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Easy Deployment and Management of NXOS Fabrics (VXLAN) with DCNM

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BRKDCN-2939

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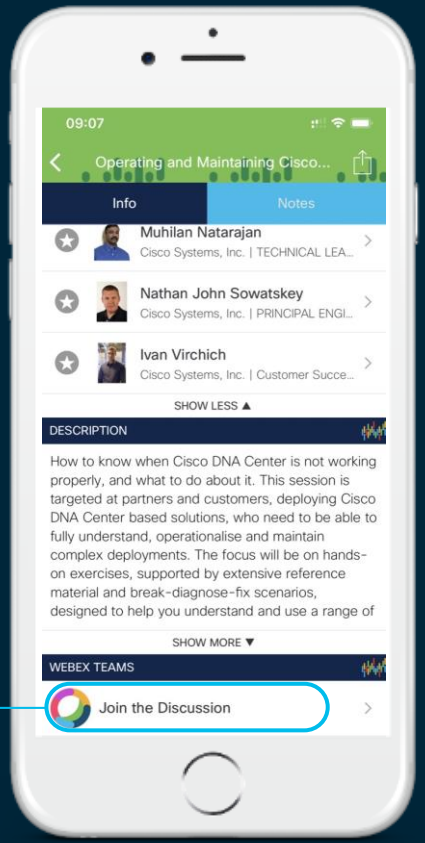


Agenda

- Introduction: DCNM 11.3 Overview
- VXLAN EVPN Greenfield Deployment
- VXLAN Multi-Site Fabric Deployment
- VXLAN EVPN Brownfield Deployment
- Monitoring, Maintenance & Troubleshooting
- Network Insights Advisor & Resources
- DCNM Fabric Live Demonstrations
- Conclusion: Evolution of Fabric Management

Introduction: DCNM 11.3 Overview

Why Choose DCNM for Your Data Center?

Automation

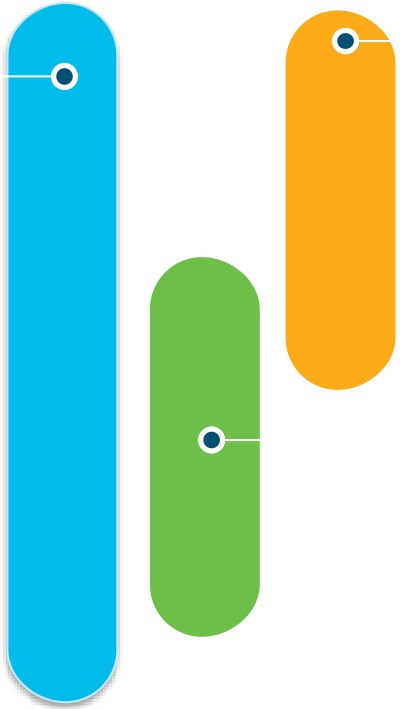
Visibility

Consistency

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

Addresses End-to-End Network Provisioning

- GUI/API-Based Provisioning
- Multi-Fabric & Multi-Site
- Network Configuration Backup & Restore

Network Architecture Deployment Modes

DCNM Modes

Fabric / Overlay Models

VXLAN + BGP-EVPN

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

Traditional Models

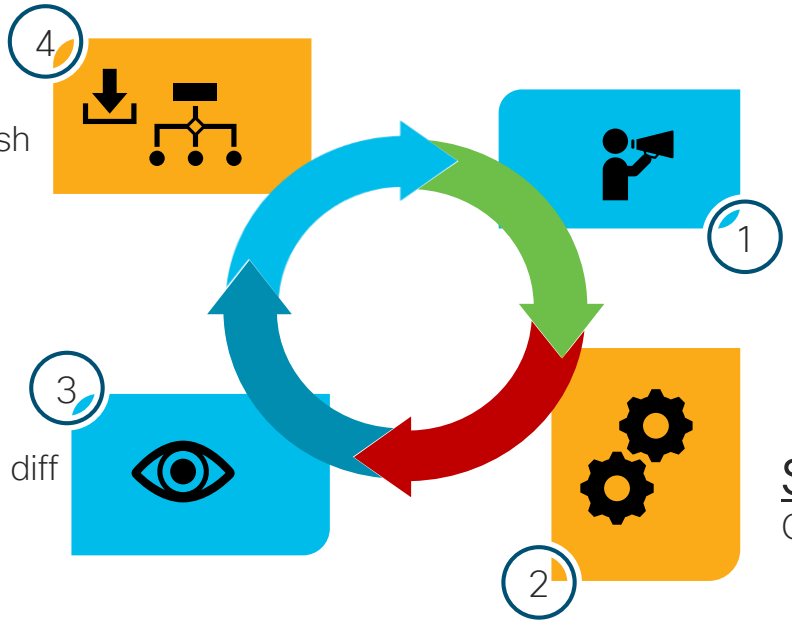
Traditional L2 / L3

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

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

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

LAN Fabric in DCNM 11 for Nexus 3K/9K



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

Your fabric is ready in a few minutes

What's New in DCNM 11.2(1)?

Design & Deployment

- vPC Fabric Peering
- eBGP based Routed Fabrics
  - Enable EVPN on top (with EPL)
- Easy Fabric Brownfield Enhancements
  - Border Spine/Border GW Spine
  - PIM Bidir
  - Tenant Routed Multicast
- Day-0/Bootstrap with External DHCP server
- Public Cloud Connectivity with Azure (Preview*)

Day 2 Operations

- Network Insights Resources
- Network Insights Advisor
- IPv6 Support for external access (eth0)
- VMM Compute visibility with UCS-FI
- Topology View Enhancements
- Inline Upgrade from 11.0/11.1

Misc. Enhancements

- 250 Switches per DCNM
- Qualifying support for 7.0.3I4(x) long-lived release
- Fabric Template Enhancements
  - Bidir support with 4 RPs
  - ISIS/OSPF/BGP authentication
- Addition of Freeform configuration policies
- Top-down enhancements
  - On-demand generation of a free VLAN for a fabric
  - On-demand generation of an underlay multicast group

What's New in DCNM 11.3(1)?

Design & Deployment

- VXLAN IPv6 underlay
- IPv6 POAP
- Super-Spine and TOR support, Border PE
- Non-Nexus Switch Support
- Public Cloud Connectivity with Azure
- VXLAN to SR/LDP MPLS handoff
- TRM over Multi-Site
- Auto VRF-Lite (knob in IFC)
- Full Routed Fabric support

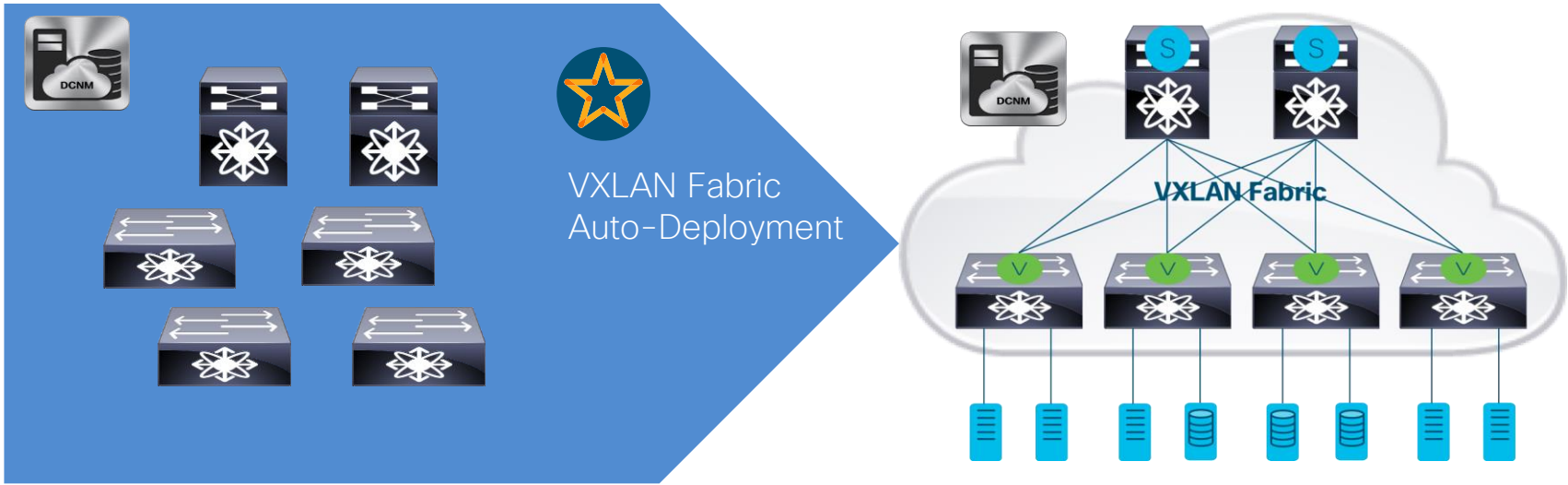
Day 2 Operations

- Network Insights continued
- EPL 2.0 ~ 4 sites
- New improved health score
- ServiceNow Integration
- IPv6 Support for eth2
- Inline Upgrade from 11.1/11.2 to 11.3(1)
- RPM and SMU install from DCNM
- Image management policies
- API inspector
- Operational view
- Kubernetes Cluster Visualization (Preview)

Misc. Enhancements

- 350 Switches/ 50k EPs
- Qualifying support for 9.3(x) long-lived release
- Fabric Template Enhancements
  - QOS templates
  - BFD support
  - PTP support
  - Strict CC
- History enhancements
- New Backup and Restore
- L3 port-channel support for external connectivity
- Clustered mode from UI
- Bonding support for ISO

Cisco DCNM VXLAN Auto-Deployment

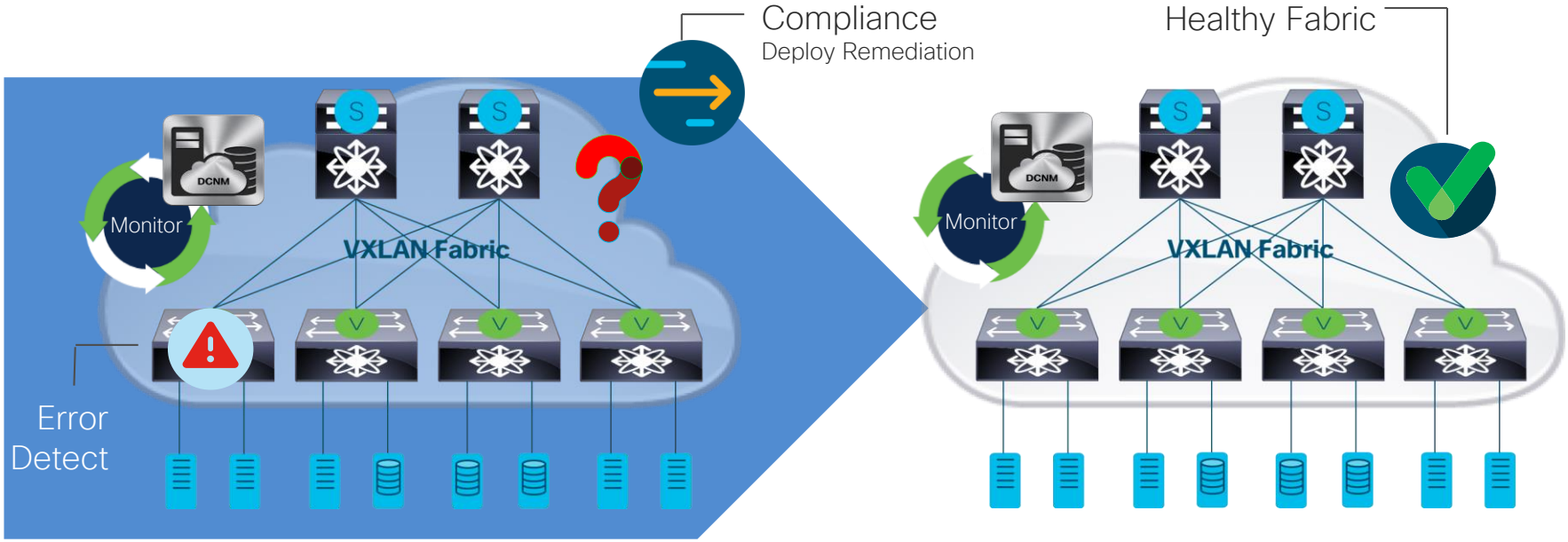


Turn-Key VTEP Deployment

Simplified Deployment

Managed-Fabric Operations

Fabric Compliance – Underlay / Overlay / Access



Compliance

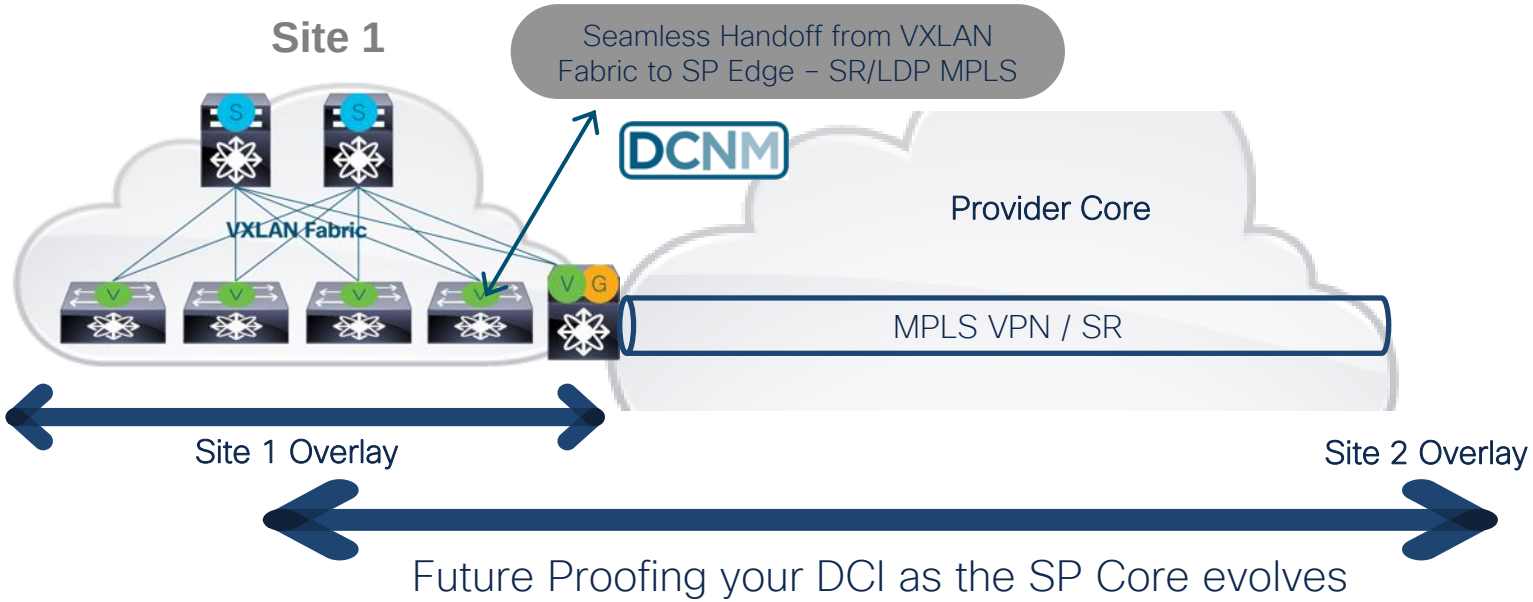
Fabric Reliability & Visibility

Operations Confidence

VXLAN-EVPN External Connectivity Deployment

- 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 & VRFs
    - TRM support added

DCNM 11.3(1) DCI Integration



Future Proofing your DCI as the SP Core evolves

Fault Containment	Single Switch Handoff	Separate Admin Domains	Scalability

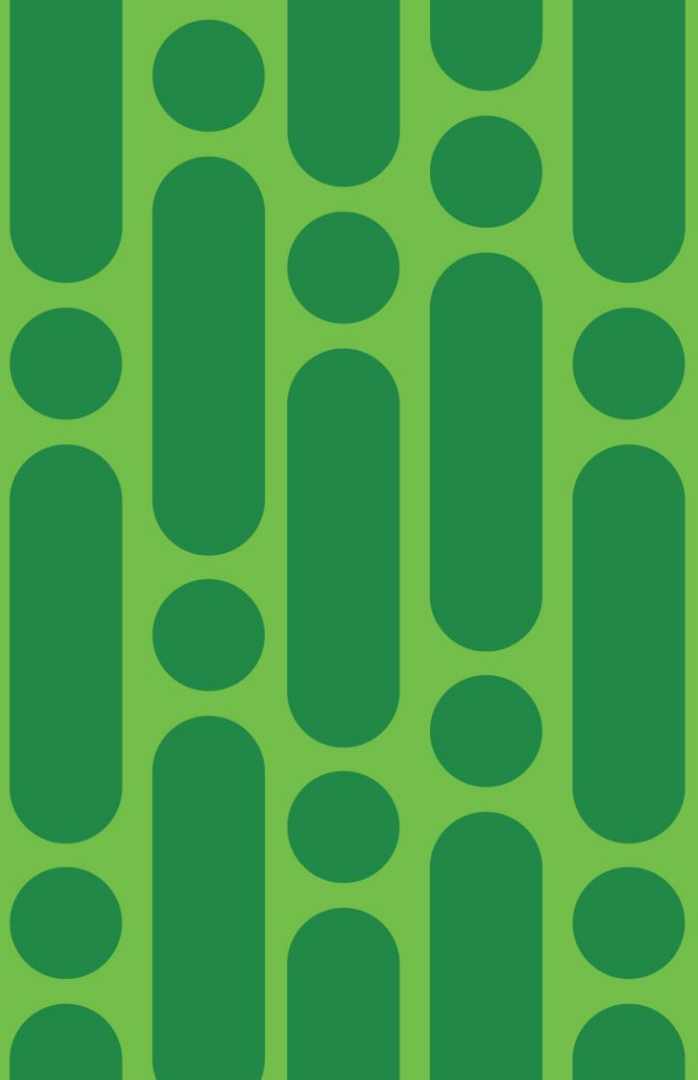
DCNM L4-L7 Services Integration

- 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

Fabric Builder Scale & Limitation

- Switches per DCNM = 350
- Switch Freeform Policies Must Have Exact Copy of the “show running configuration” Output
- vPC on Spine not Supported
- No Layer-3 Port Channel Support Between Spine and Leaf
- L3 Port-Channel Support Added for External Connectivity

VXLAN EVPN
Greenfield Deployment



LAN Fabric (VXLAN-EVPN) Greenfield Deployment

Controller-Centric Top Down Approach

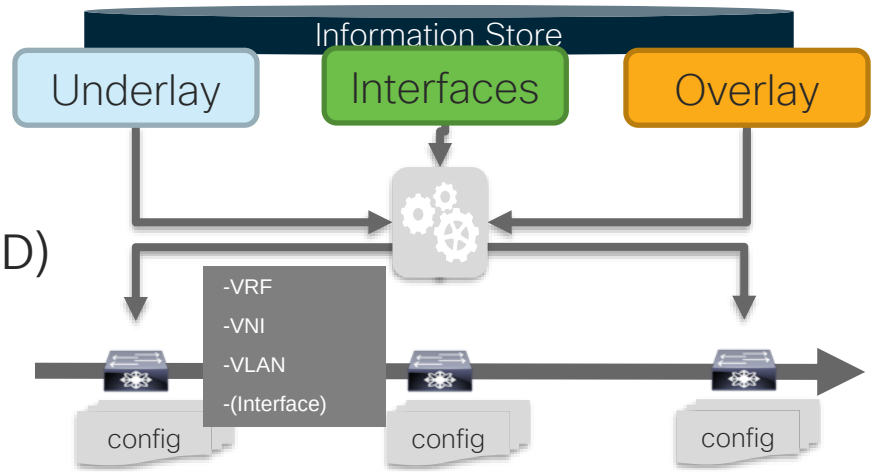
Three Steps for deployment:

- Underlay (POAP + Bootstrap)
- Interfaces
- Overlay

Fabric Builder for Multi-Site Domain (MSD)

- Centralized to Route Server
- Direct peering between BGWS

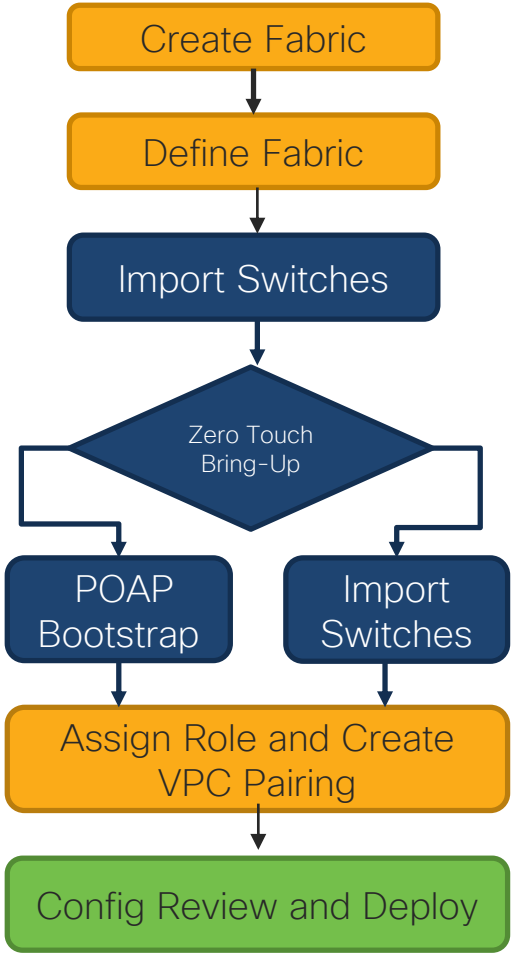
VRF-Lite External Connectivity



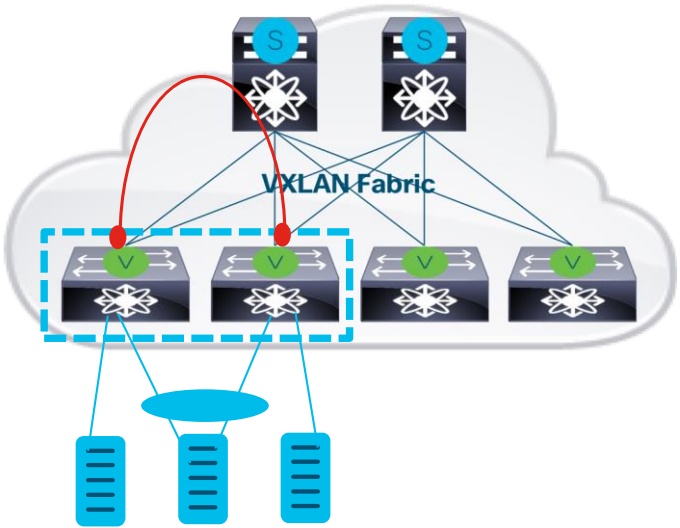
Underlay Deployment

VXLAN EVPN Fabric Builder

- Day-0 bring-up with Auto-Bootstrap
- Best practice flexible python templates for configuration generation
- Underlay includes:
  - Fabric Definition & Creation
  - Device Discovery
  - Configuration Generation, Preview, & Deploy
- Single-click VPC pairing
- Support any combination of replication, multicast, IGP, IP numbered/unnumbered options



VPC Fabric Peering – DCNM 11.2(1) Onwards

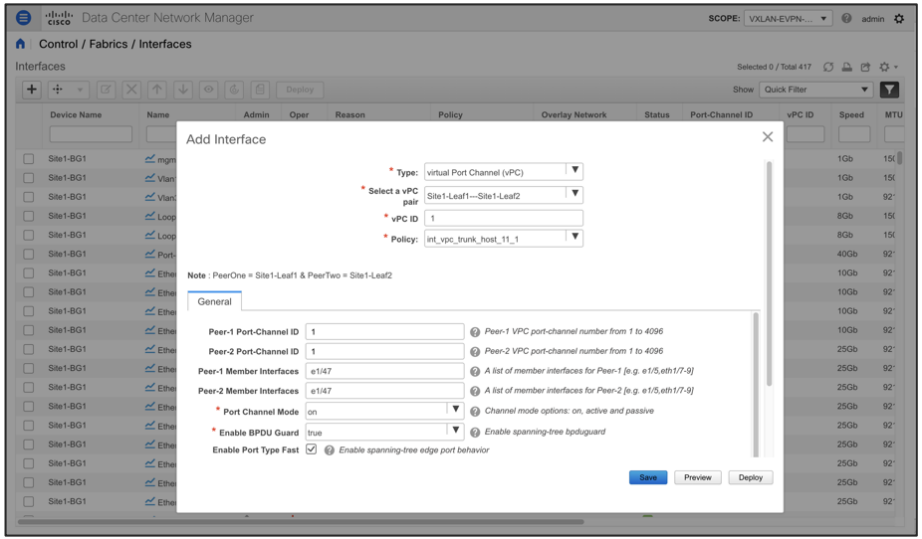


- Enhanced dual-homing solution without wasting physical ports
- Preserve traditional vPC characteristics
- Optimized routing for singled homed end points with PIP

Host FEX/Breakout Connectivity

Interface Configuration

- Attaching Servers/Access switches/FEXes
- Best practice flexible python templates for interfaces
  - vPC, Port-Channels, Access, Trunk, Loopback, Sub interfaces, Routed interfaces
- Support for ST & AA FEX
- Support for Breakout Interfaces
- Customizable Interface Policies
- Bulk Configuration with REST APIs

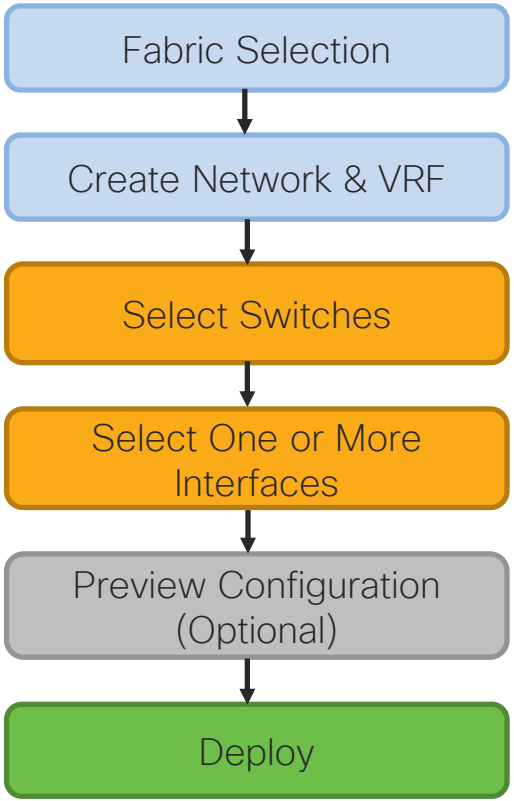


Fabric Interface Configuration

Overlay Deployment

Networks and VRF's

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



External Fabrics – LAN Classic

- External Fabrics can be managed or monitored
- Support for Nexus 2k – 9k for VXLAN/Traditional Fabrics
  - IOS-XE family devices: CSR1000v, ASR1000
  - IOS-XR family devices: ASR9000, NCS5500
  - Catalyst 9000 family devices: C9500
- Non-Nexus Device Support
  - Arista Devices
- Configuration Compliance support in External Fabric Builder
- Config backup & restore with side-by-side diff view
- Support for EPL in External VXLAN-EVPN Fabrics

DCNM 11.3(1) Interfaces Scale & Limitations

LAN Fabric Installation Mode

LAN Fabric Installation Mode

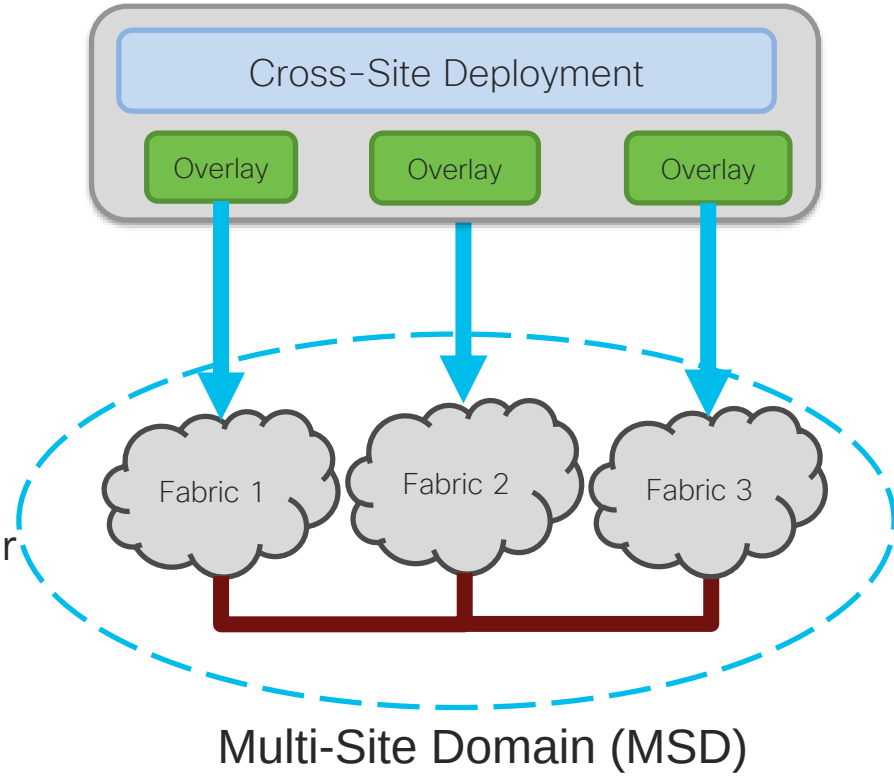
Feature	Scale
Physical Interfaces	20k (11.1) / 25k (11.2) 30k (11.3(1))
Switch Scale	350 – In Managed Mode 750 – In Monitor Mode
L3 Scenario: Networks and VRFs per Fabric	1000 Networks/500 VRFs
L2 Scenario: Networks per Fabric	1500 Networks
Endpoint Locator	100K Endpoints across 4 Fabrics
Virtual Machine Manager End Points	5k
Maximum vCenter Instances per DCNM	4

VXLAN Multi-Site Fabric Deployment

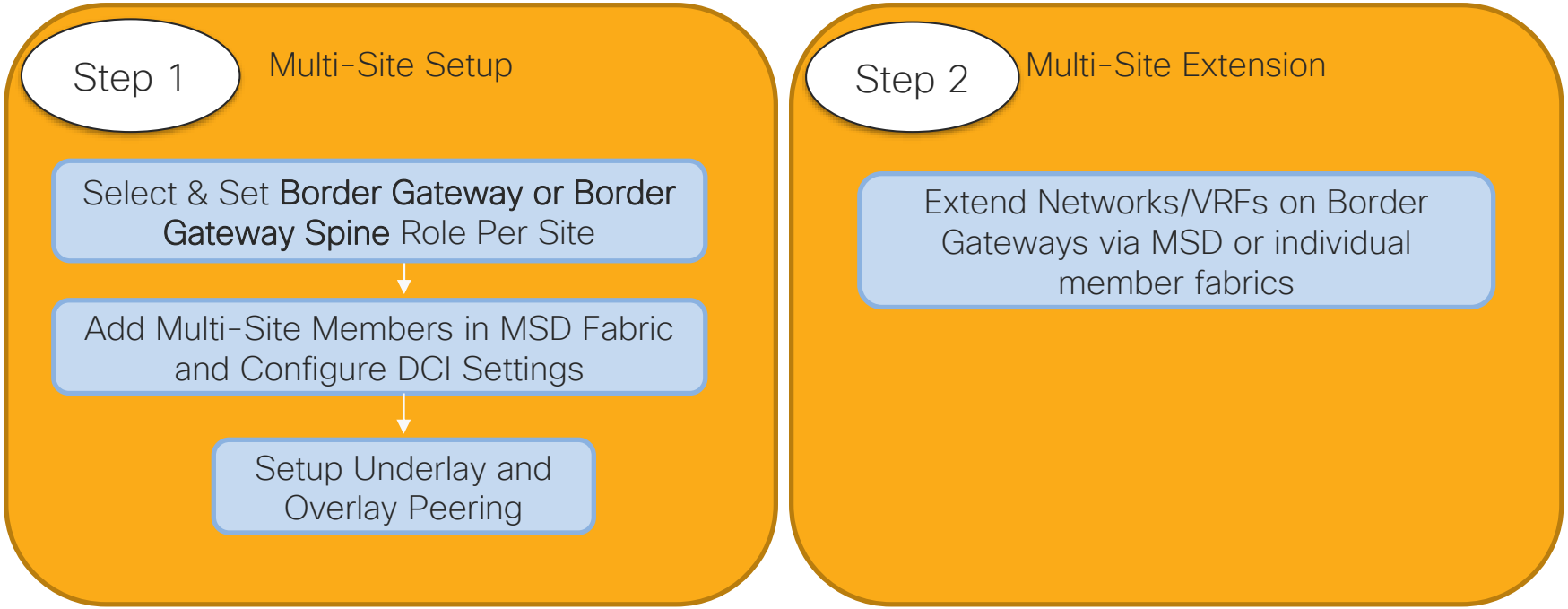
VXLAN EVPN Multi-Site Deployment

Multi-Site Domain

- Zero touch bring-up of Border Gateways
- Workflow for Multi-Site Underlay and Overlay external connection peering
- Multi-Site Domain with member fabrics aka Sites
- One-time definition for Networks & VRFs
  - Definitions auto-inherited to members
- On-Demand extension of VRFs/Networks over Multi-Site



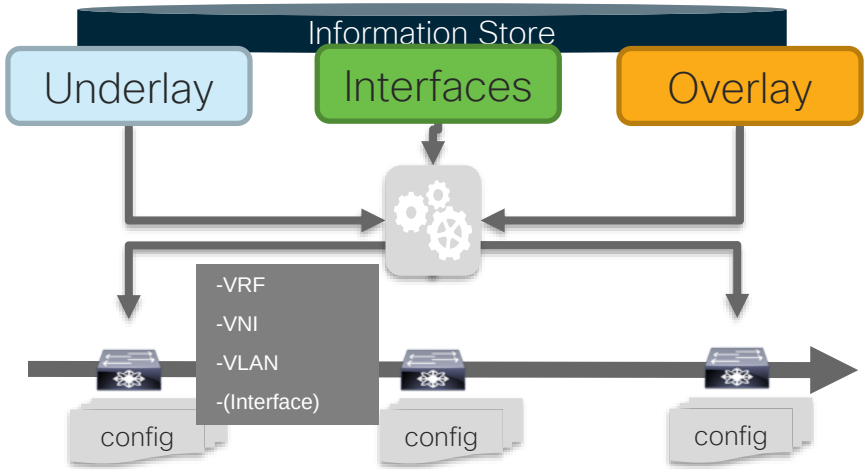
VXLAN EVPN Multi-Site Deployment



VXLAN EVPN
Brownfield Deployment

LAN Fabric Brownfield Deployment

- Non-disruptive import of existing VXLAN EVPN deployments
- Learns topology, all configuration, associated resources, IP subnets, VNIs, VLANs etc. from the existing deployment
  - State reverse populated into DCNM
- Start managing fabric as if provisioned from DCNM

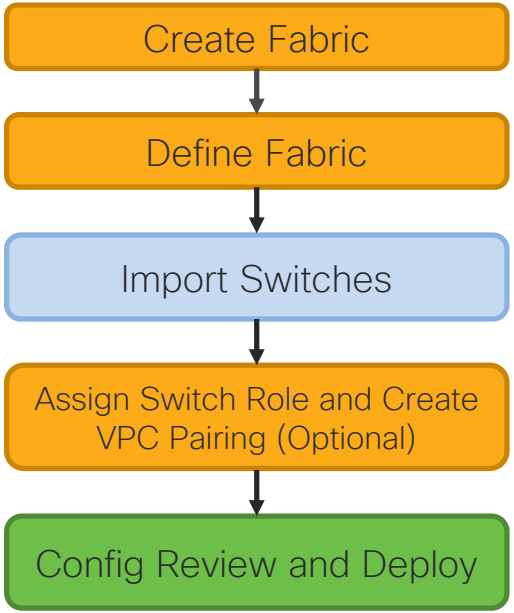


Brownfield Deployment

VXLAN EVPN Fabric Builder

Procedure:

- Fabric Definition & Creation
- Import Devices via Add Switches
  - Switches will be imported in “Migration” State
- Save & Deploy
  - Per switch configuration processing matched against selected Fabric Settings
  - All configuration & associated resource usage per switch learnt by the DCNM
  - Sanity checks for mis-configs with error reporting
    - Iterative process to continue migration post error correction



Brownfield Scale & Limitations

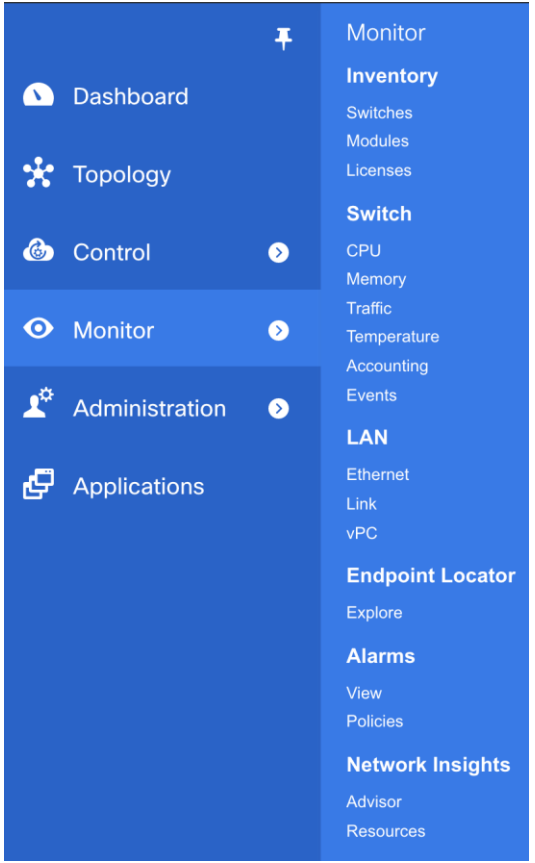
- eBGP Routed Fabric (optionally EVPN) not supported
- Import of Fabrics with Multi-Site requires re-creation of Multi-Site Overlay Inter-Fabric Connections
- Verified scale numbers
  - Switches per fabric = 70

Monitoring, Maintenance & Troubleshooting

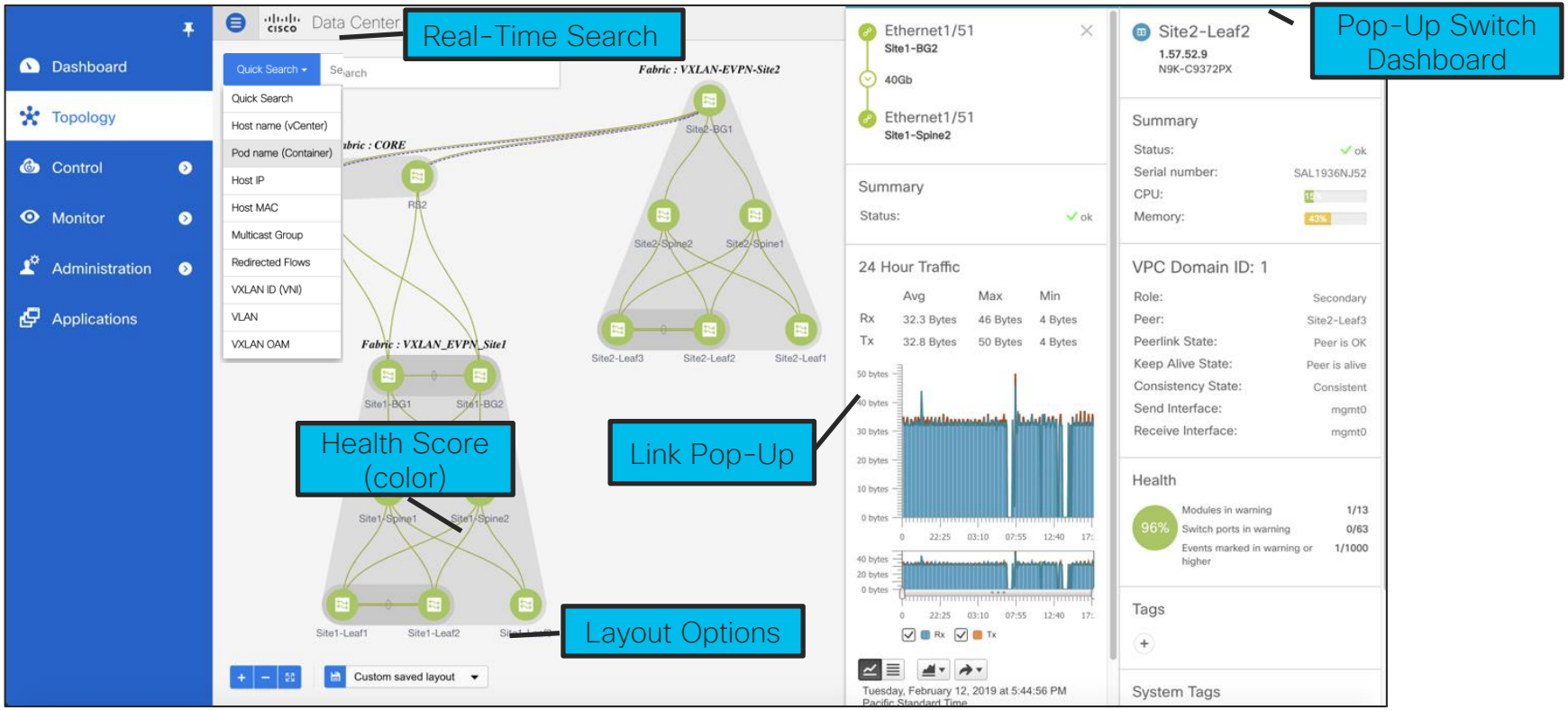
Monitoring, Maintenance & Troubleshooting

Day 2 Operations

- Real-Time Network View
- Network Insights
- Common Operations
  - Update Credentials, Policies, Fabric wide History
- Configuration Compliance
- Resync Fabric
- Backup and Restore
- Endpoint Locator
- VXLAN OAM
- Software Upgrades
- RMA

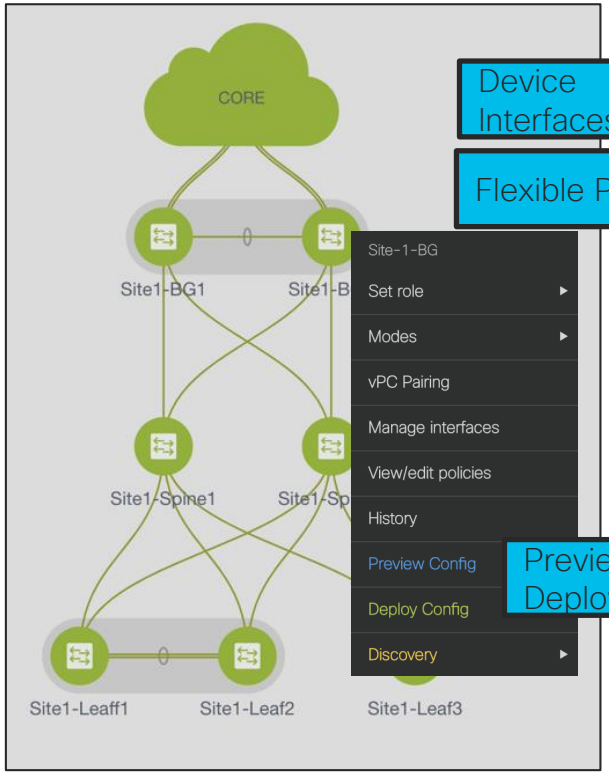


Real Time Topology View



Multilayer Topology Views

Device Maintenance

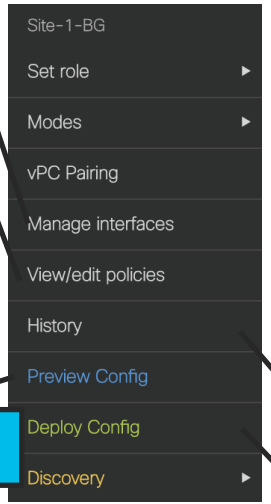


Device Interfaces

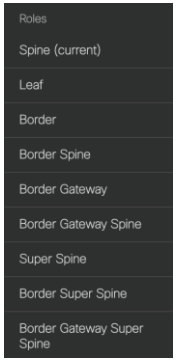
Flexible Policies

Preview without Deploy

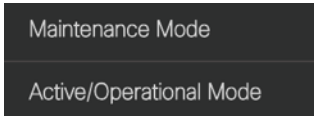
Device Options



Device Roles



Device Modes

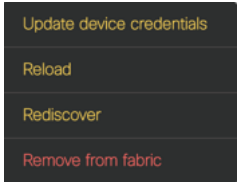


RMA

Configuration Status & History

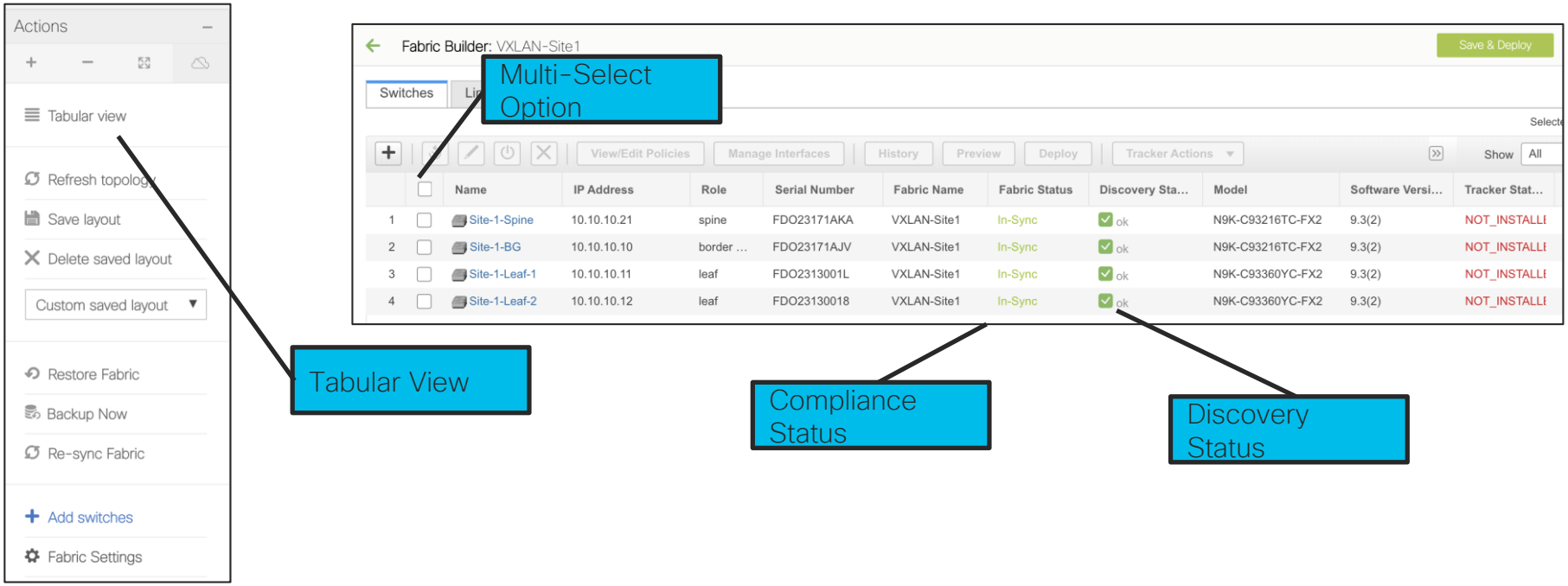
Device-Level Deployment

Discovery



Fabric Builder Day 2 Topology Views

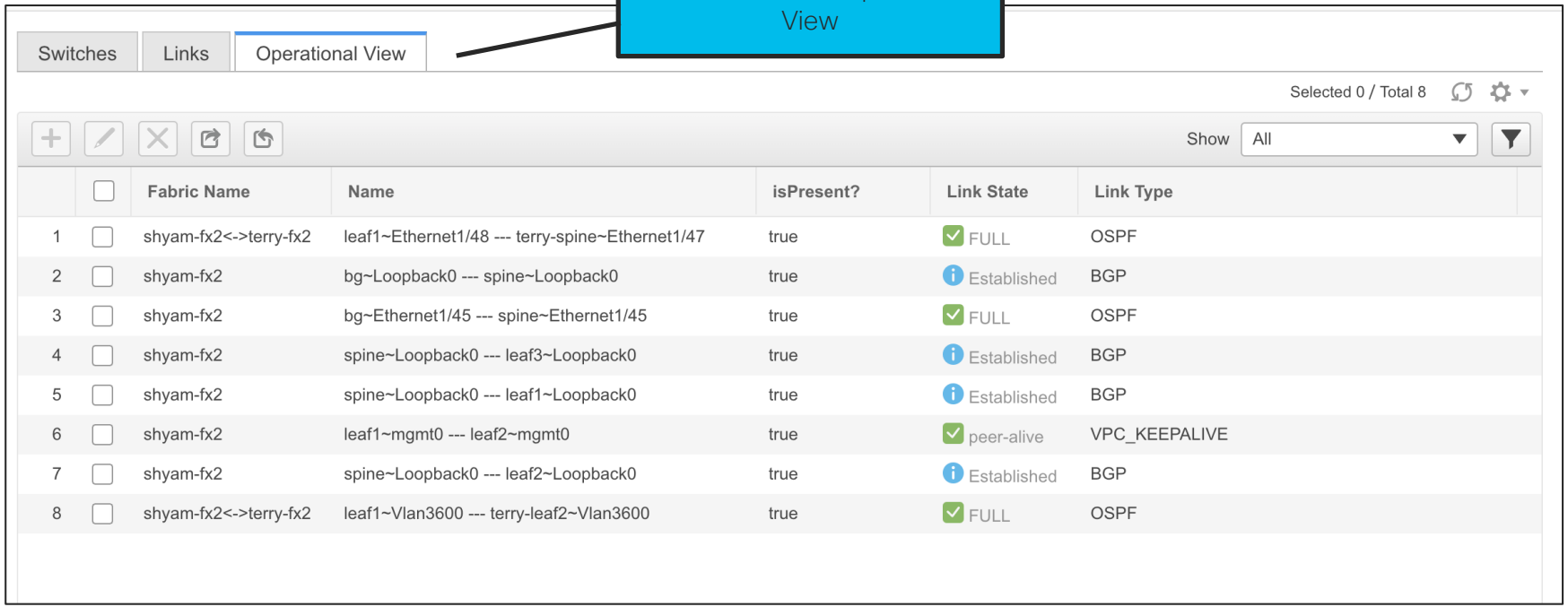
Bulk Switch Functions



Fabric Builder Tabular View

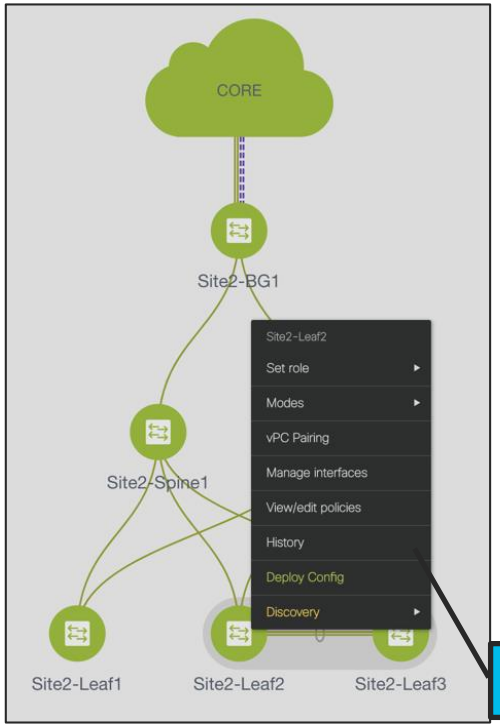
View Operational Status

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

Deployment History per Switch



Deployment History

Switch History

Policy Status

Policy Deployment History for Site-2-Leaf-2 (SAL1812NTB6)

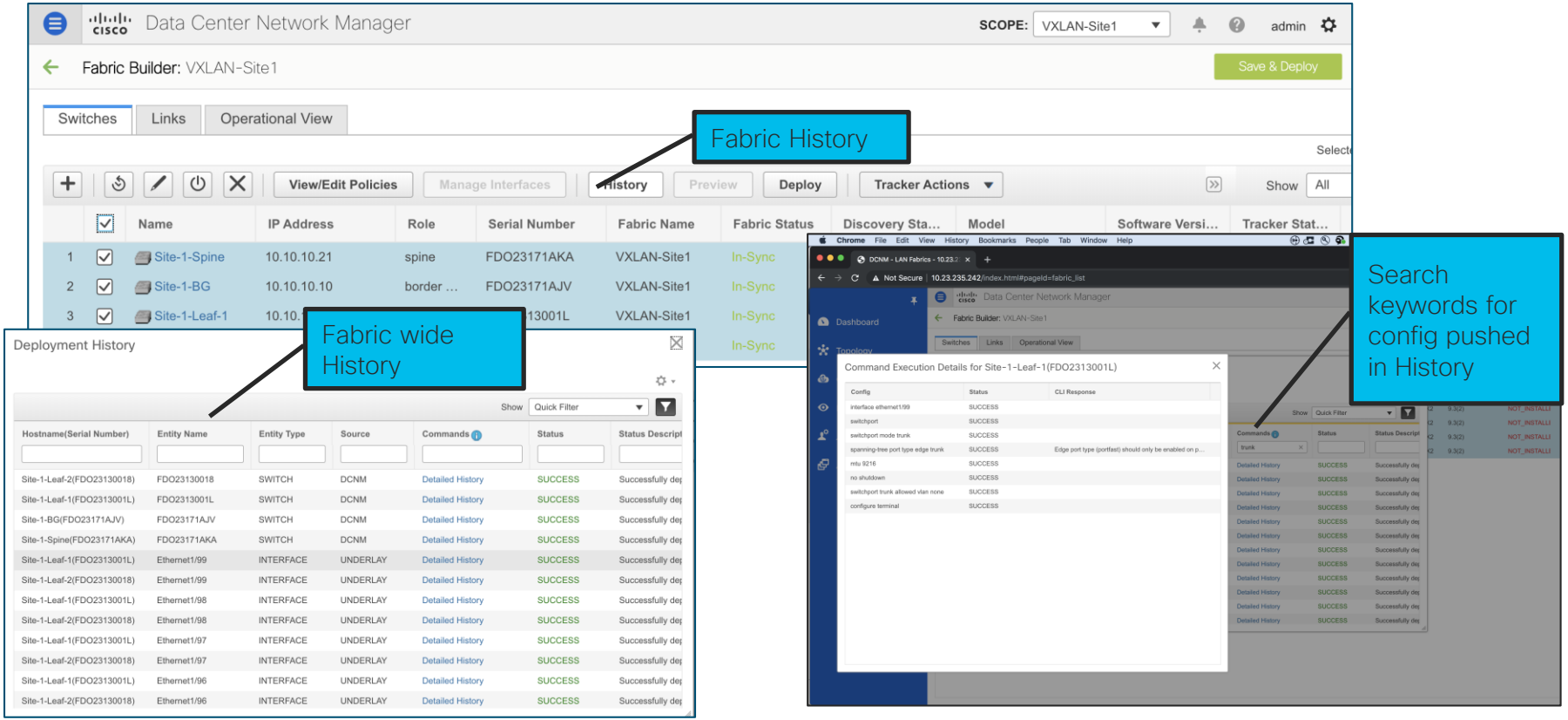
Entity Name	Entity Type	Source	Status	Status Description	User	Time of Completion
SAL1812NTB6	SWITCH	DCNM	SUCCESS	Successfully deployed	admin	2018-06-11 08:42:4
SAL1812NTB6	SWITCH	UNDERLAY	SUCCESS	Successfully deployed	admin	2018-06-11 07:24:1
Port-channel1	INTERFACE	OVERLAY	SUCCESS	Successfully deployed	admin	2018-06-11 07:08:3
MyNetwork_30001	CONFIG_PROFILE	OVERLAY	SUCCESS	Successfully deployed	admin	2018-06-11 07:08:3
MyNetwork_30001	CONFIG_PROFILE	OVERLAY	SUCCESS	Successfully deployed	admin	2018-06-11 07:08:0
Port-channel1	INTERFACE	OVERLAY	SUCCESS	Successfully deployed	admin	2018-06-11 07:08:0
SAL1812NTB6	SWITCH	DCNM	SUCCESS	Successfully deployed	admin	2018-06-10 15:42:4
Port-channel1	INTERFACE	OVERLAY	SUCCESS	Successfully deployed	admin	2018-06-10 15:25:4
MyNetwork_30001	CONFIG_PROFILE	OVERLAY	SUCCESS	Successfully deployed	admin	2018-06-10 15:25:4
MyNetwork_30001	CONFIG_PROFILE	OVERLAY	SUCCESS	Successfully deployed	admin	2018-06-10 15:25:2
Port-channel1	INTERFACE	OVERLAY	SUCCESS	Successfully deployed	admin	2018-06-10 15:25:2
SAL1812NTB6	SWITCH	DCNM	SUCCESS	Successfully deployed	admin	2018-06-10 11:42:4
Ethernet2/10	INTERFACE	GLOBAL_INTERFA...	SUCCESS	Successfully deployed	admin	2018-06-10 11:00:2
Ethernet2/9	INTERFACE	GLOBAL_INTERFA...	SUCCESS	Successfully deployed	admin	2018-06-10 11:00:2
Ethernet2/8	INTERFACE	GLOBAL_INTERFA...	SUCCESS	Successfully deployed	admin	2018-06-10 11:00:2
Ethernet2/7	INTERFACE	GLOBAL_INTERFA...	SUCCESS	Successfully deployed	admin	2018-06-10 11:00:2

Policy Type

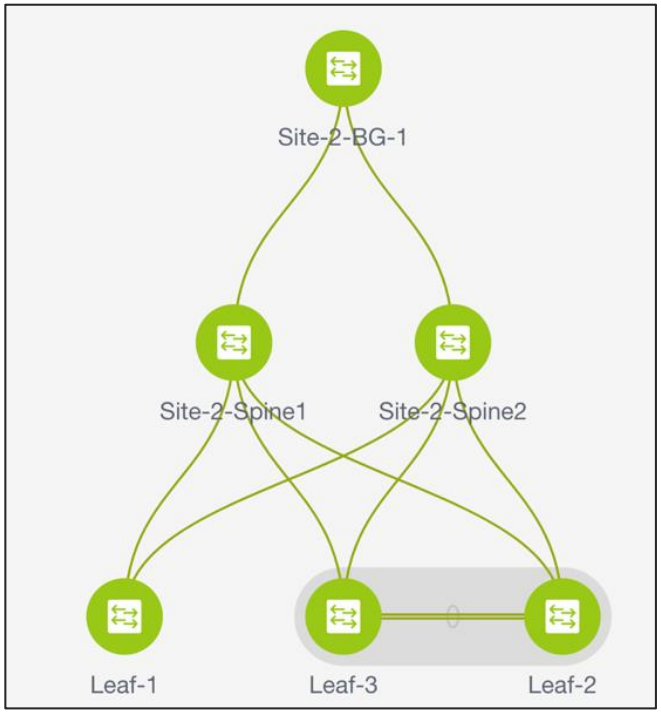
User Role

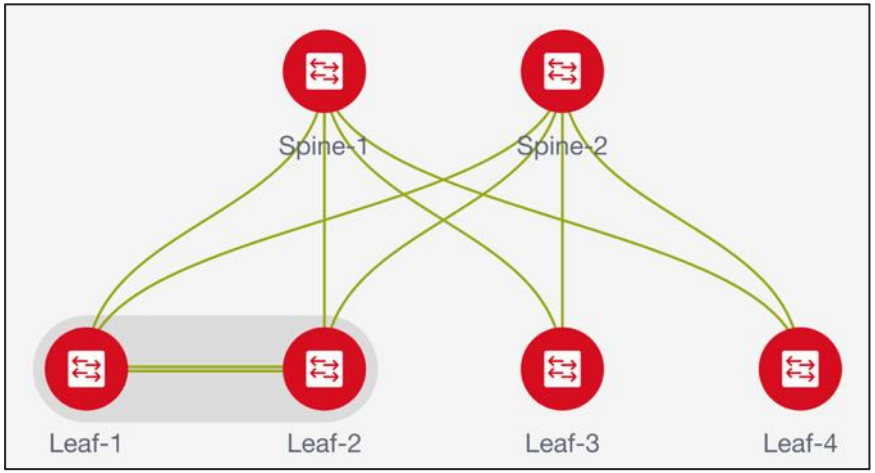
Underlay/Overlay/Interface Configuration Deployment

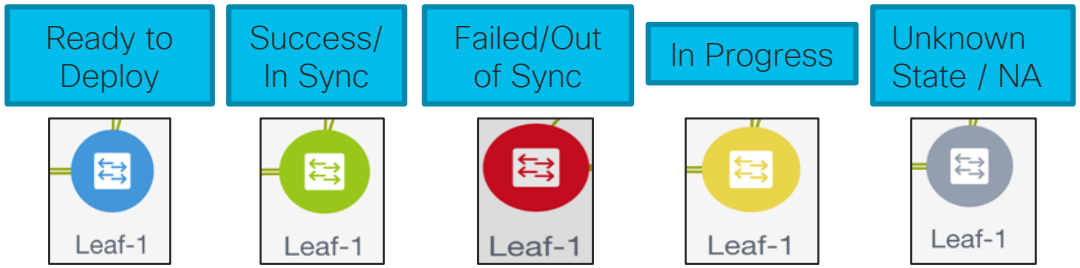
Fabric Wide History with Search



Configuration Compliance

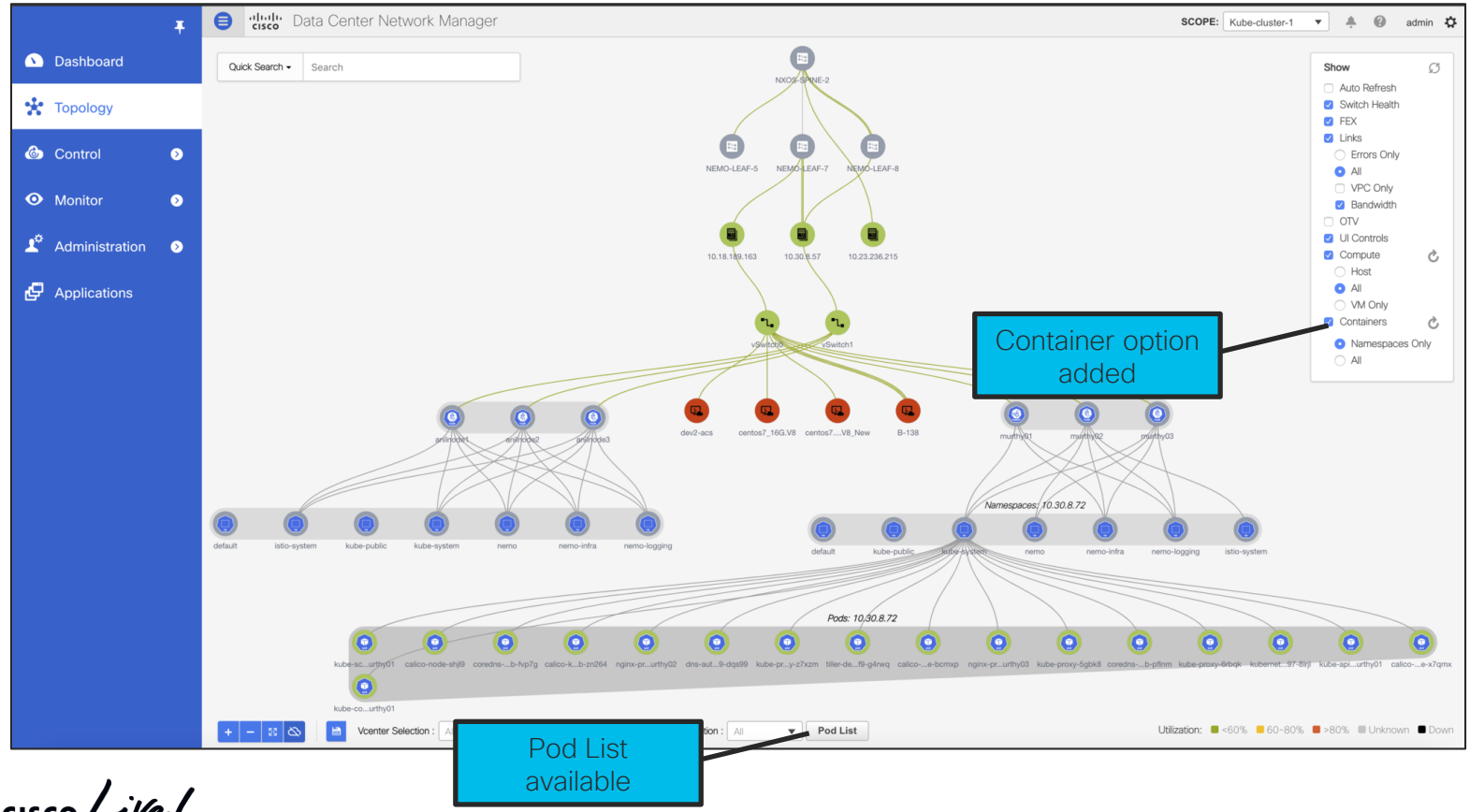




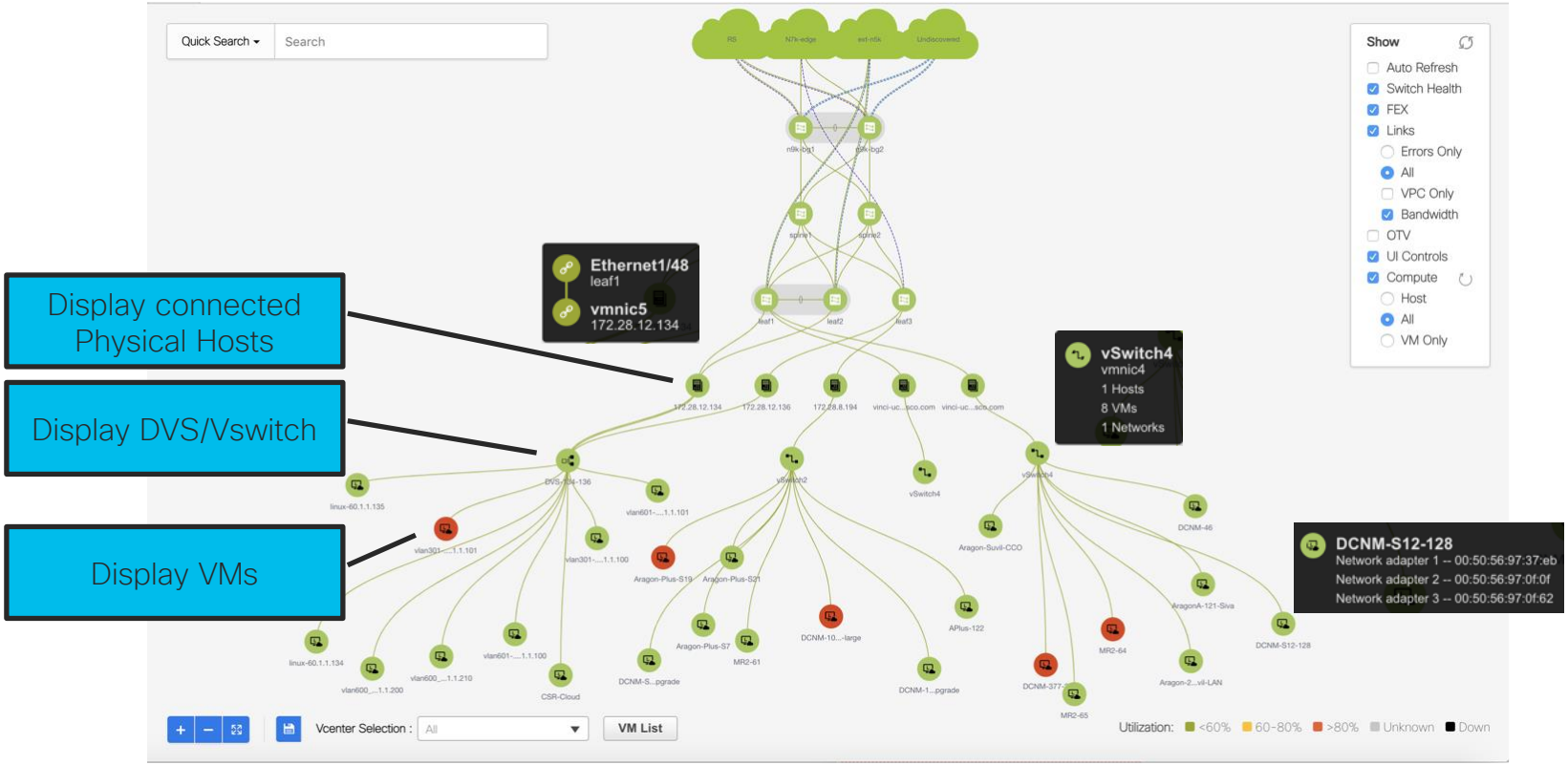


Fabric Builder Real Time Status

Kubernetes Cluster Visualization in Topology

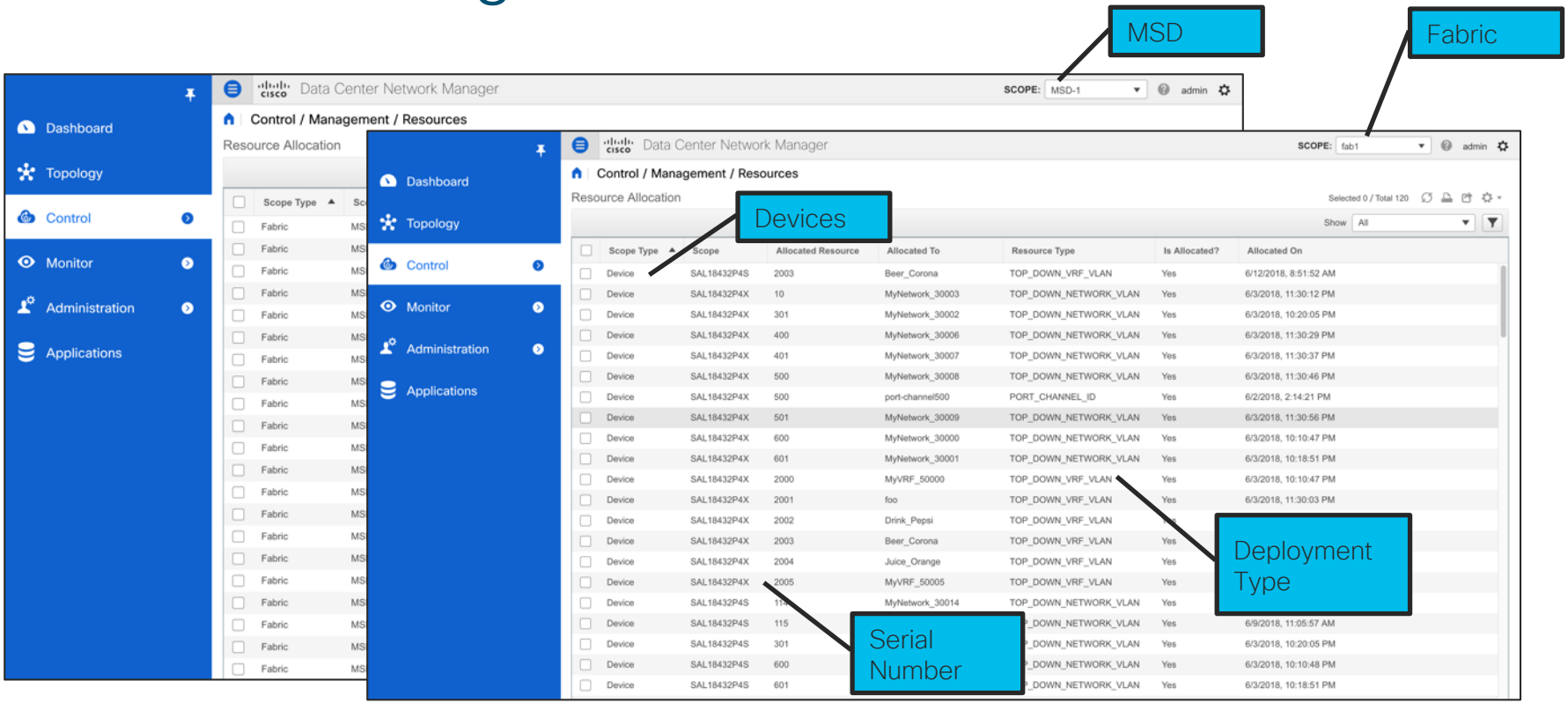


Virtual Machine Manager



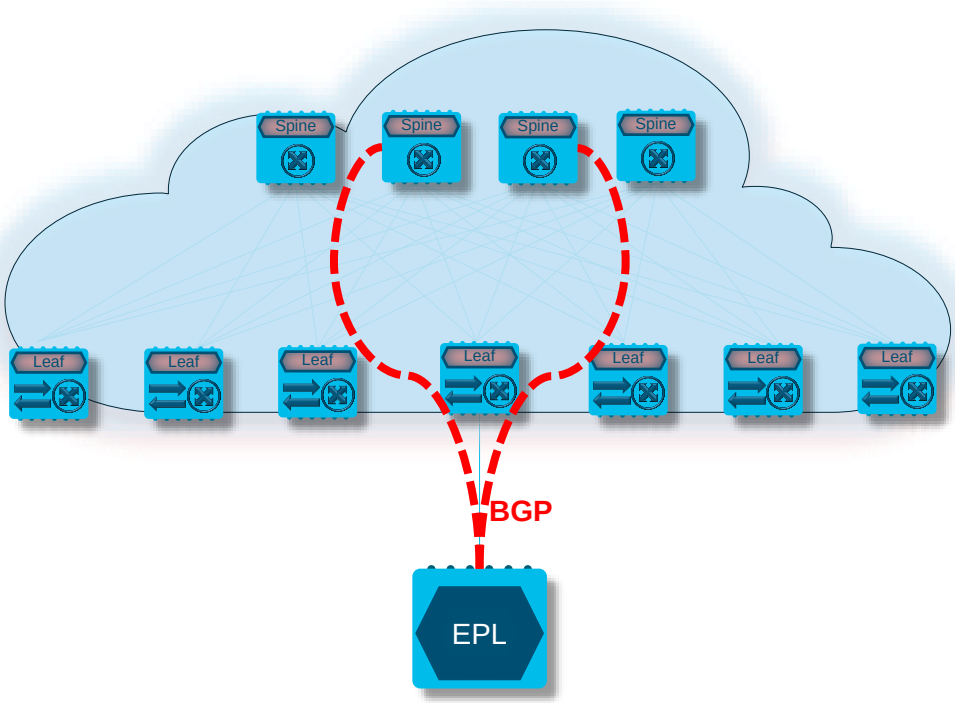
Virtual Machine Manager (VMM) Visibility with VMware vCenter

Resource Manager



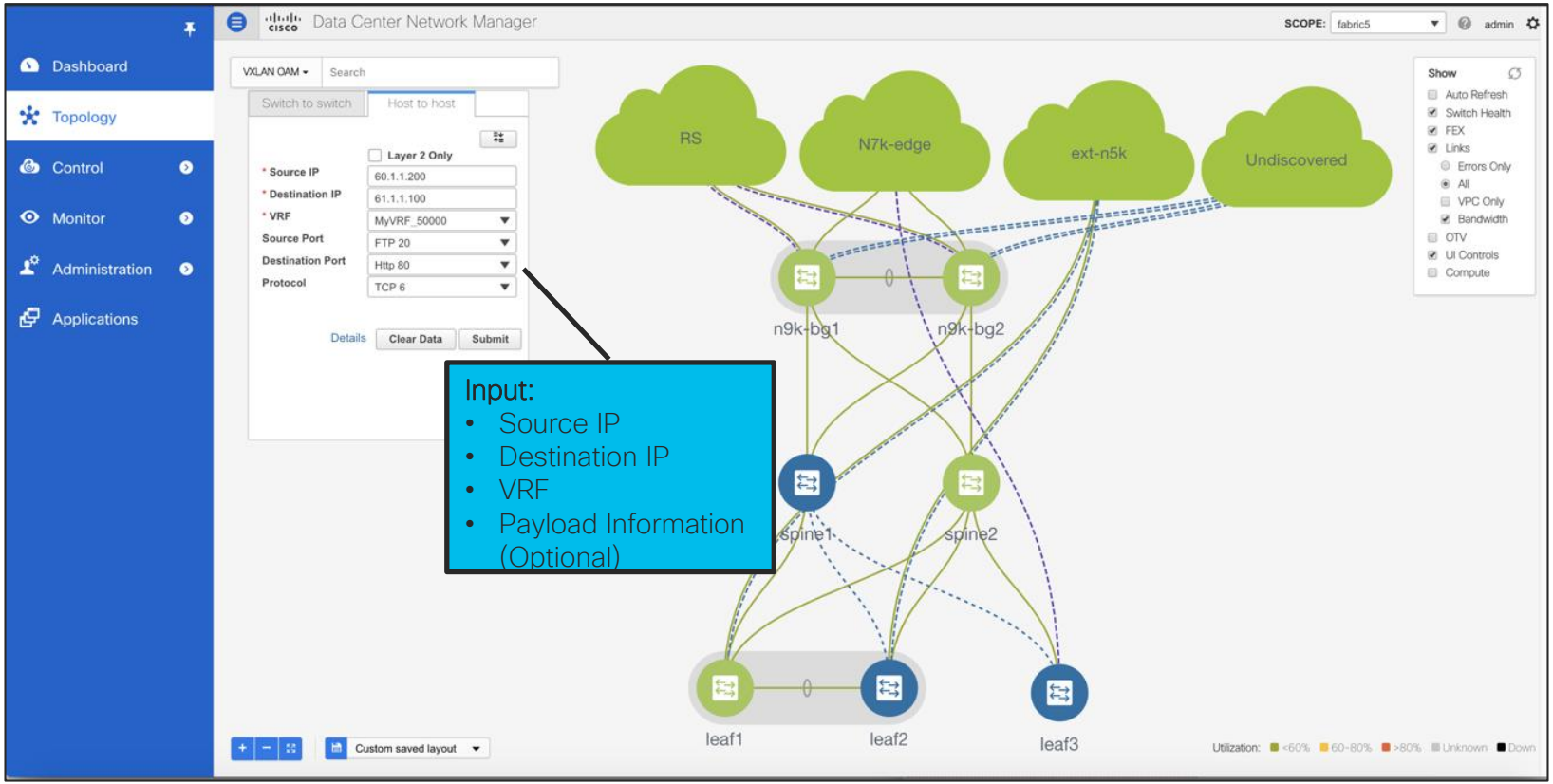
Resource Manager

Endpoint Locator (EPL)

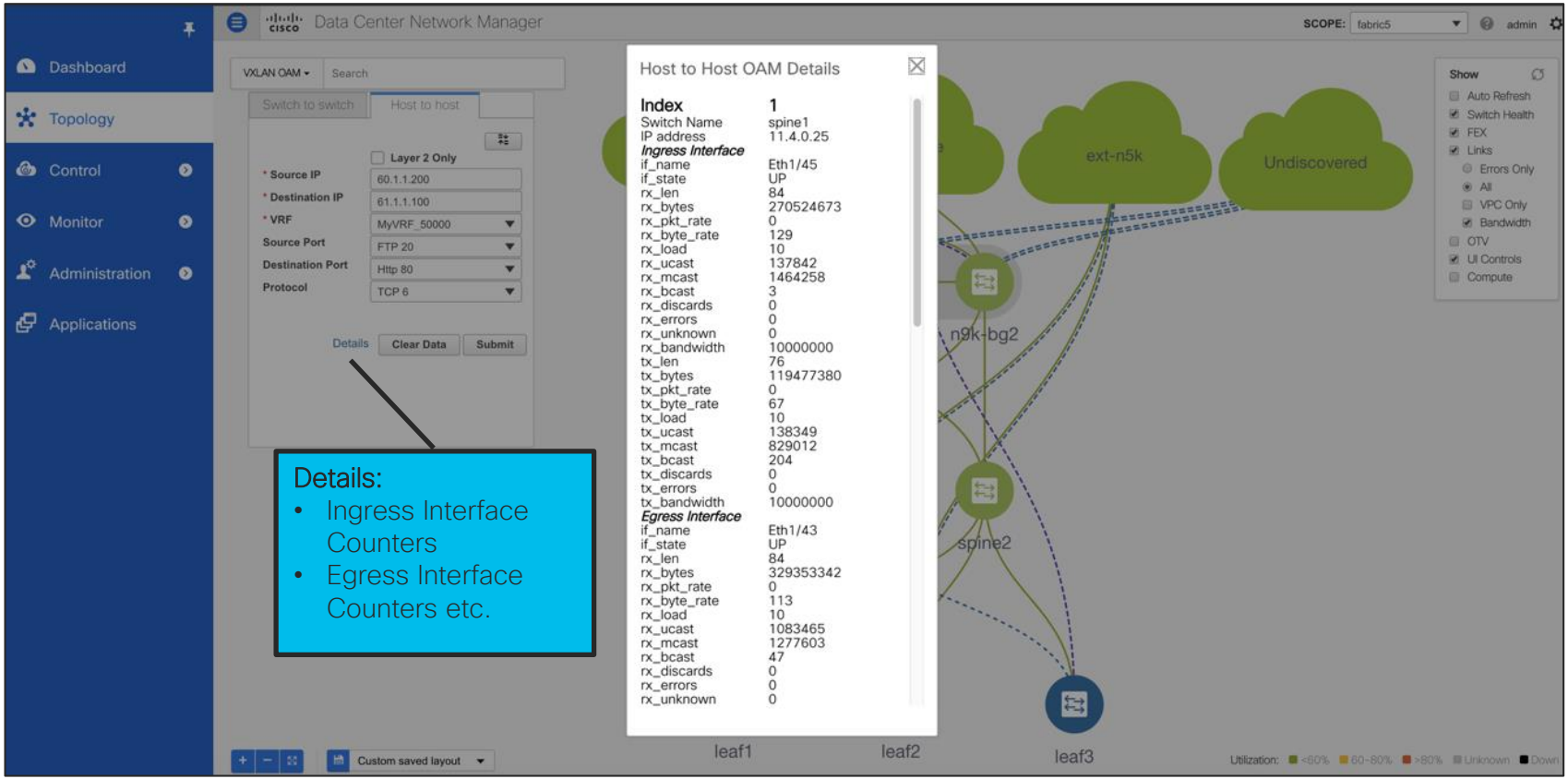


- Endpoint Locator (EPL)
  - Application in DCNM
  - Peers with the Overlay Control-Plane (i.e. BGP EVPN)
  - BGP Receiver only (Passive)
- Searchable and Scalable Database for Real-Time and Historic Data
- Stores every Endpoint Control-Plane Event
- Correlates with Inventory Data

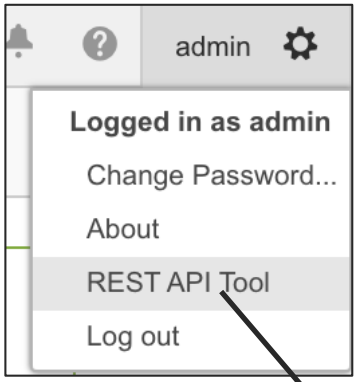
VXLAN OAM



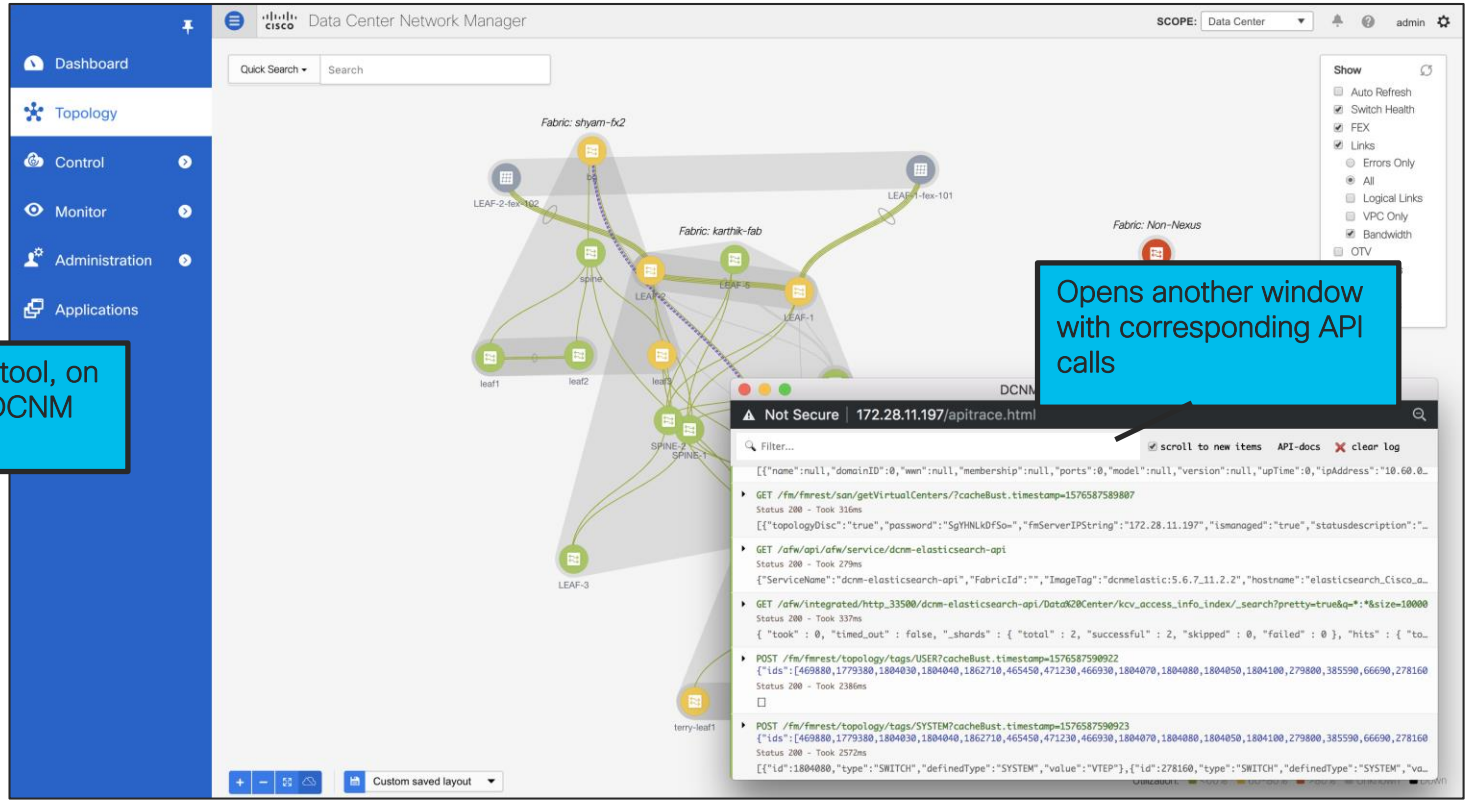
VXLAN OAM



API Inspector



To access API tool, on Each Page of DCNM UI



Opens another window with corresponding API calls

Network Insights Portfolio

DCNM Application Hosting Framework

Extensible Framework

Applications can run on the framework

instead of core S/W

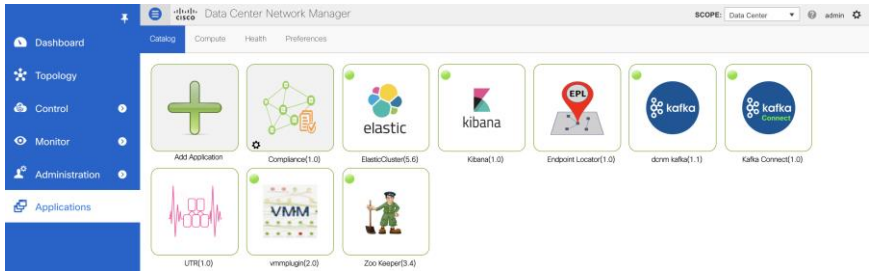
- "Future Proof" – new apps on existing framework
- Separation between apps
- Extensible

Examples: Telemetry, Analytics

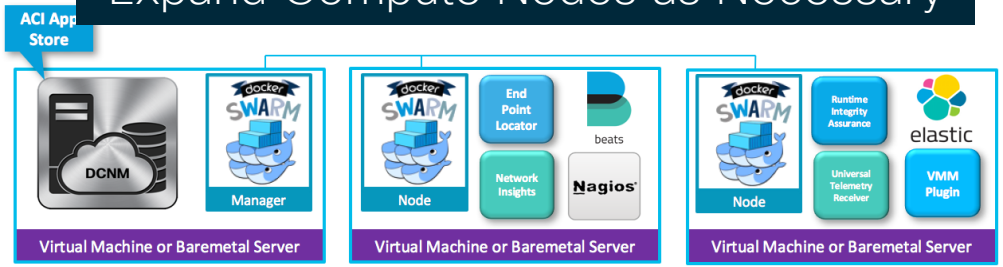
Apps, Reporting, Automation

Uses Worker-Nodes for expansion

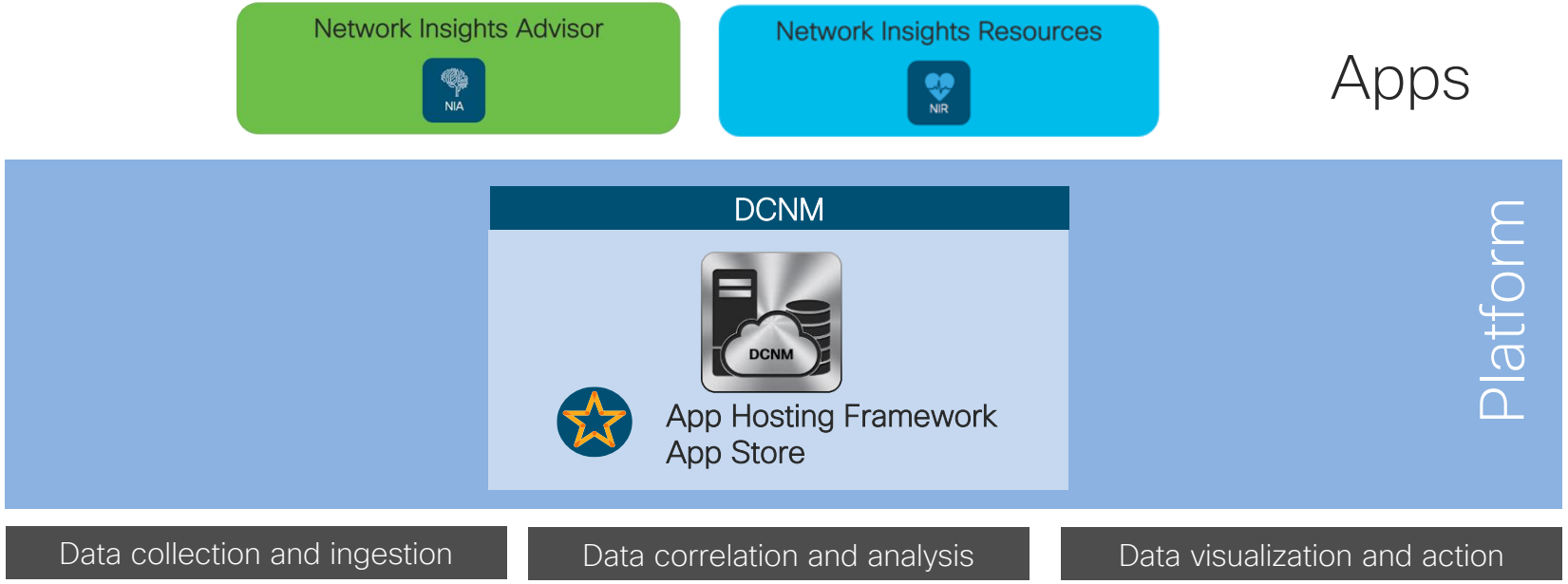
Make All the Apps into Containers



Expand Compute Nodes as Necessary



Network Insights Applications



Visibility
Learn from your network and recognize anomalies

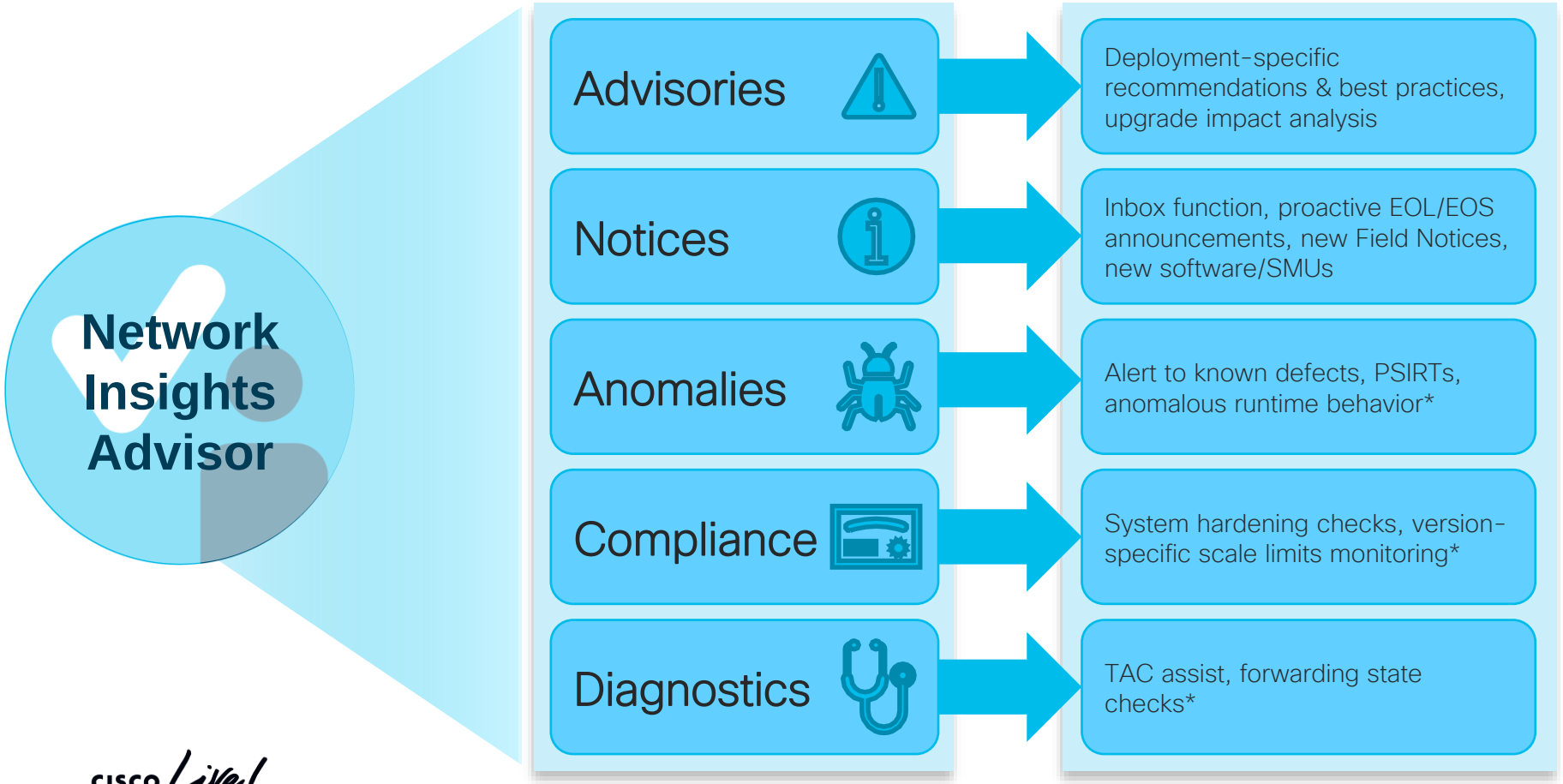
Insights
See problems before your end users do

Proactive Troubleshooting
Find root cause faster with granular details

How Can NIR Help with Day 2 Operations?

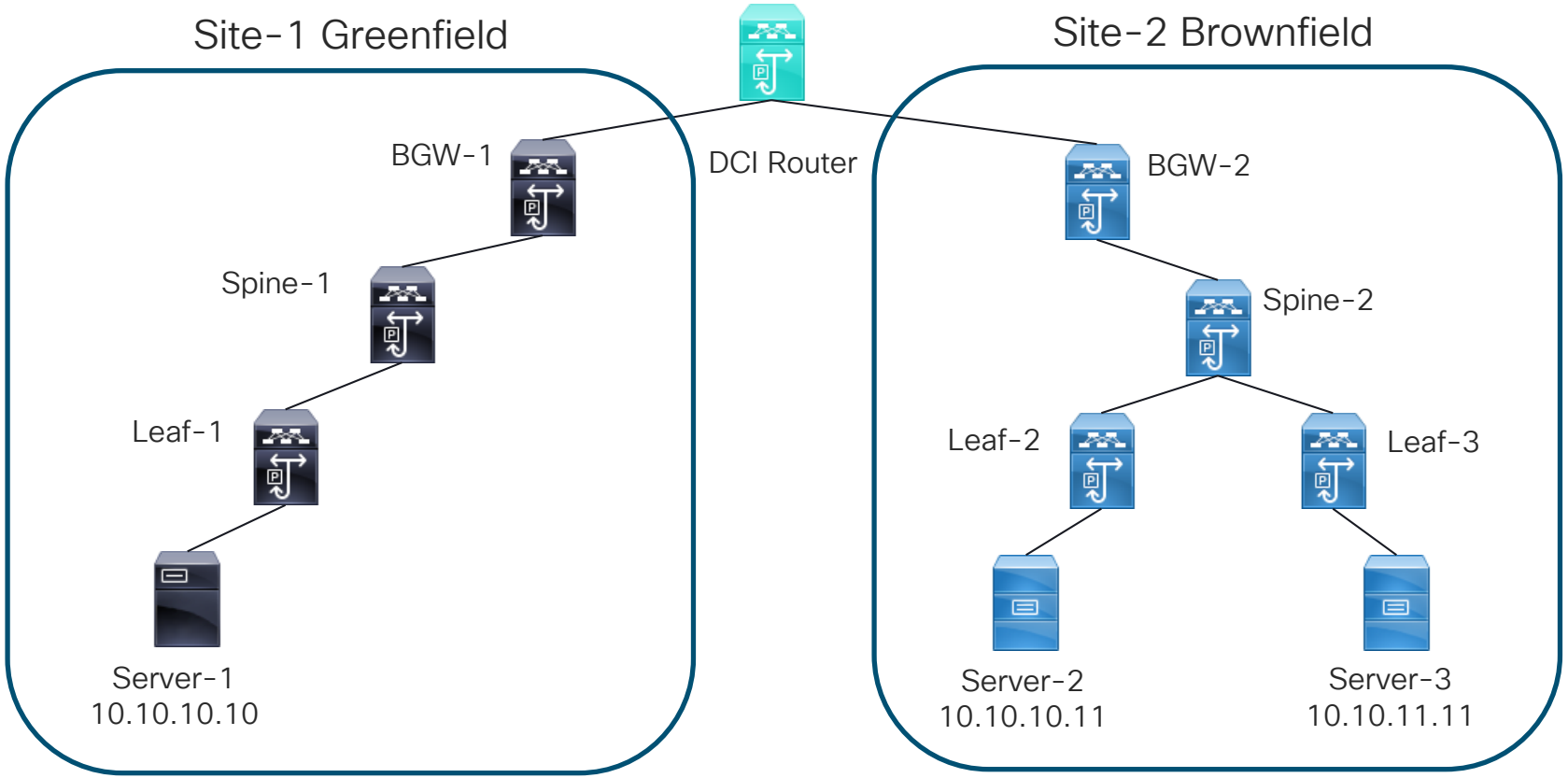
Resources	Monitor fabric-wide and node-specific resource utilization
Environmental	Track CPU & memory consumption, monitor power and temperature
Statistics	Monitor network bandwidth utilization, packet drops, and network protocol statistics
Flows	Track flow paths, identify applications experiencing high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

How Can NIA Help with Day 2 Operations?

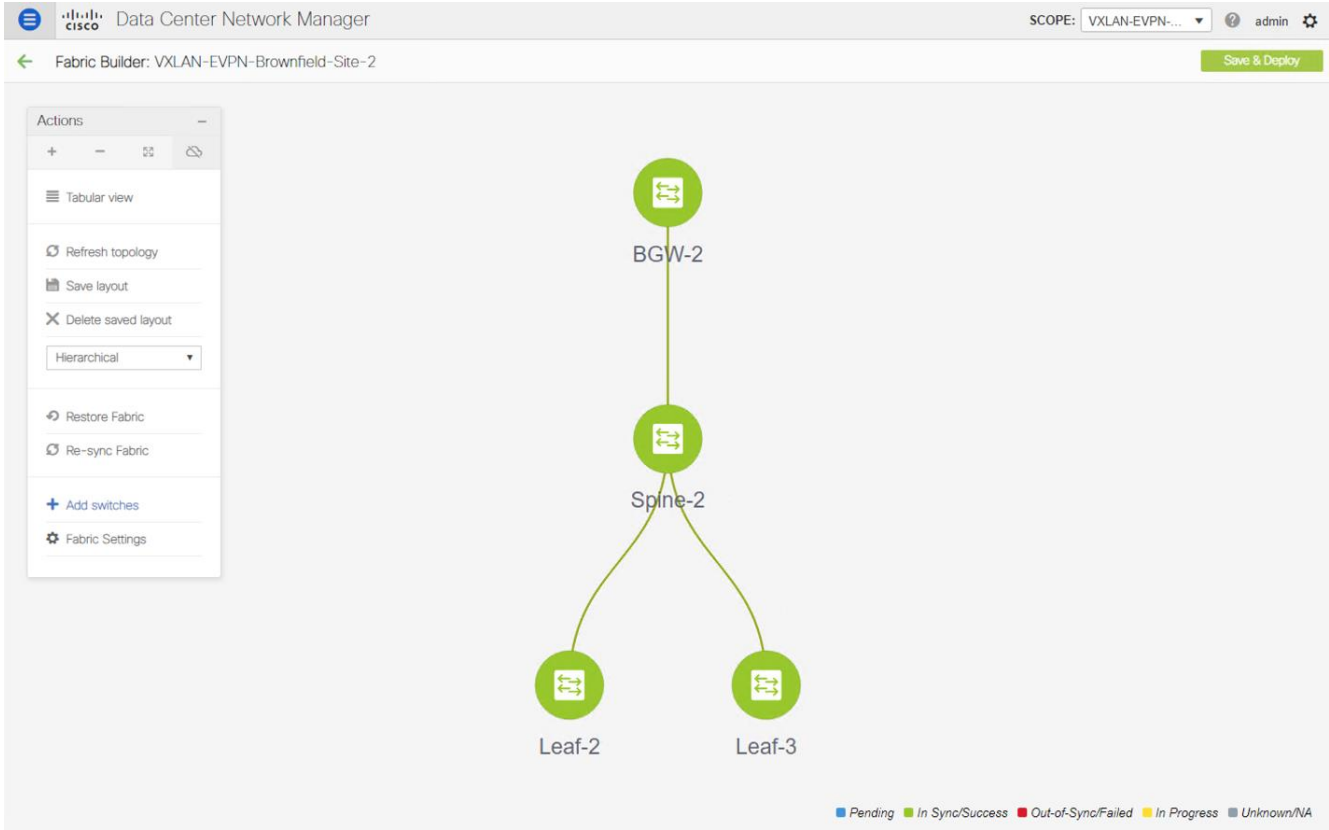


DCNM Live Fabric Demonstrations

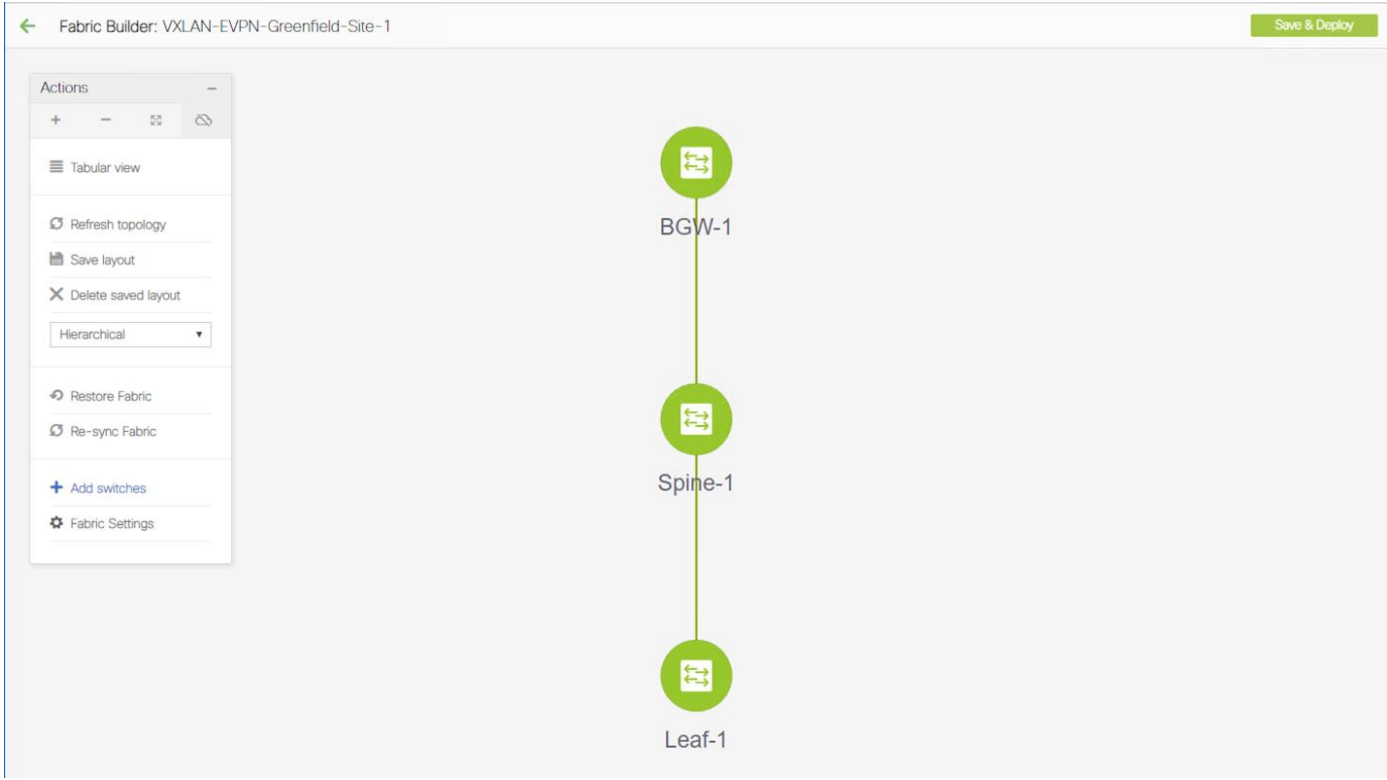
DCNM Lab Demo Topology



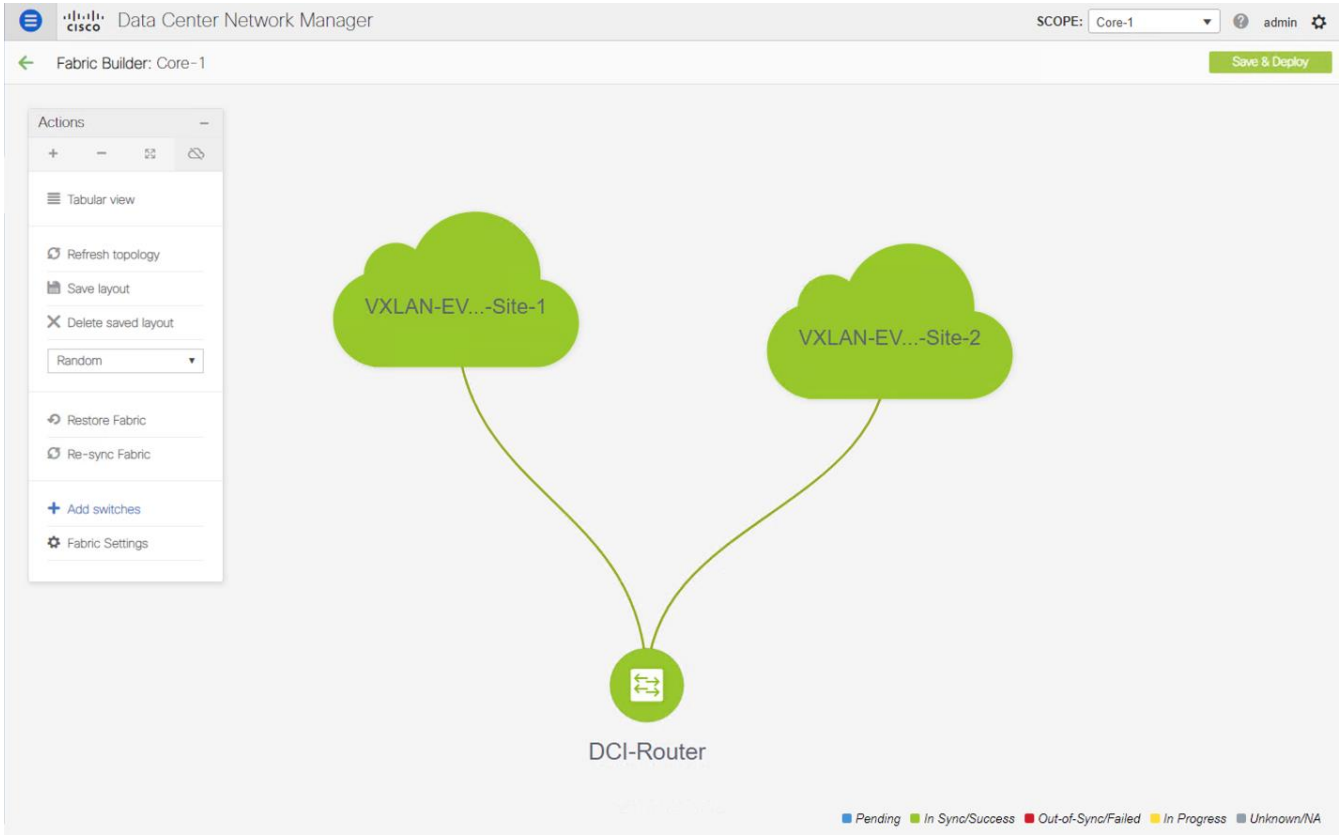
Demo Topology – Brownfield Site



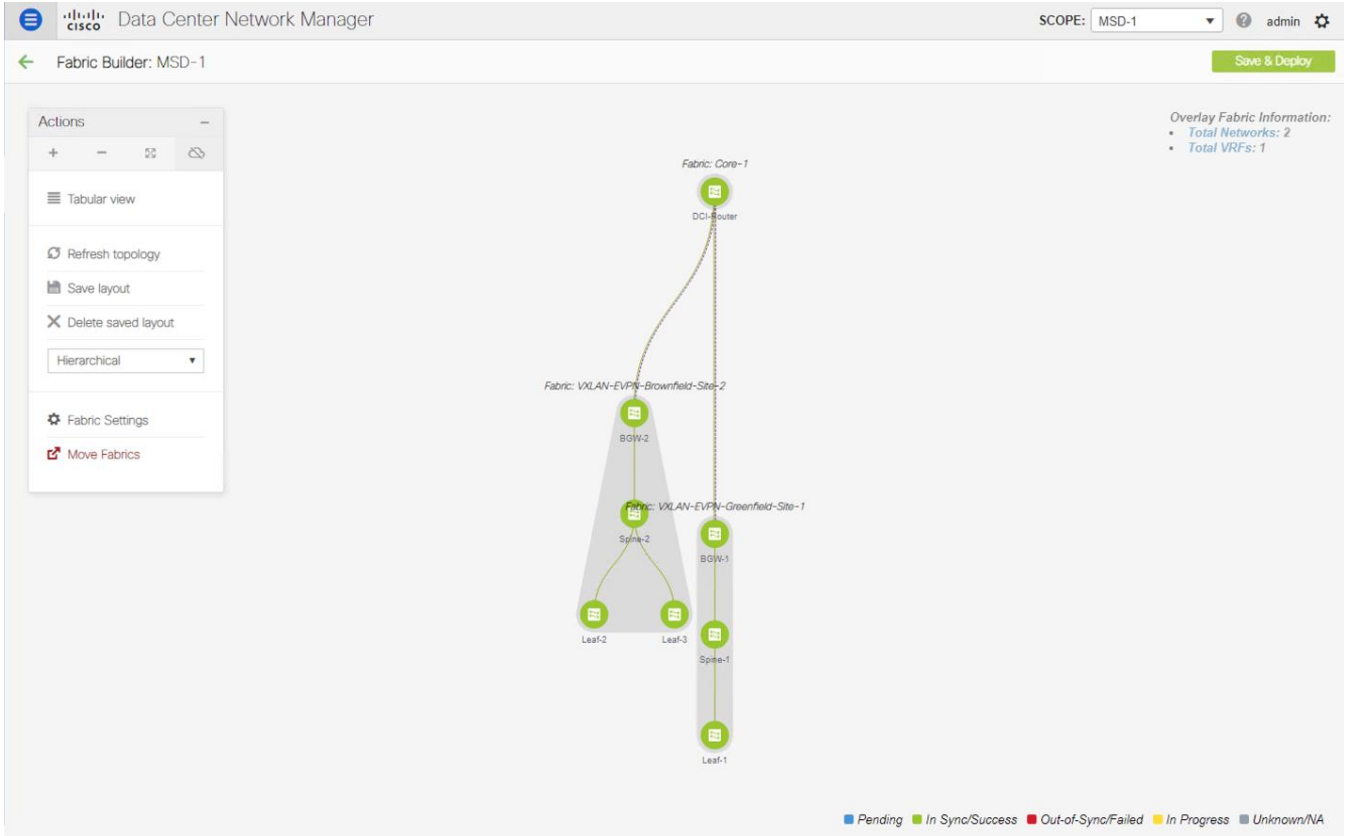
Demo Topology – Greenfield Site



Demo Topology – Core Network



Demo Topology – Multi Site Deployment



Demo – Network Insights (NIA/NIR)

Network Insights - Advisor

Network Insights - Resources

Summary

Why Choose DCNM for Your Data Center?

Automation

Visibility

Consistency

Complete your online session survey

- Please complete your session survey after each session. Your feedback is very important.
- Complete a minimum of 4 session surveys and the Overall Conference survey (starting on Thursday) to receive your Cisco Live t-shirt.
- All surveys can be taken in the Cisco Events Mobile App or by logging in to the Content Catalog on ciscolive.com/emea.

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Related sessions

Thank you

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