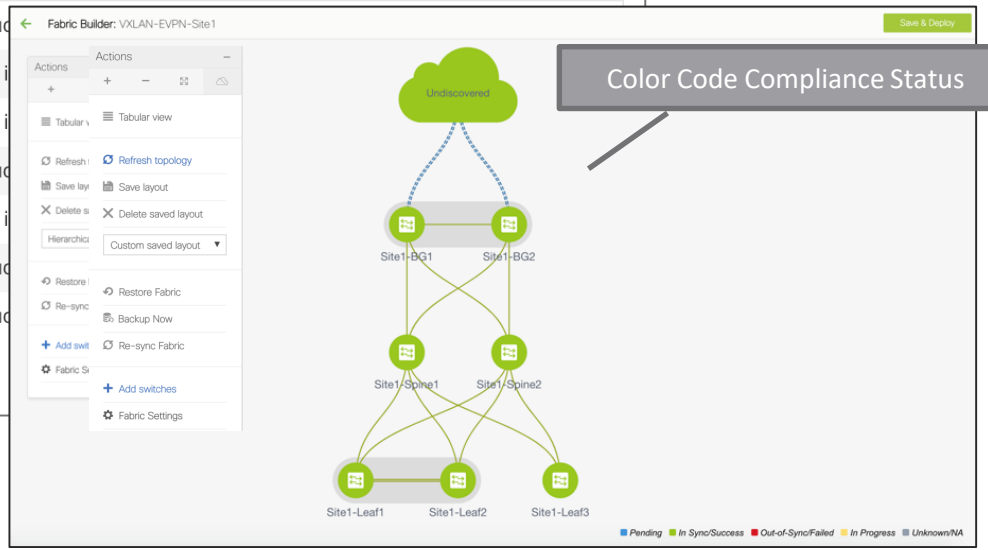
Step 5 - Deploy

Parallel deployment of configurations once approved by user

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 suc	
Site1-Leaf1	1.57.52.10	STARTED	Deployment i	
Site1-Leaf3	1.57.52.6	STARTED	Deployment i	
Site1-Spine1	1.57.52.3	COMPLETED	Deployed suc	
Site1-Leaf2	1.57.52.8	STARTED	Deployment i	
Site1-BG2	1.57.52.14	COMPLETED	Deployed suc	
Site1-BG1	1.57.52.11	COMPLETED	Deployed suc	



Color Code Compliance Status

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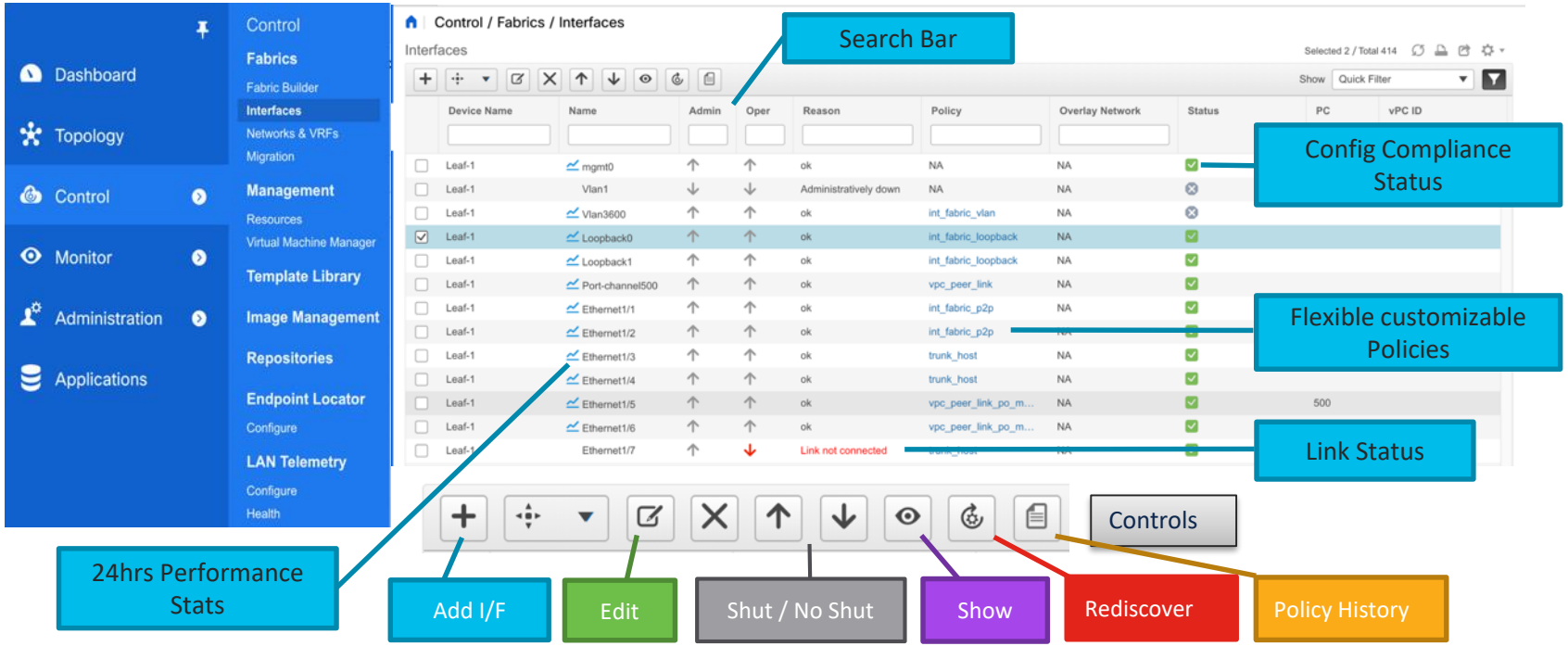
Day in the Life of DCNM

Interface Management



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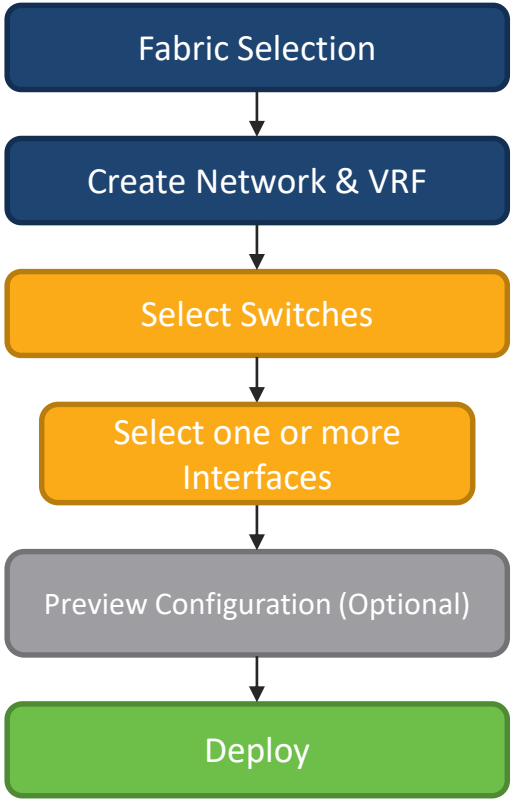
Day in the Life of DCNM

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



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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

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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

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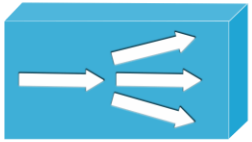
Supported Use-Cases



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

Intra-tenant/Inter-tenant	One-armed/Two-armed
• PBR Use-cases • Tenant-Edge Firewall	• PBR Use-case (No SNAT)

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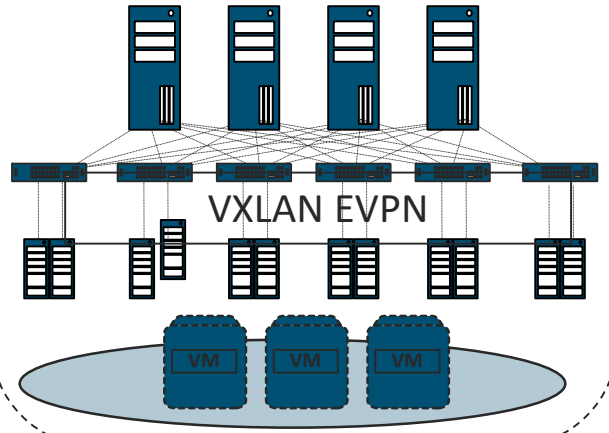
DCNM - Tying On-Prem To Public Cloud

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.

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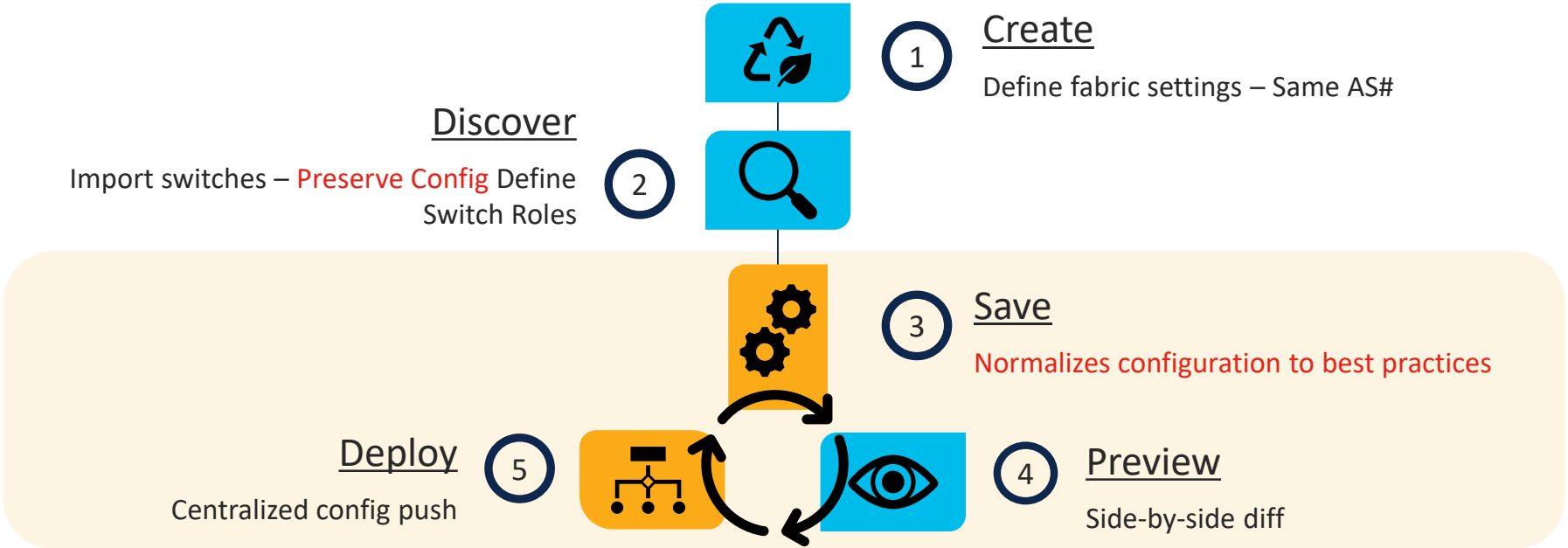
Day in the Life of DCNM

Underlay Using Fabric Builder



Viola! You just imported your existing VXLAN fabric

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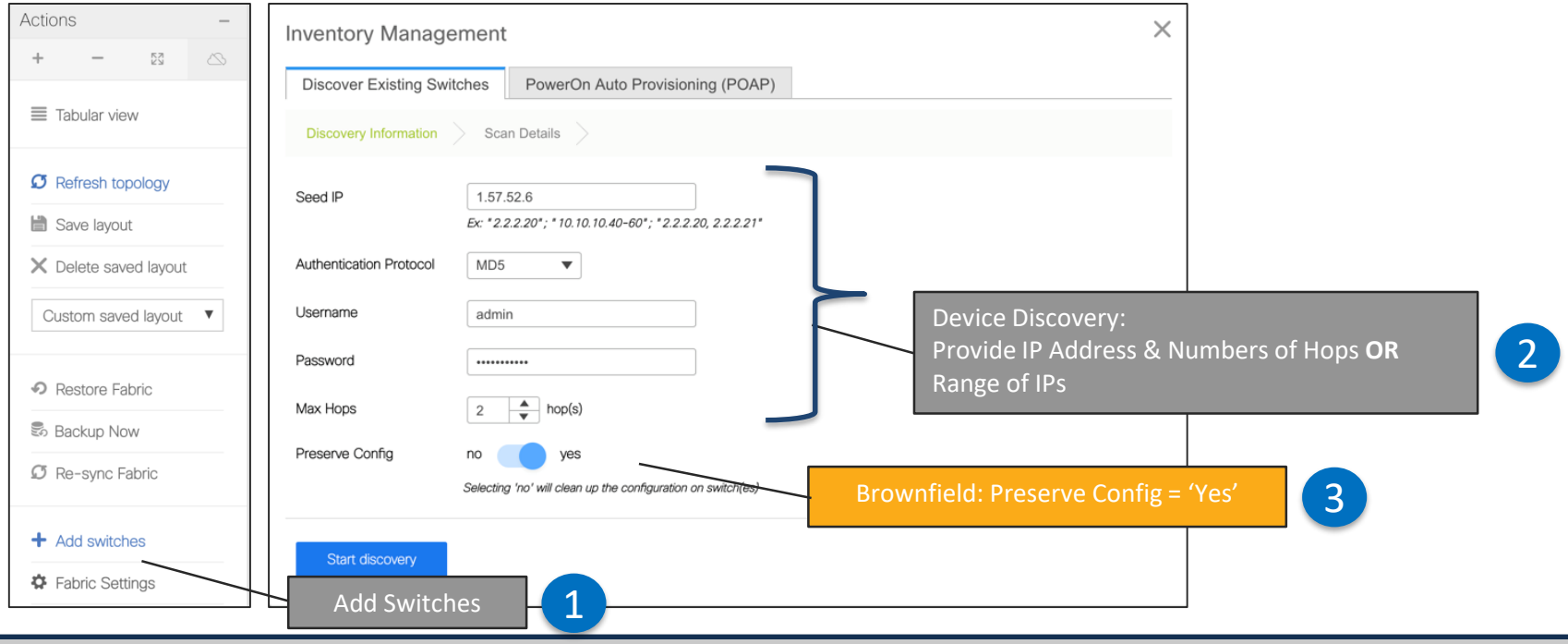
Import Switches – Preserve Config



Import Existing VXLAN-EVPN Fabric

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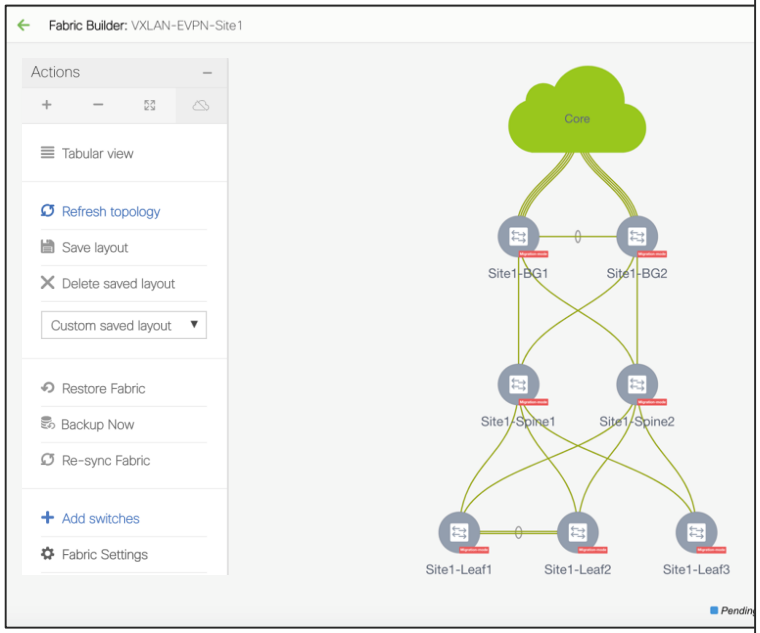
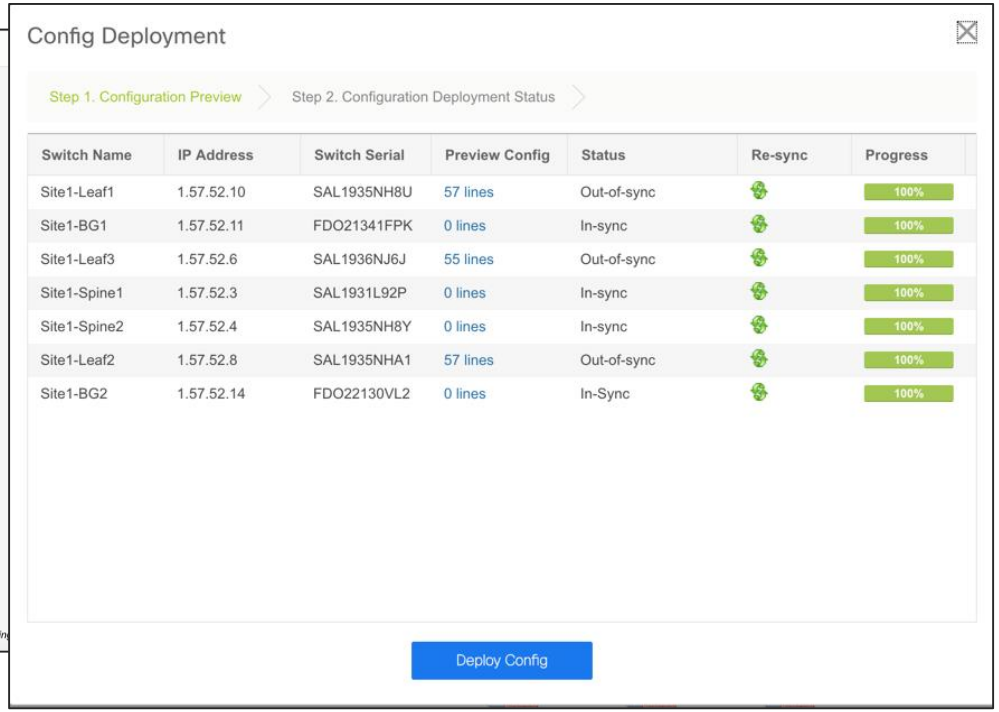
Migration Mode

Population and Calculation of Configurations





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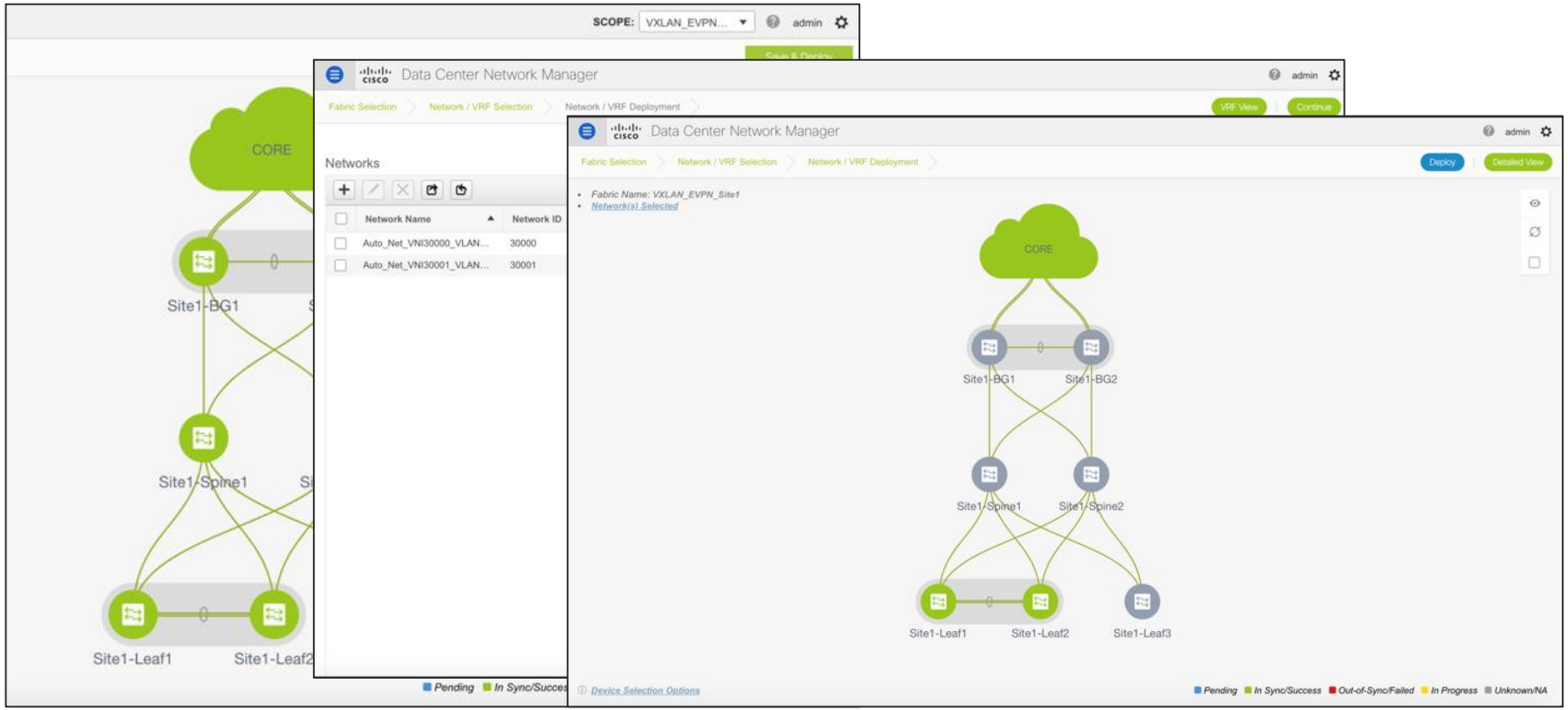
Verification of Overlays



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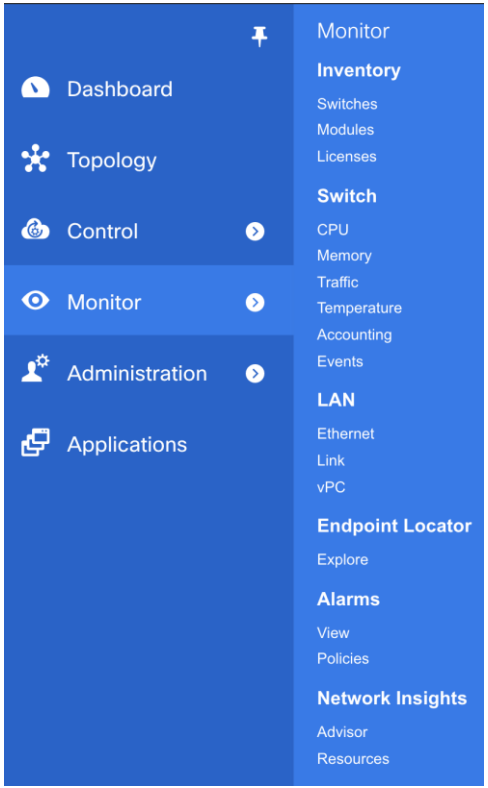
We Got Your Day 2 Needs Covered!

- 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



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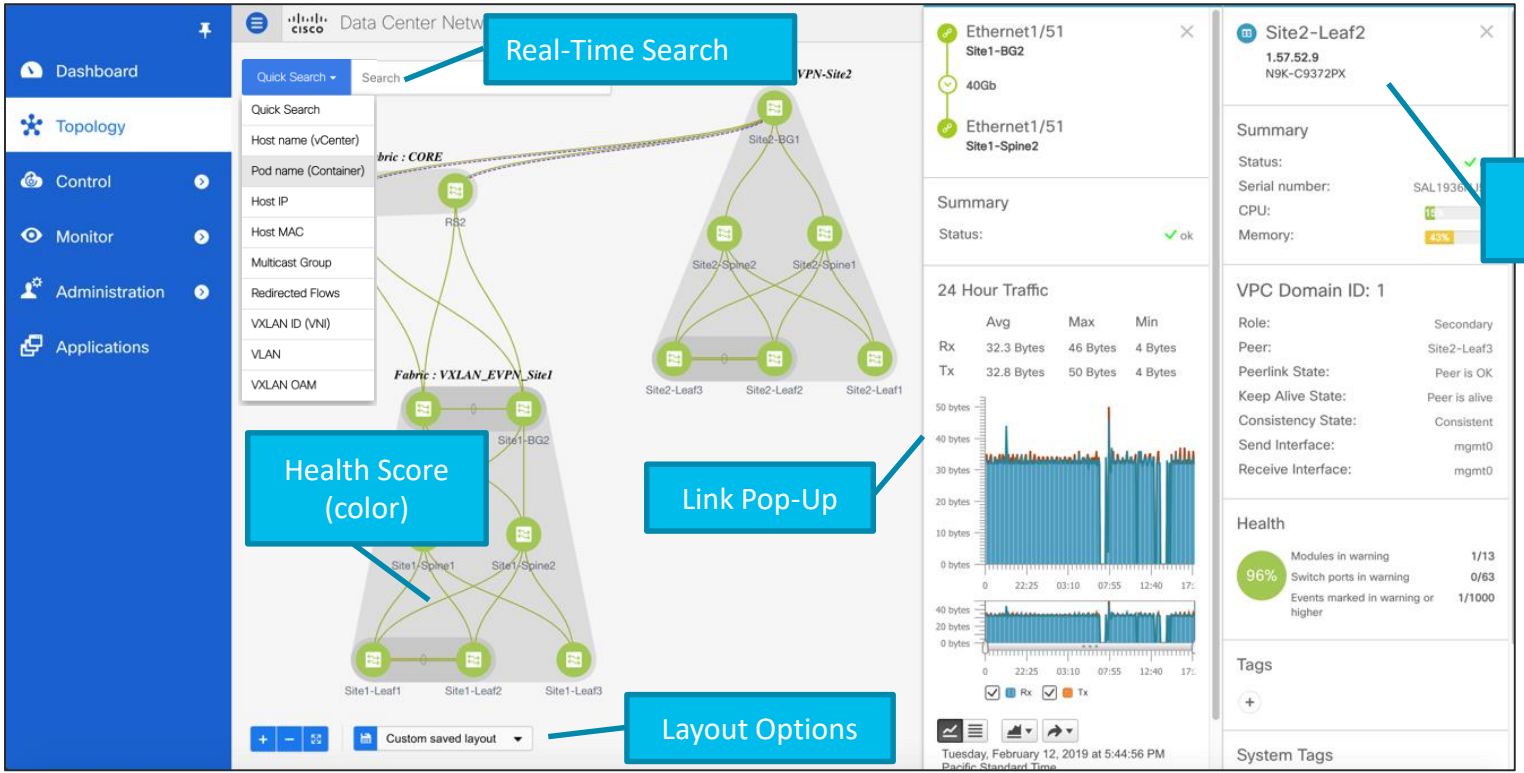
Real Time Topology View

Multilayer Topology Views



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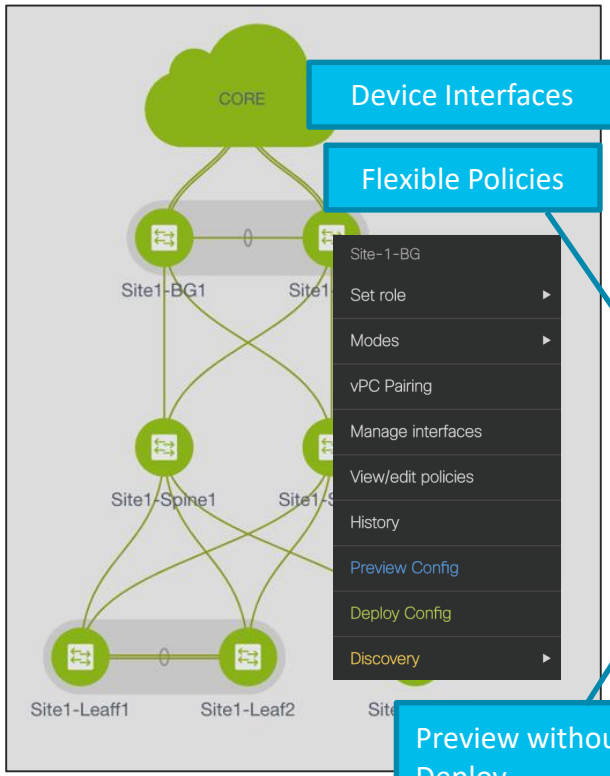
Device Options

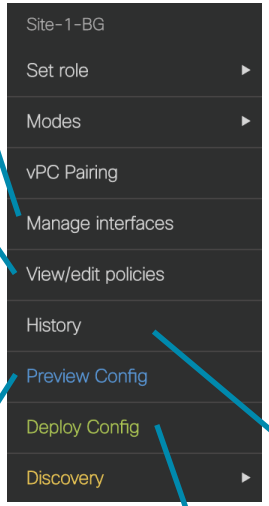
Fabric Builder Day 2 Topology Views



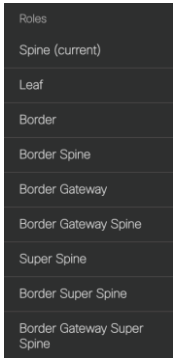
Device Interfaces

Flexible Policies

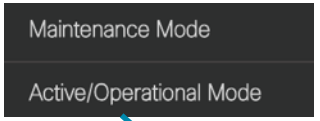
Device Options



Device Roles



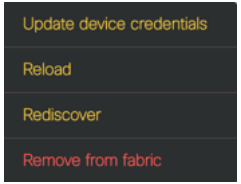
Device Modes



RMA

Configuration Status & History

Discovery



Preview without Deploy

Device-Level Deployment

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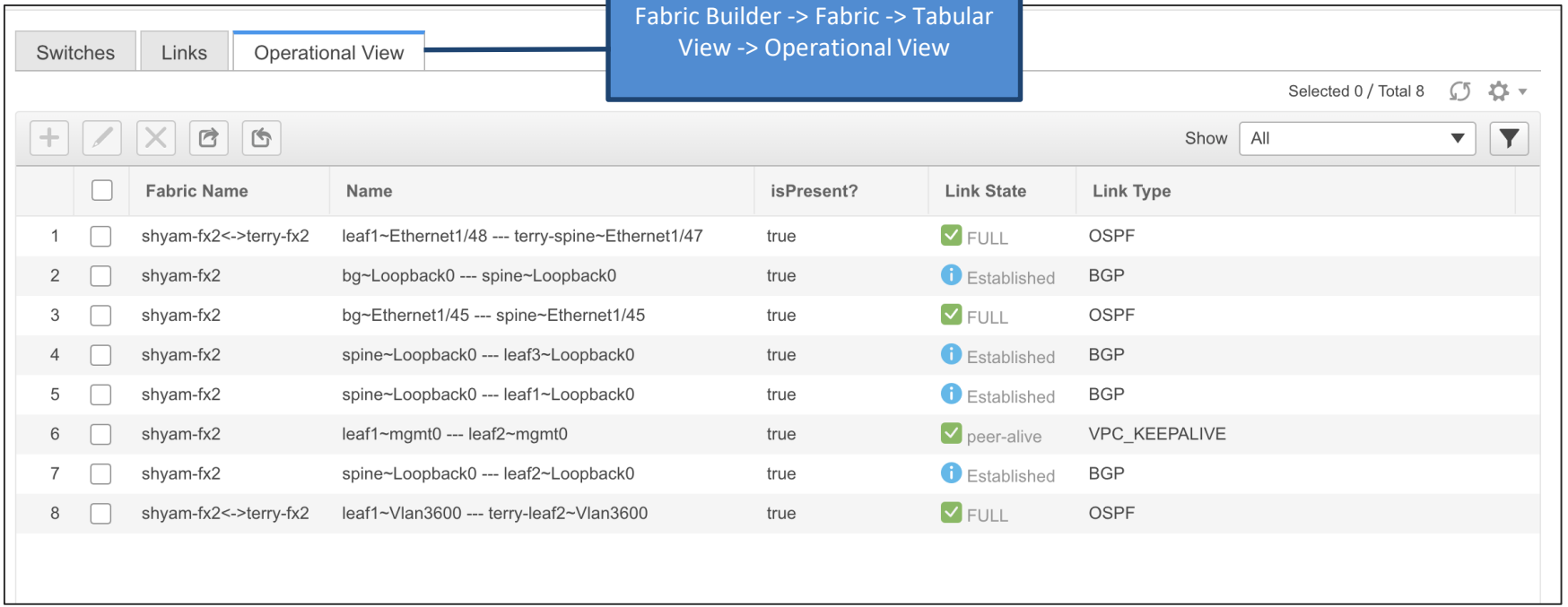
View Operational Status

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



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

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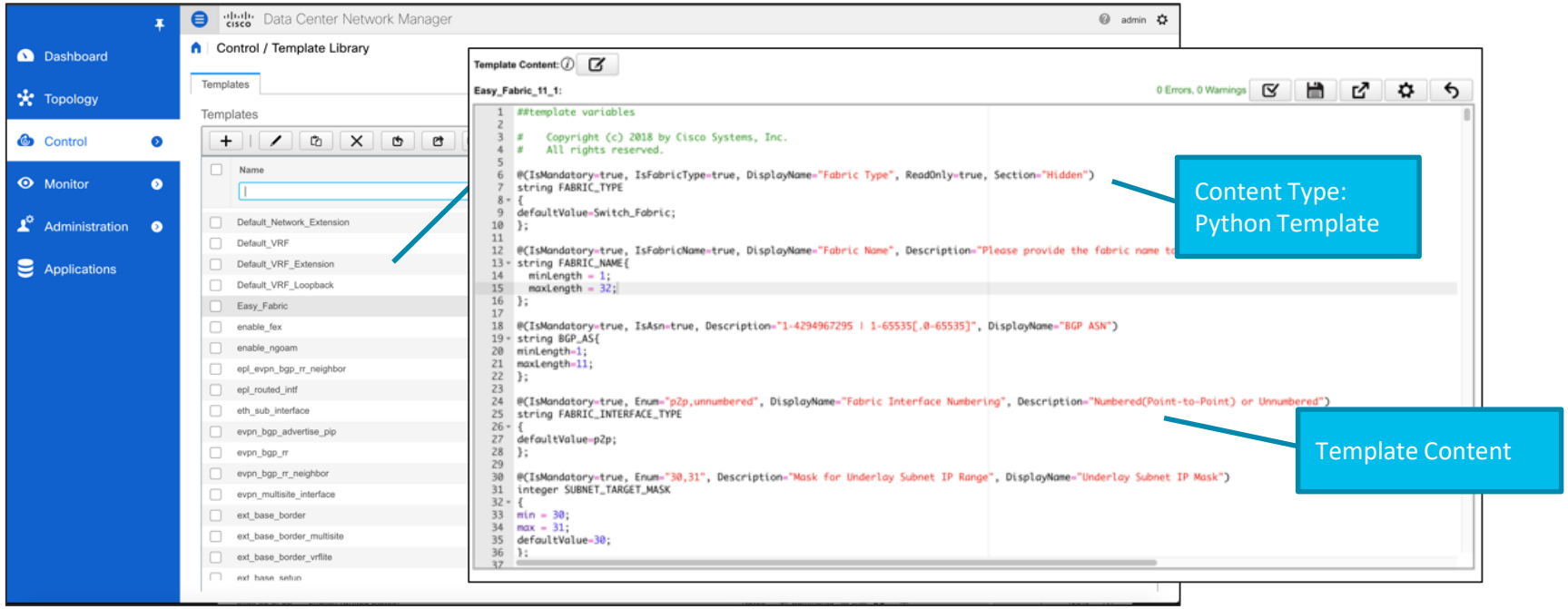
Template Library – Customize or Create New



Fabric Templates | Policy Templates | Interface Templates | Profile Templates | Show Templates

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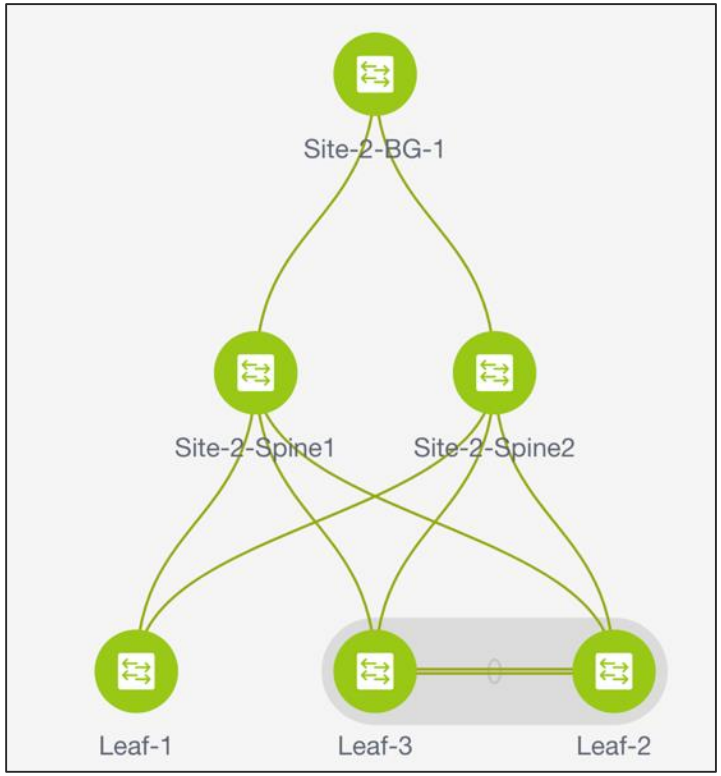
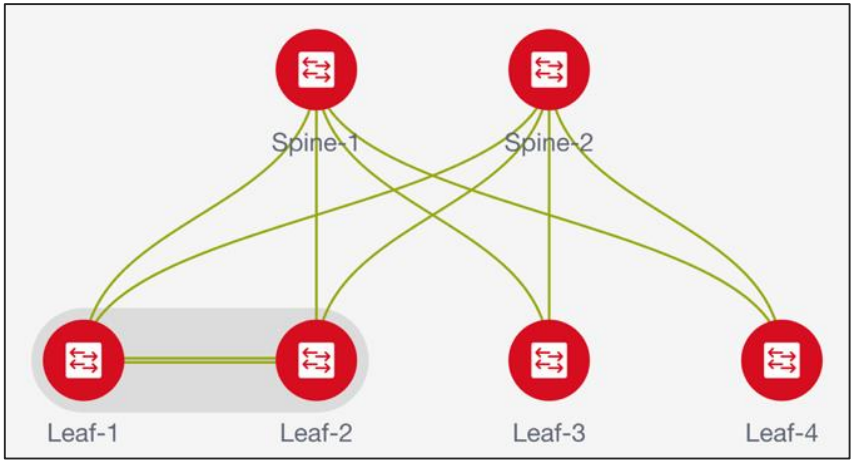
Configuration Compliance





Ready to Deploy	Success/In Sync	Failed/Out of Sync	In Progress	Unknown State / NA
Leaf-1	Leaf-1	Leaf-1	Leaf-1	Leaf-1

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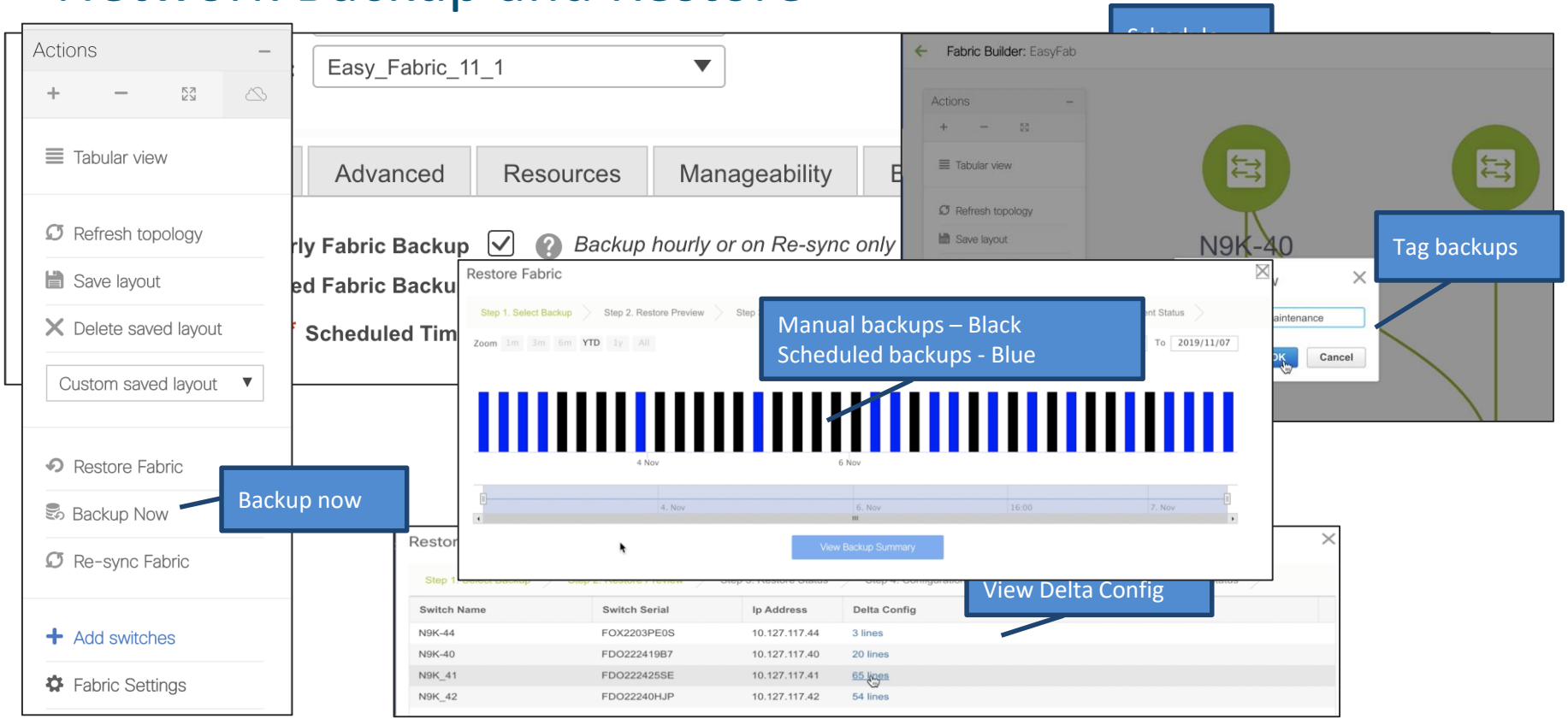
Network Backup and Restore



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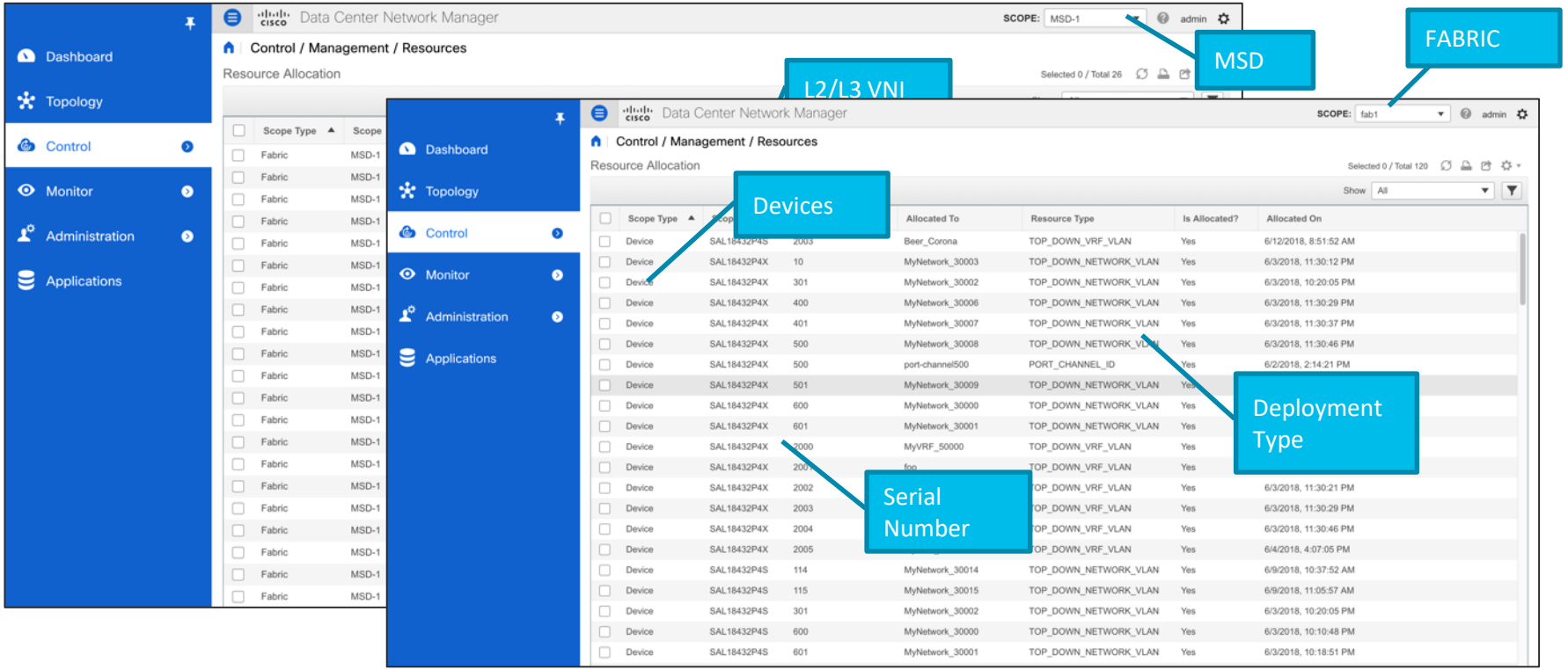
DCNM Keeps Track – Resource Manager



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Endpoint Locator (EPL)

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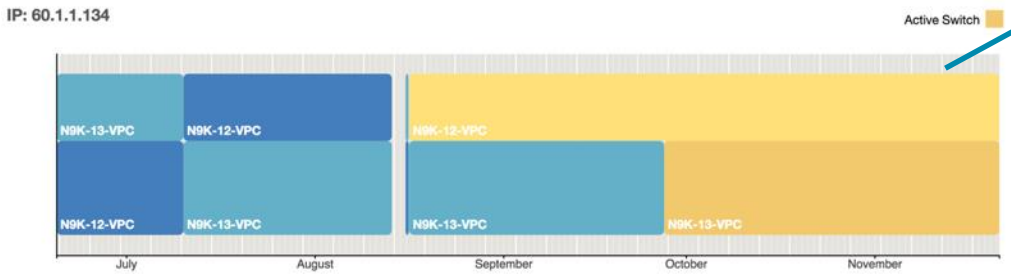
Endpoint Locator (EPL)

- 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



Graphical view of host life-cycle on the network

Endpoint Locator (EPL)

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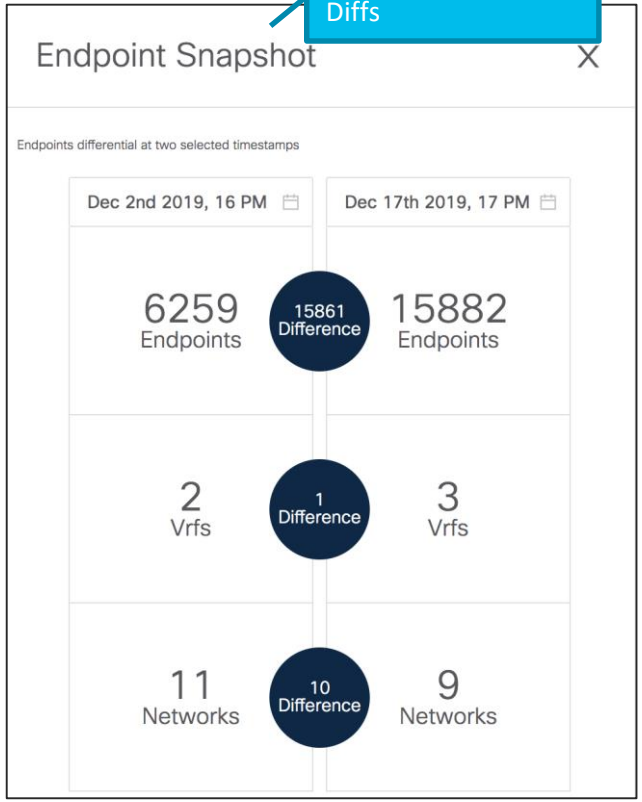
Endpoint Locator (EPL)

History of Endpoints and VRFs/Networks

Ability to Generate Diffs



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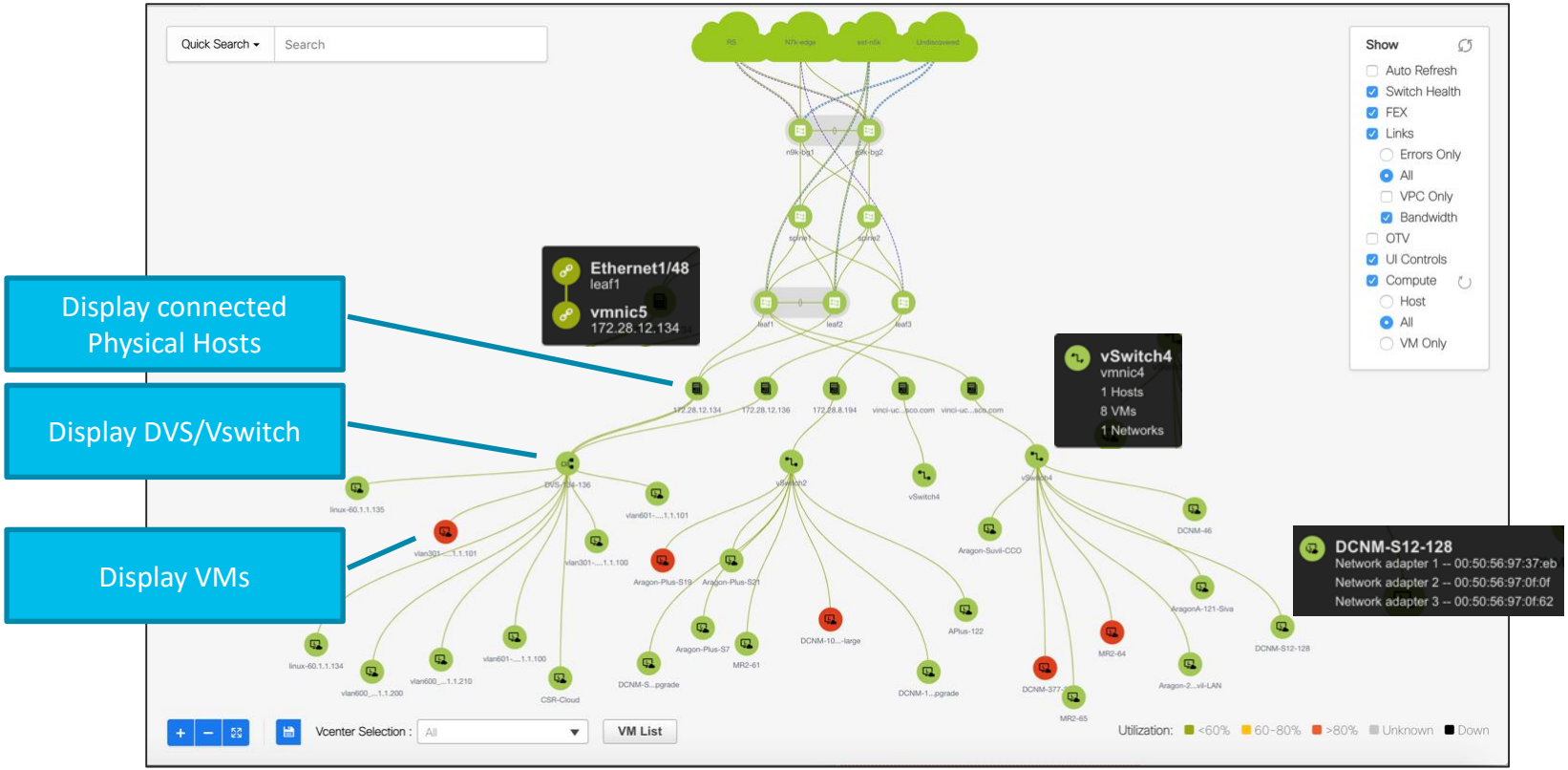
Virtual Machine Manager – Compute Visibility



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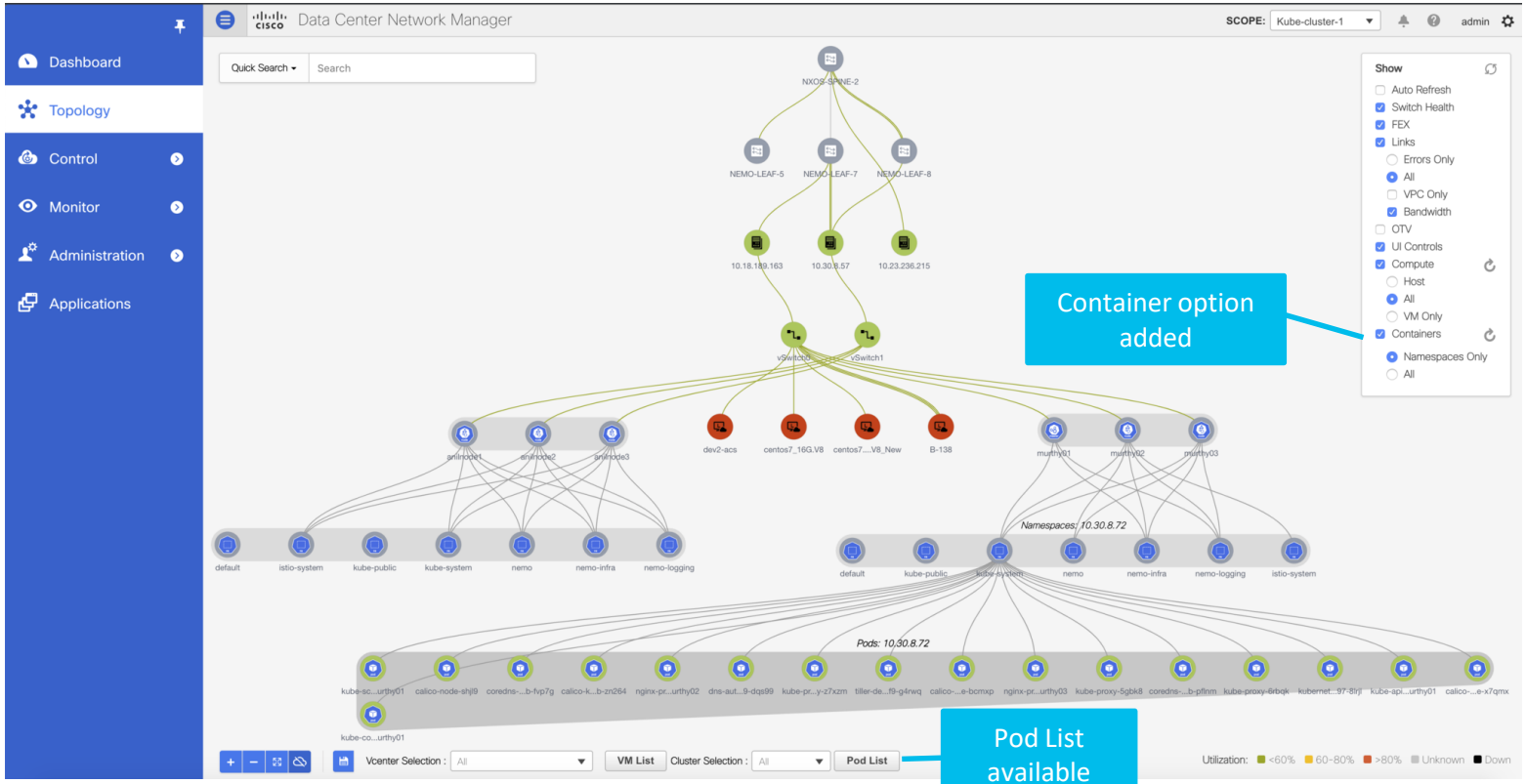
Kubernetes Cluster Visualization in Topology



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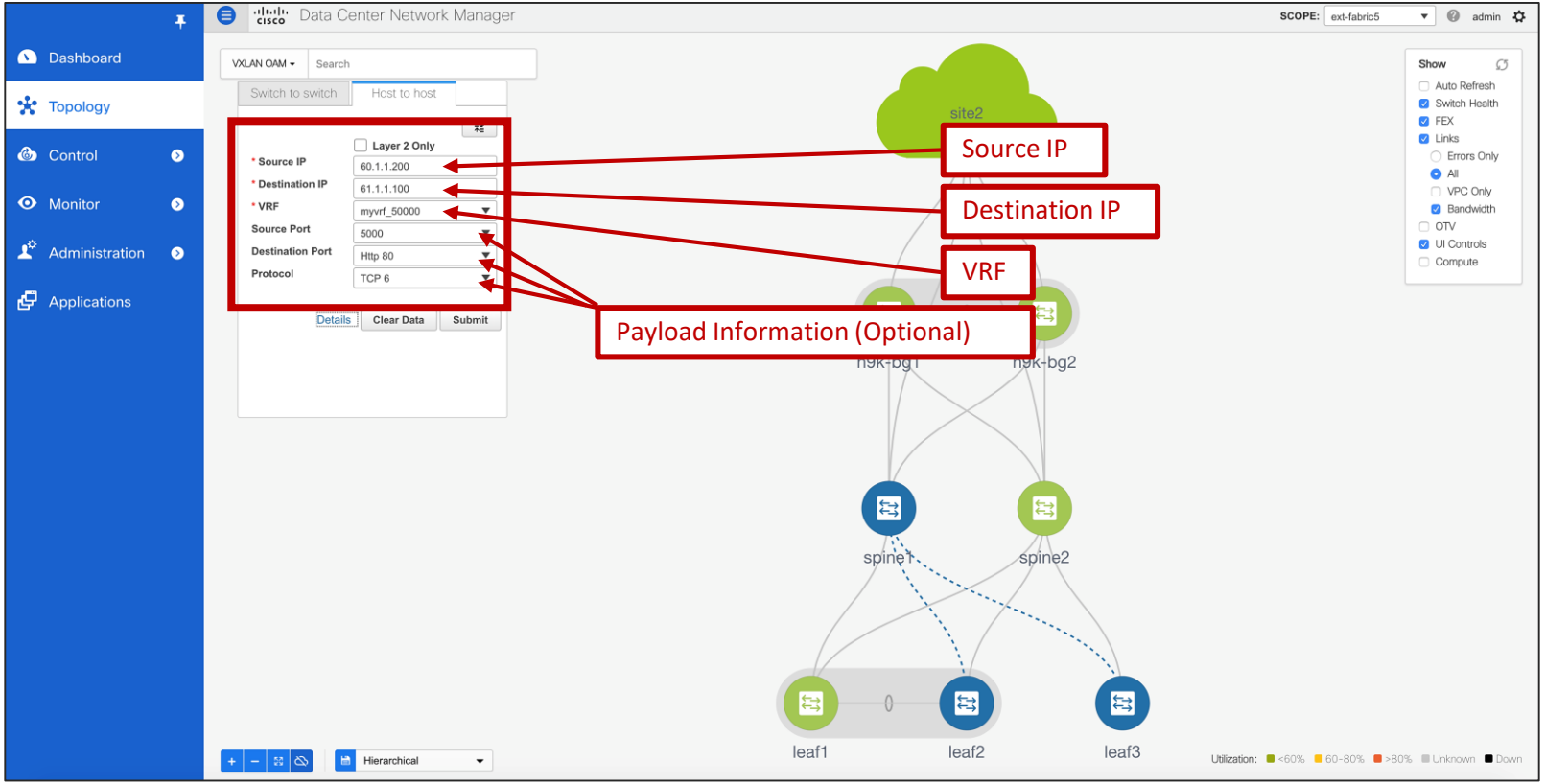
VXLAN OAM



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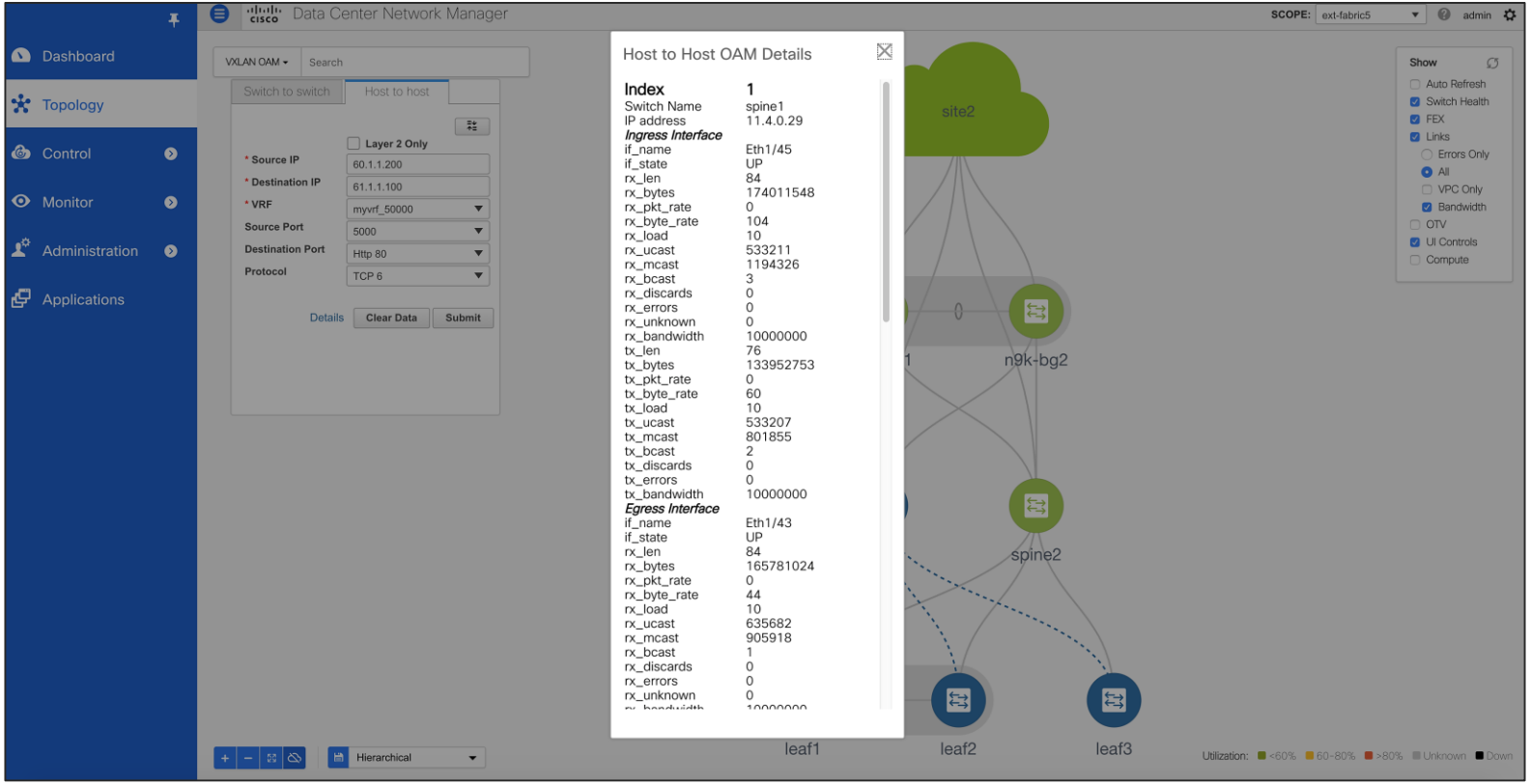
VXLAN OAM



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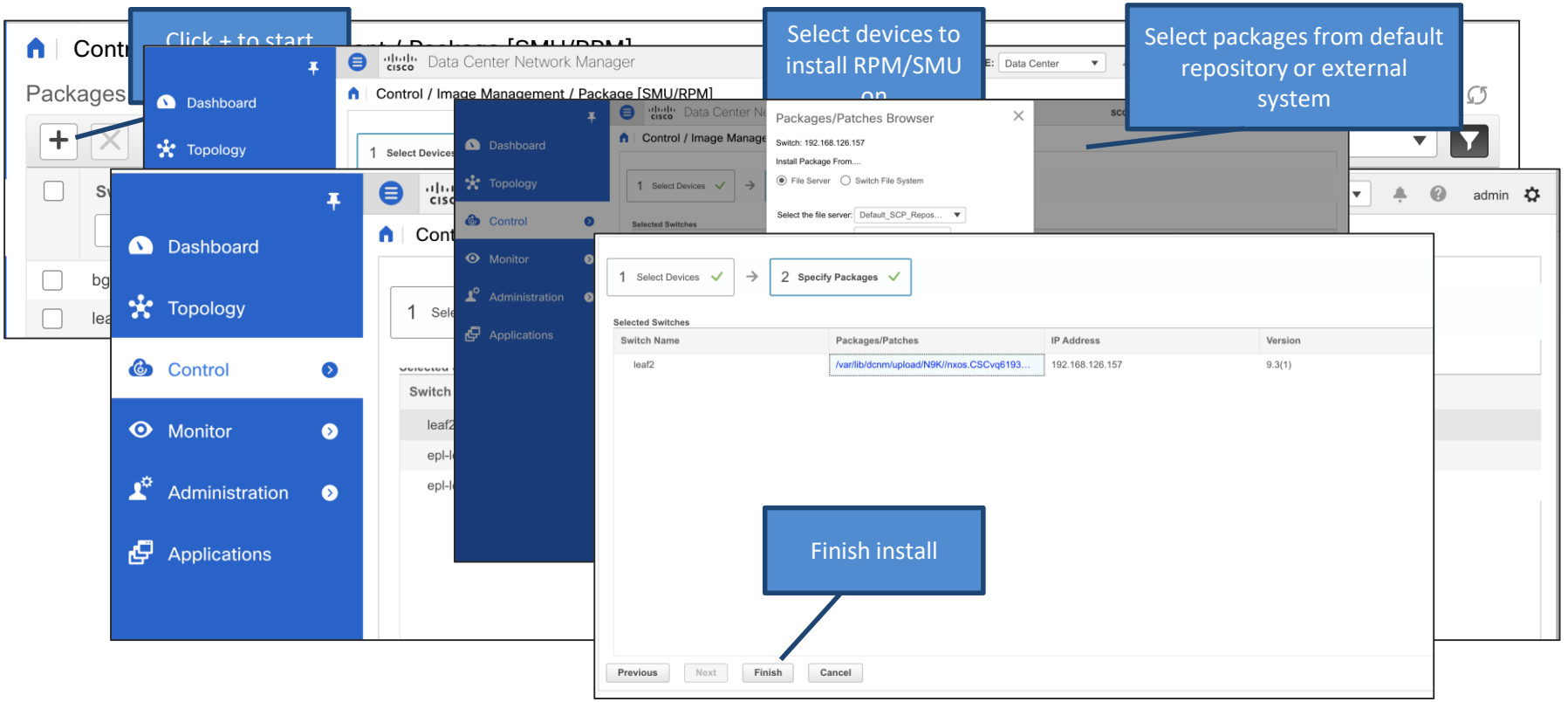
Install RPM/SMU



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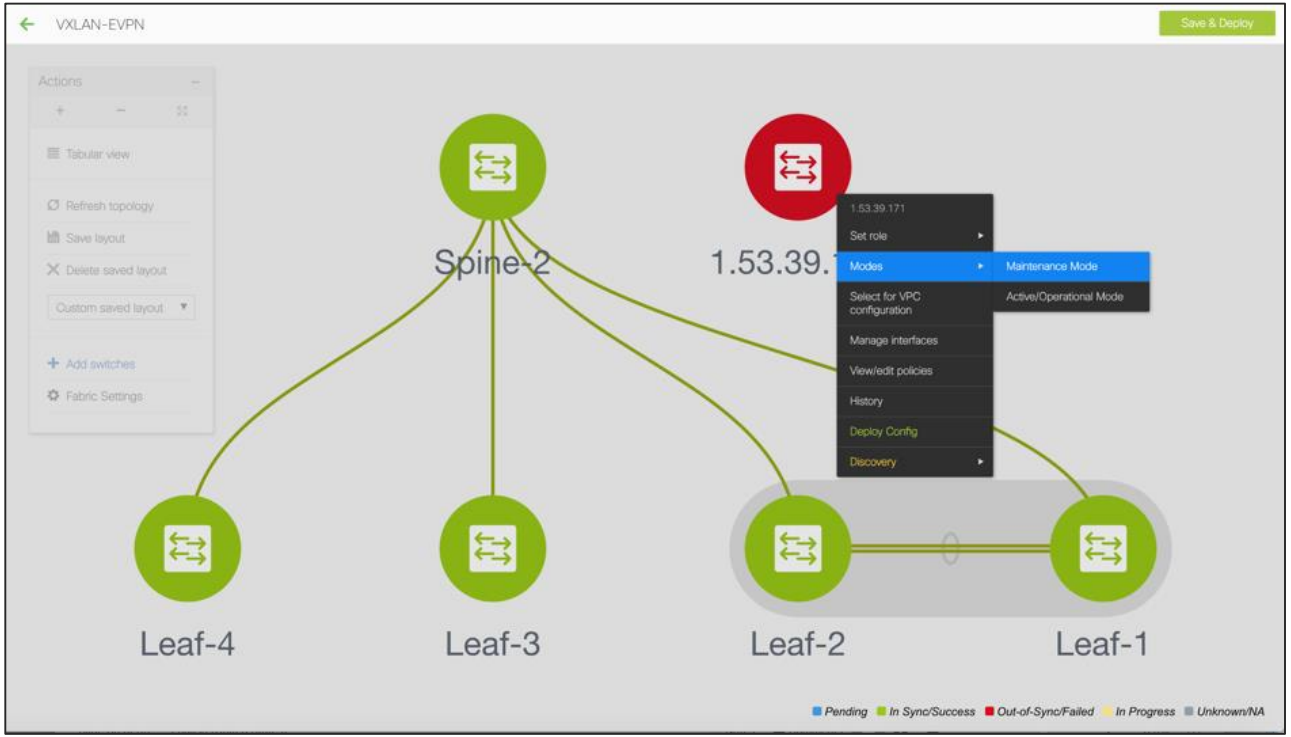
Switch Maintenance Mode



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

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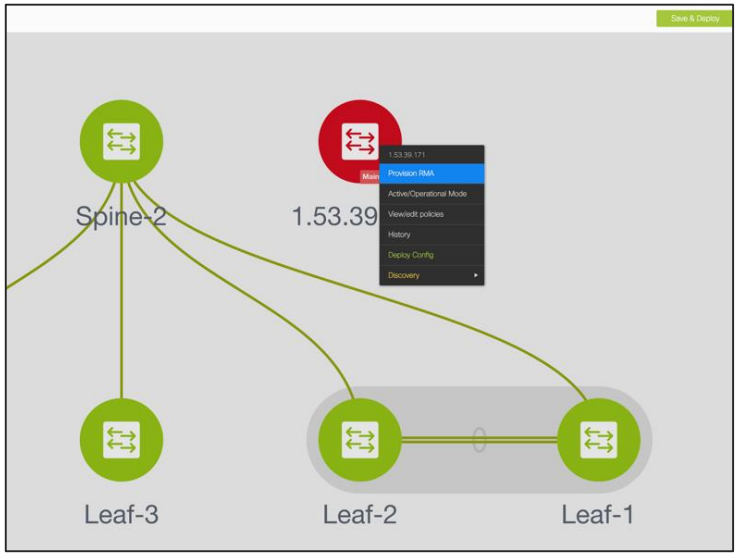
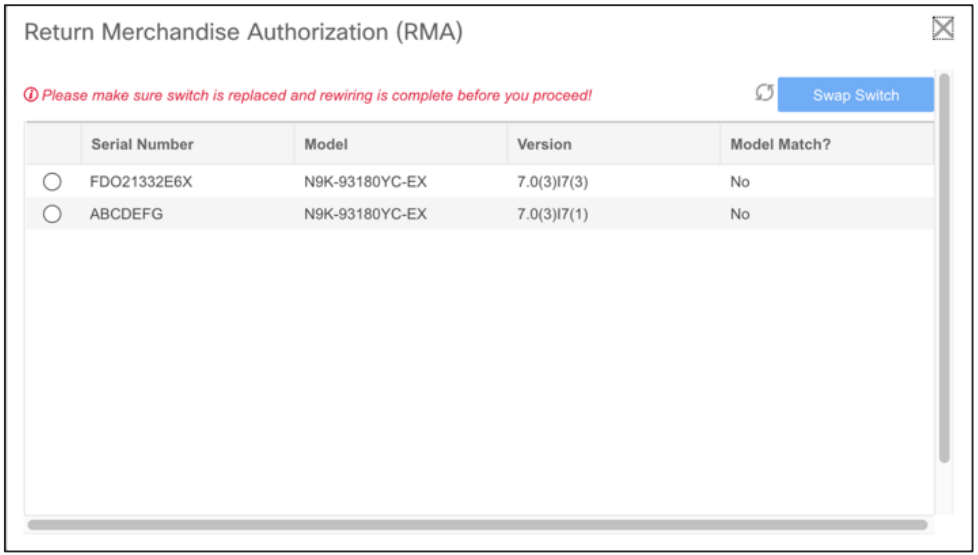
Provision RMA





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.

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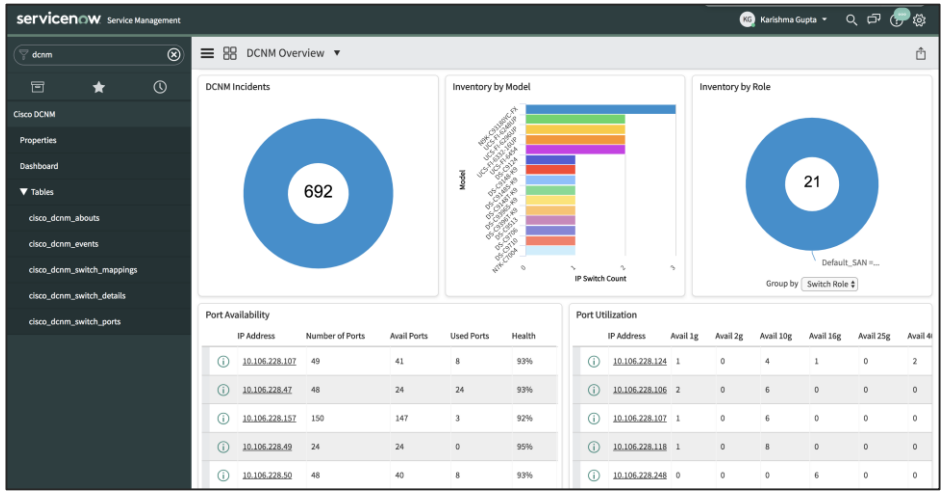
DCNM Integration with ServiceNow

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



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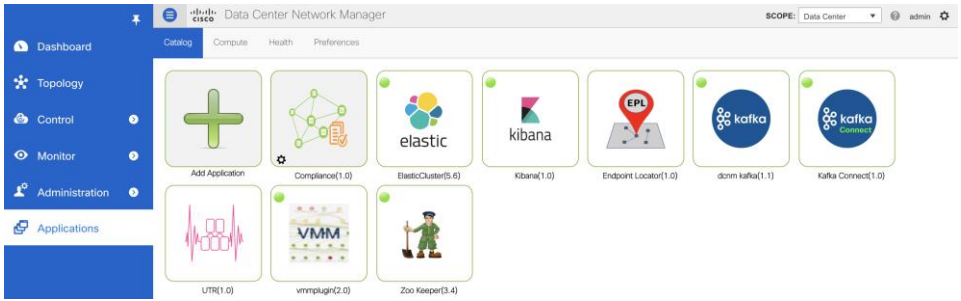
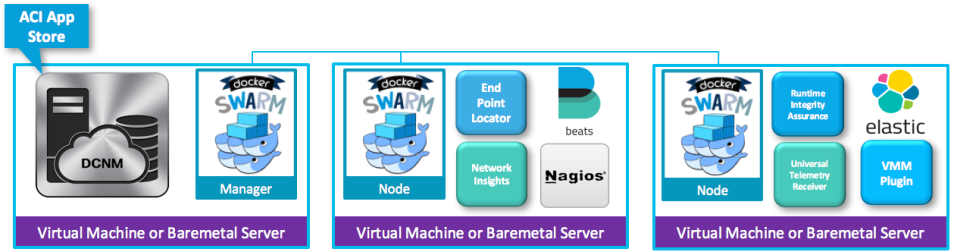
DCNM Application Hosting Framework

- 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



Expand Compute Nodes as Necessary



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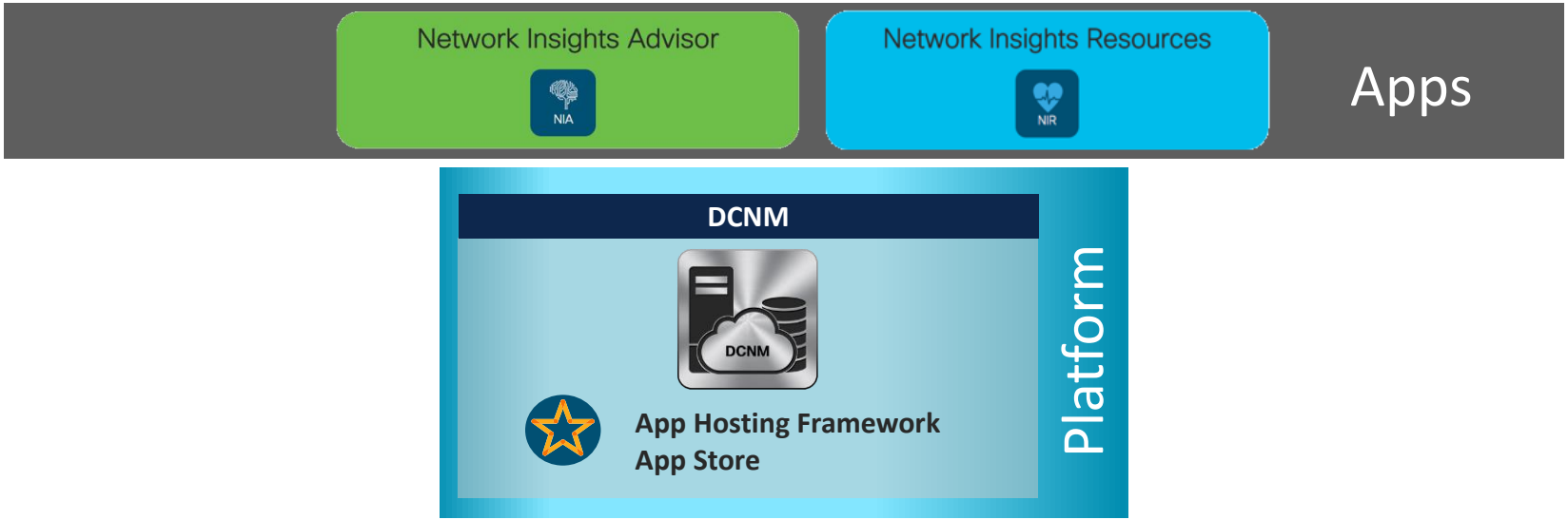
Network Insights Applications



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

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How Can NIR Help with Day 2 Operations?

Resources	Monitor fabric-wide and node-specific resource utilization
Environmental	Track CPU & memory consumption, monitor power and temperature
Statistics	Monitor network bandwidth utilization, packet drops, and network protocol statistics
Flows	Track flow paths, identify applications experiencing high latency or packet drops
Events	Correlate changes to events, identify faults

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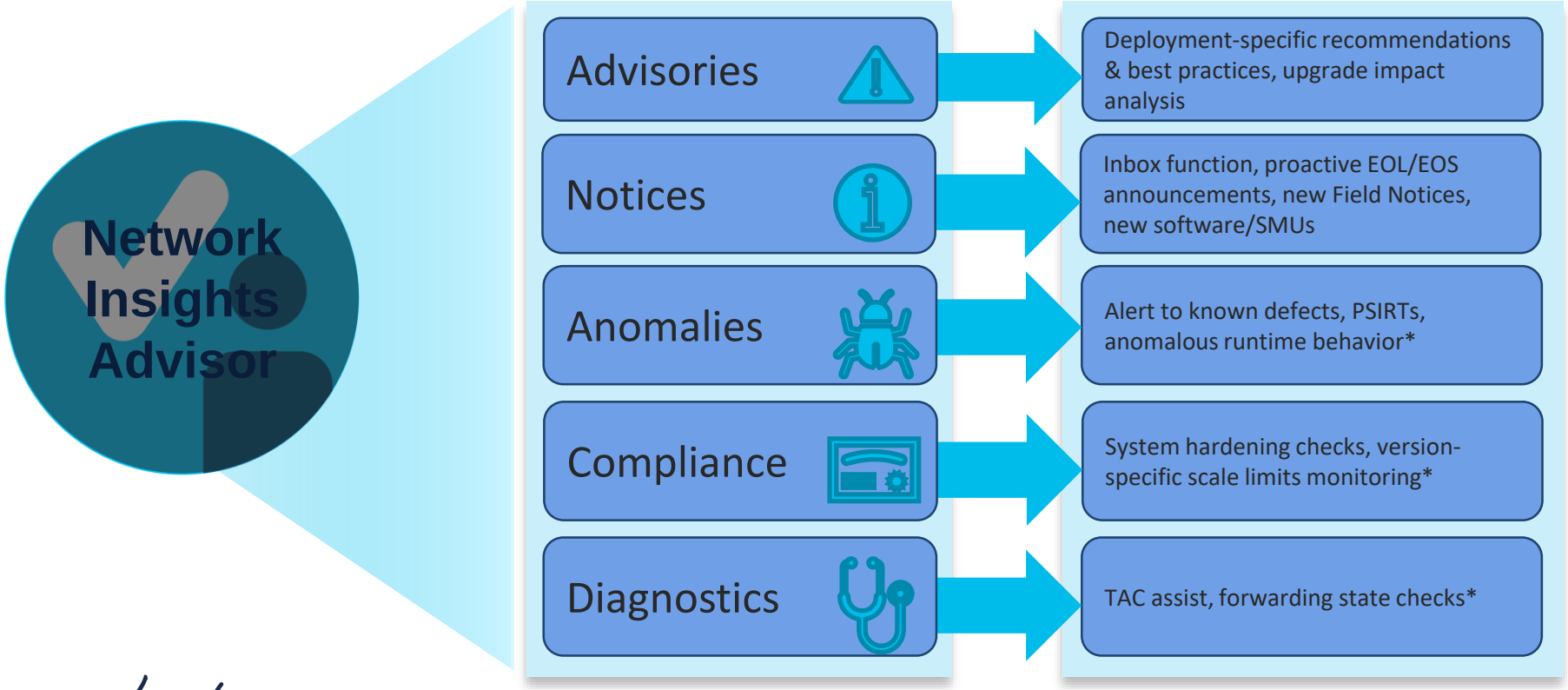
How Can NIA Help with Day 2 Operations?



* Roadmap

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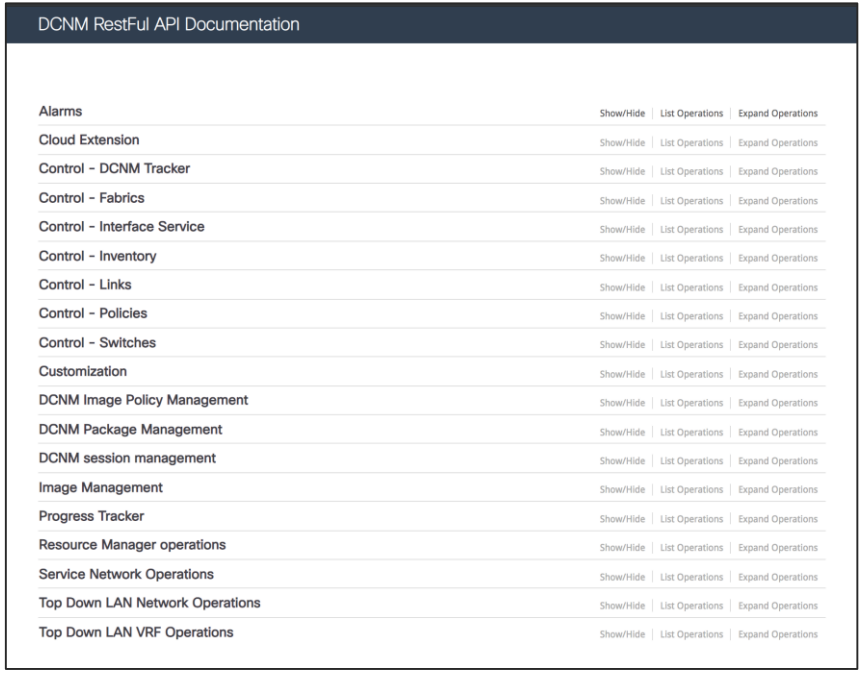
Want to Automate or Deploy at Bulk?

REST Away!



DCNM GUI uses REST APIs

1:1 parity with UI

Automate

Deploy at Bulk

Interface with 3rd party tools

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

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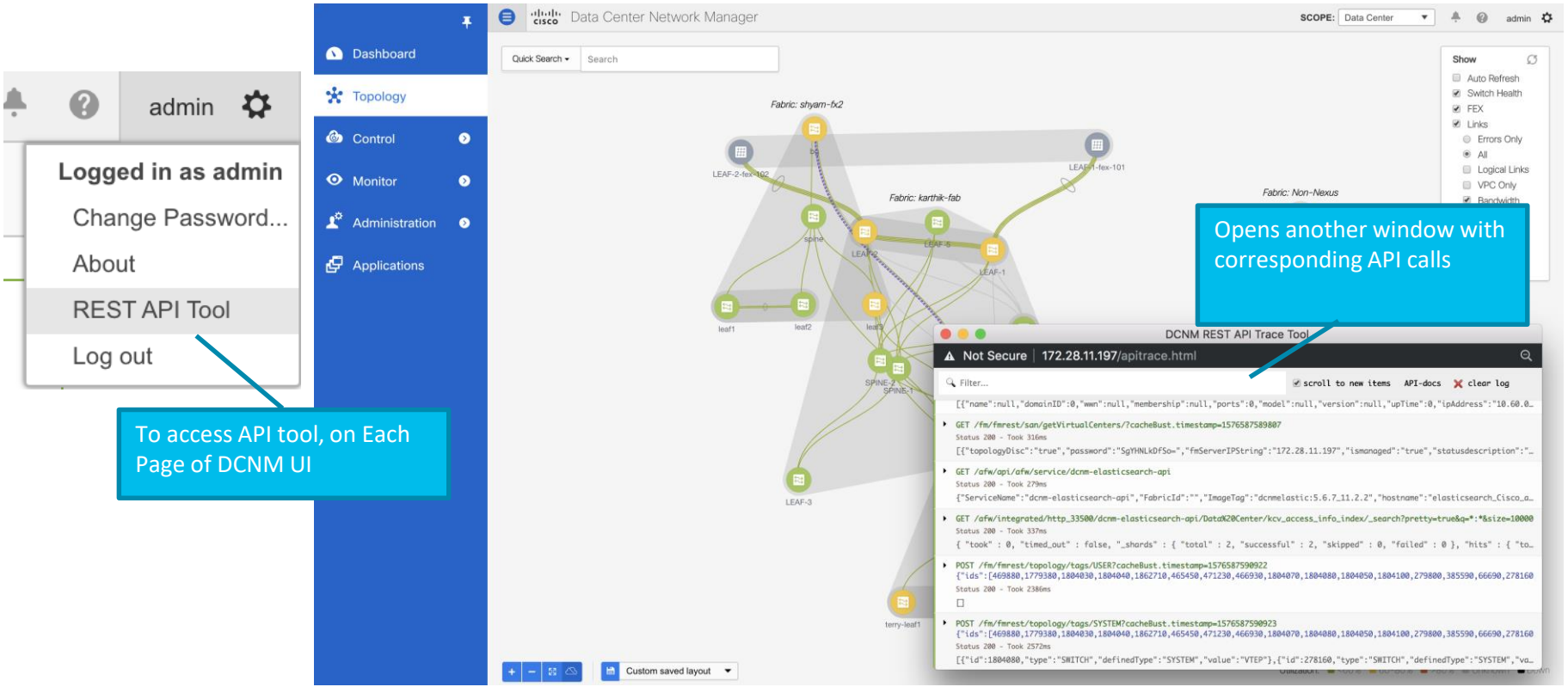
API Inspector



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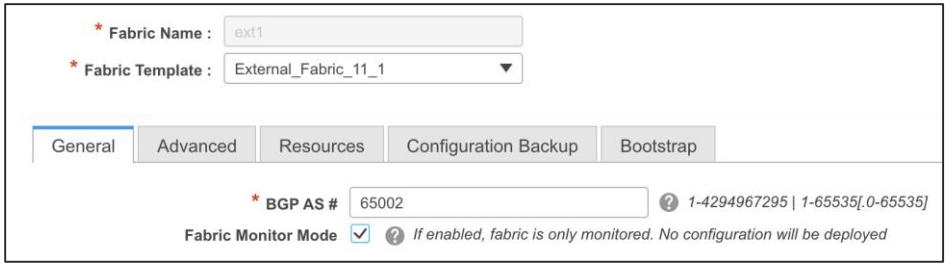
DCNM Monitor Mode

- 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



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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

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Demos

You make networking **possible**

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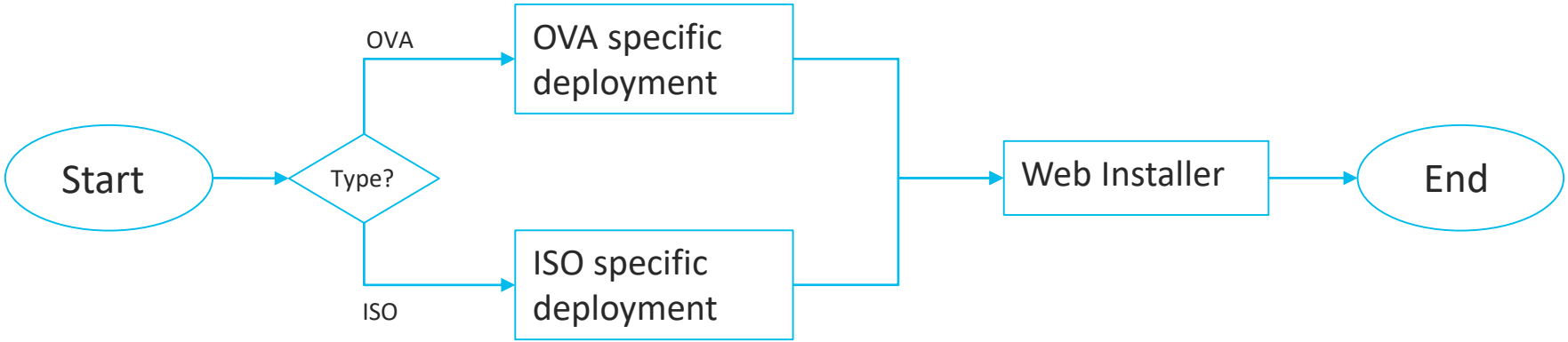
DCNM11 Installation

New Installation Mechanism

Full support for DCNM HA nodes



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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

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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

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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

DCNM HA SUPPORTED AND RECOMMENDED

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DCNM/NX

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

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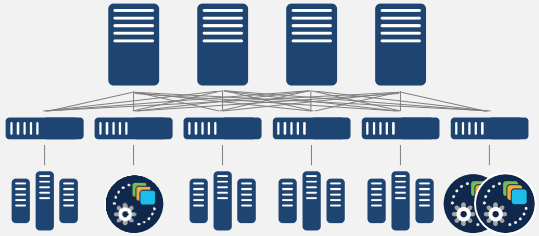
Cisco Application Services Engine

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



Network insights

DCNM Plugins

3rd Party apps *

* planning

2.2 GHz 10 core CPU x 2

256 GB memory

2.4 TB x 4 HDD

10G/25G/40G connect

Network automation | Scale-out cluster | SE-CL-L3

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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	

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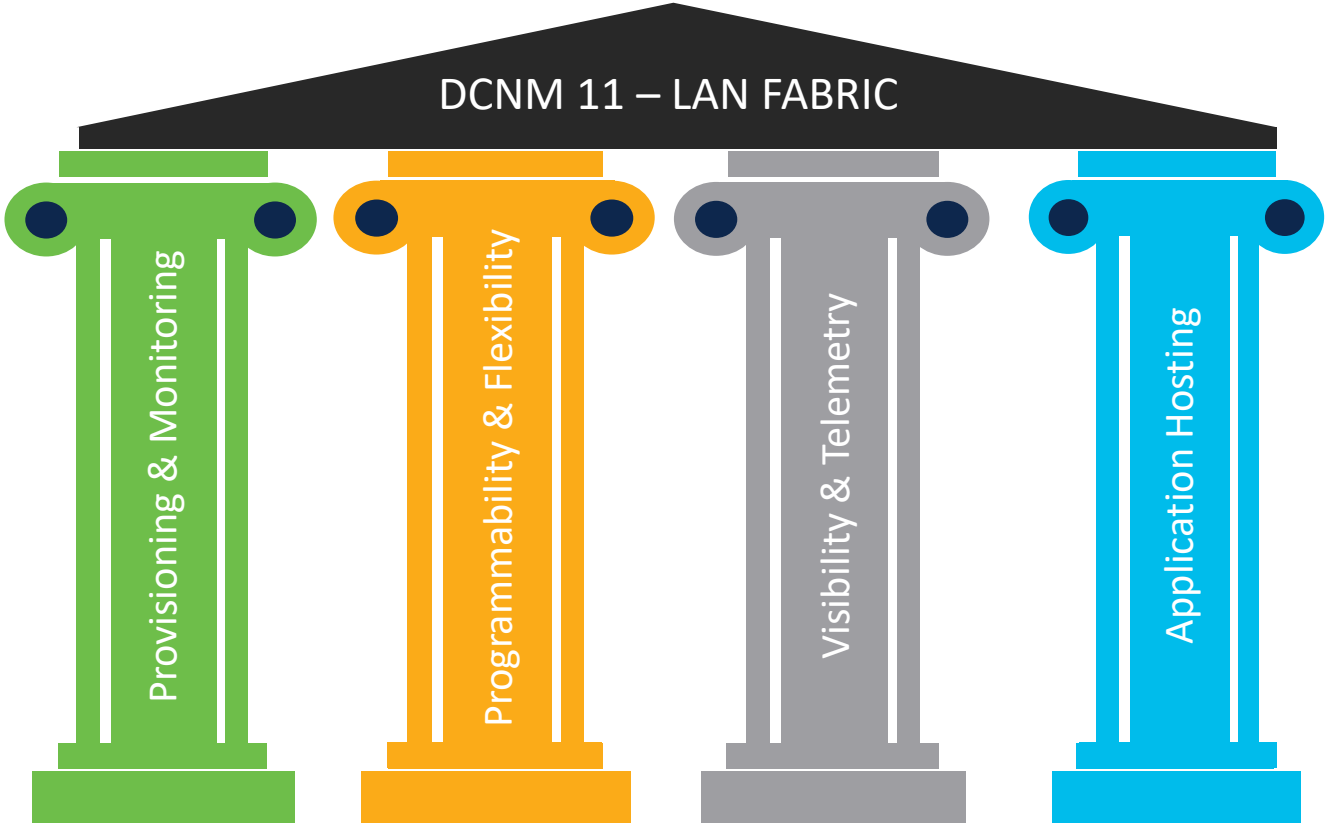
Conclusion



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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

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Thank you

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