

Deploy EVPN VXLAN, Multi-Site via DCNM 11.2(1)

Contents

[Introduction](#)

[Prerequisites](#)

[Requirements](#)

[Components Used](#)

[Physical Topology Built](#)

[Deploy the OVA/OVF in vCenter](#)

[Deploy the First Fabric -- RTP Fabric](#)

[Add Switches into the Fabric](#)

[Deploy the Fabric's Configuration](#)

[Deploy the Second Fabric -- SJ](#)

[Create a Network \(VLAN/L2VNI\) and VRFs \(L3VNIs\)](#)

[Multi-Site Configuration](#)

[Deploy Host Access/Trunk Policies](#)

[Day 2 Operations](#)

[Upgrade NX-OS Software via DCNM](#)

[Install Endpoint Locator](#)

[Problems Encountered During This Deployment](#)

[Bad Cabling](#)

[Failed to Configure a Feature](#)

[Overlap the Management Subnets for Different Fabrics](#)

[Breakout Interfaces](#)

[Fabric Error When Deployed to Unsupported Capability](#)

[What's new in DCNM 11.2?](#)

[Related Information](#)

Introduction

This document describes how to deploy two individual EVPN VXLAN Fabrics as well as how to merge these two fabrics into an EVPN Multi-Site Fabric deployment using Cisco Data Center Manager (DCNM) 11.2(1).

Multi-Site Domain (MSD), introduced in DCNM 11.0(1) release, is a multifabric container that is created to manage multiple member fabrics. It is a single point of control for a definition of overlay networks and Virtual Routing and Forwarding (VRF) that are shared across member fabrics.

 **Note:** This document does not describe the details with respect to the functions/properties of each tab within DCNM. Please see References at the end which does cover detailed explanations.

Prerequisites

Requirements

Cisco recommends that you have knowledge of these topics:

- vCenter/UCS to deploy DCNM Virtual Machine
- Familiarity with NX-OS and Nexus 9000s
- Nexus 9000s ToRs, EoRs connected in a Leaf/Spine fashion

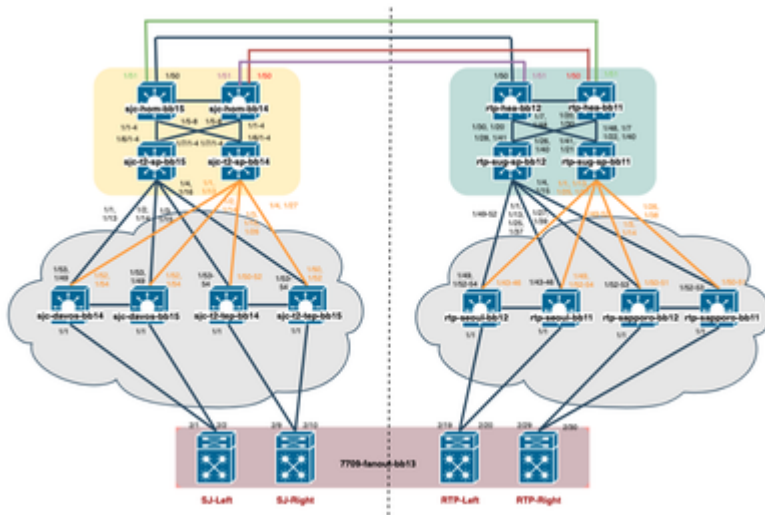
Components Used

The information in this document is based on the following software and hardware:

- DCNM 11.2(1)
- NX-OS 7.0(3)I7(7) and NX-OS 9.2(3)
- Spines: N9K-C9508 / N9K-X97160YC-EX & N9K-C9508 / N9K-X9636PQ
- Leafs: N9K-C9372TX, N9K-C93180YC-EX, N9K-C9372TX-E, N9K-C92160YC-X
- Border Gateways: N9K-C93240YC-FX2 & N9K-C93180YC-FX
- 7K "hosts": N77-C7709

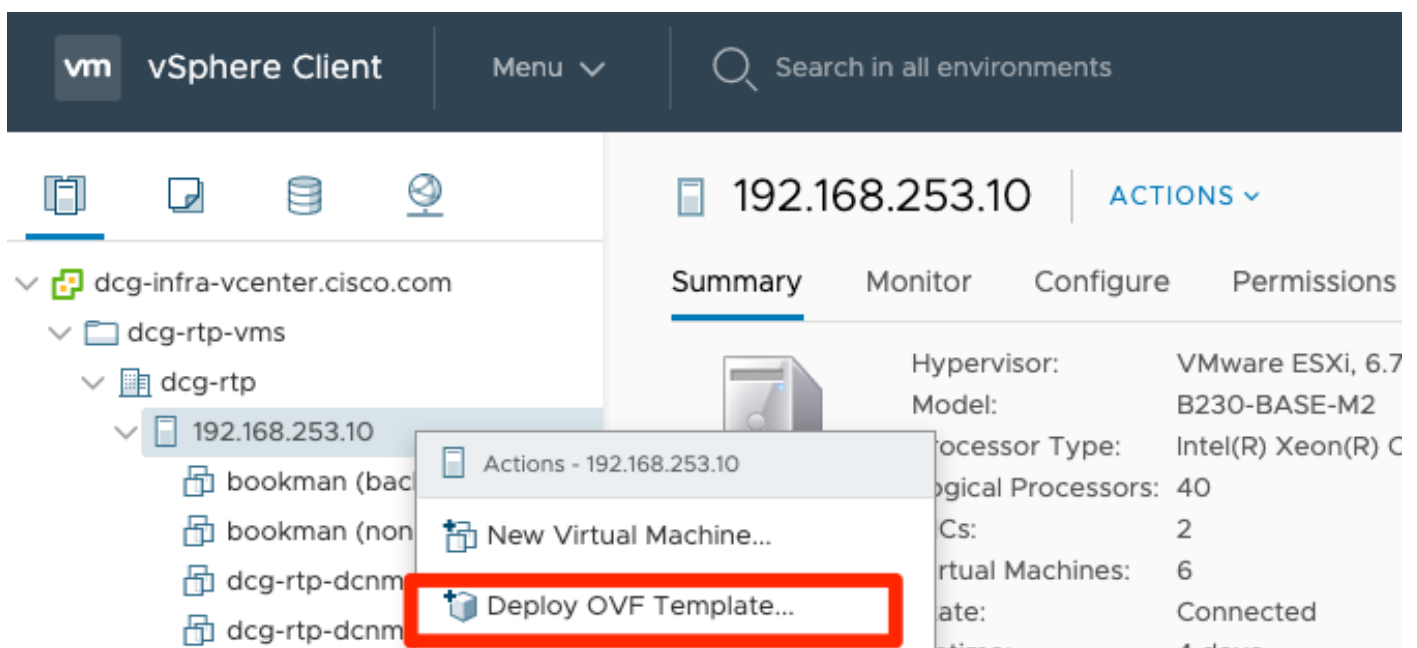
The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Physical Topology Built



Deploy the OVA/OVF in vCenter

Step 1. Under **vCenter**, deploy Open Virtualization Format (OVF) Template in the server/host of your choice, as shown in the image.



1. Have OVA/OVF, etc file locally and select via **Choose Files**, as shown in the image:

Deploy OVF Template

1 Select an OVF template

2 Select a name and folder

3 Select a compute resource

4 Review details

5 Select storage

6 Ready to complete

Select an OVF template

Select an OVF template from remote URL or local file system

Enter a URL to download and install the OVF package from the Internet, or browse to a location accessible from your computer, such as a local hard drive, a network share, or a CD/DVD drive.

☐ URL

http | <https://remoteserver-address/filetodeploy.ovf> | .ova

☒ Local file

Choose Files dcnm-va.11.2.1.ova

2. Follow rest of prompts (VM name, which host, network settings, as shown in the image) and click on **Finish**.

Deploy OVF Template

✓ 1 Select an OVF template

✓ 2 Select a name and folder

✓ 3 Select a compute resource

✓ 4 Review details

✓ 5 License agreements

✓ 6 Configuration

✓ 7 Select storage

8 Select networks

9 Customize template

10 Ready to complete

Select networks

Select a destination network for each source network.

Source Network	Destination Network
dcnm-mgmt	DCG-INFRA-1
enhanced-fabric-mgmt	EVPN-NAT-1
enhanced-fabric-inband	EVPN-NAT-1
3 items	

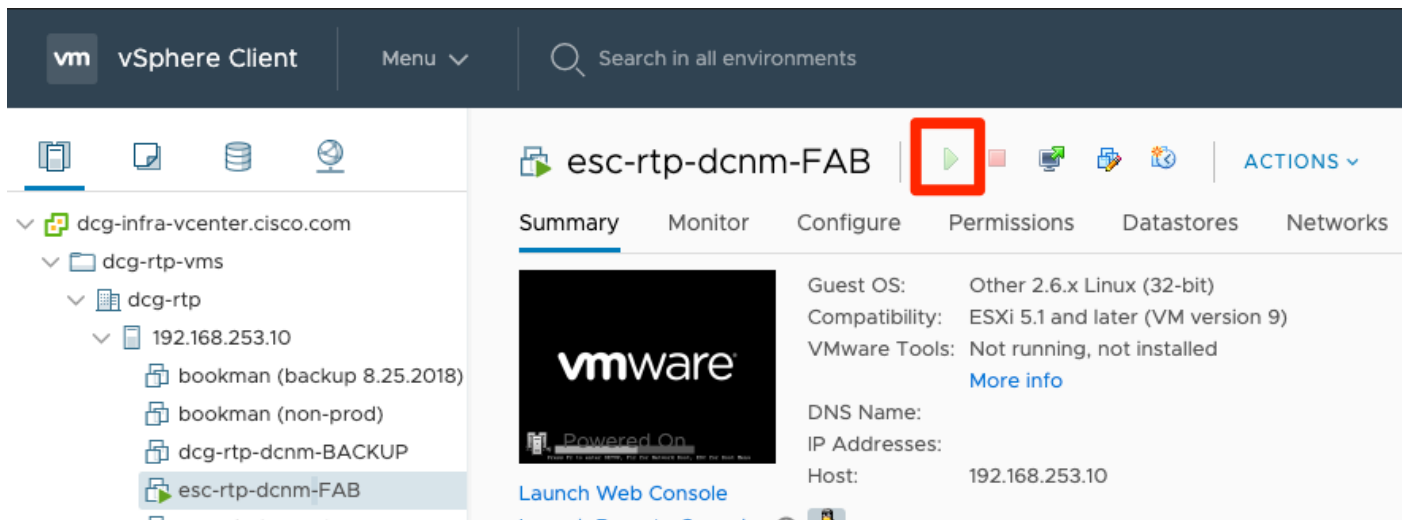
IP Allocation Settings

IP allocation: Static - Manual

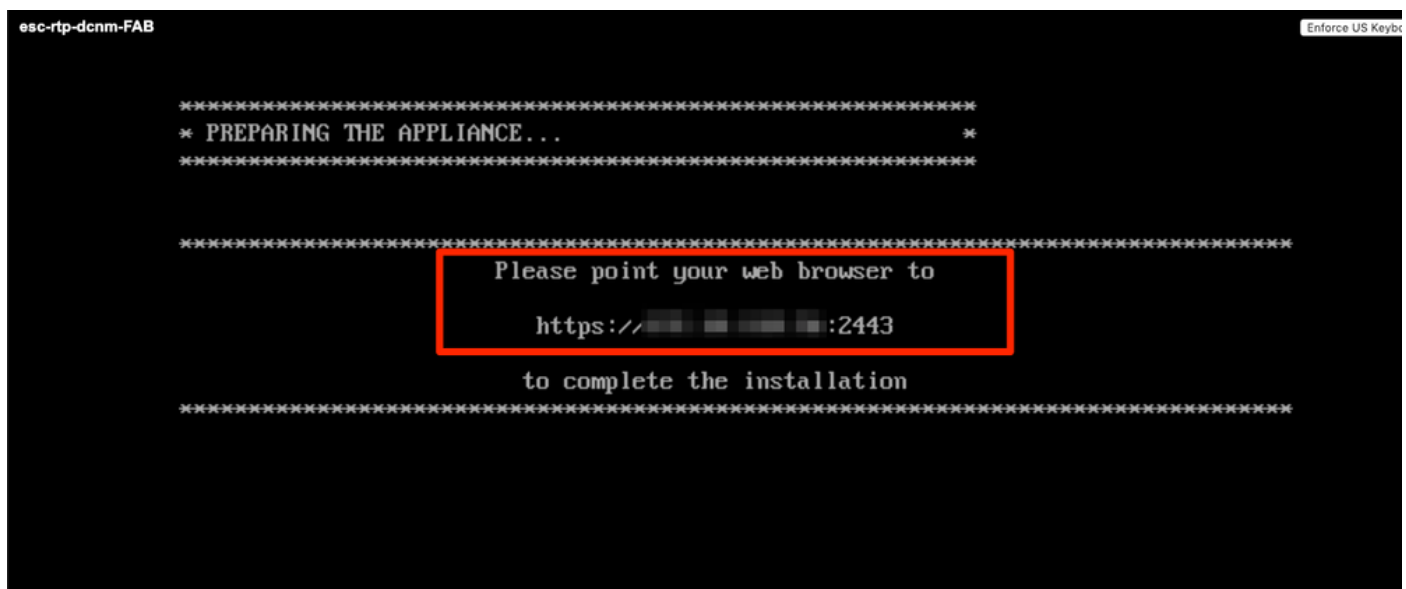
IP protocol: IPv4

Step 2. Once Completed, start your DCNM VM, as shown here.

Recent Tasks		Alarms						
Task Name	Target	Status	Initiator	Queued For	Start Time	Completion Time	Server	
Power On virtual machine	esc-ntp-dcnm-FAB	Completed	DCG.LOCAL\Administrator	3 ms	06/17/2019, 3:19:21 PM	06/17/2019, 3:19:21 PM	dcg-infra-vcenter.cisco.com	
Initialize powering On	dcg-ntp	Completed	DCG.LOCAL\Administrator	4 ms	06/17/2019, 3:19:21 PM	06/17/2019, 3:19:21 PM	dcg-infra-vcenter.cisco.com	
Deploy OVF template	esc-ntp-dcnm-FAB	Completed	DCG.LOCAL\vpkd-extension-440bec49-45...	7 ms	06/17/2019, 3:01:45 PM	06/17/2019, 3:13:07 PM	dcg-infra-vcenter.cisco.com	



Step 3. Launch web console, once in console, you should see these prompt (IP differs as this is specific to your environment and your configuration):



Step 4. Head to <https://<your IP>:2443> (This is the IP you configured earlier during the OVA deployment) and click on **Get Started**. In this example, a Fresh installation is covered.

Cisco DCNM Installer

Please select how you want to setup this instance of Cisco Data Center Network Manager:

- ☒ Fresh installation - Standalone
- ☐ Fresh installation - HA Primary
- ☐ Fresh installation - HA Secondary
- ☐ Fresh installation with backup file for restore

Continue

Step 5. Once you've configured the admin password, you must select the type of fabric you would like to install. Select between LAN or FAB as each type has a different purpose so be sure to understand and choose correctly. For this example, the LAN Fabric is used, it is for most VXLAN-EVPN Deployments.

Please choose the installation mode

LAN Fabric is for most VXLAN-EVPN deployments.

Step 6. Follow the installer's prompts with your network's DNS, Network Time Protocol (NTP) server, DCNM hostname, etc.

Please enter the following system settings

Fully Qualified Host Name *

Fully Qualified Host Name as per RFC1123, section 2.1, for example:

myhost.mydomain.com

dcg-rtp-dcnm-fab.cisco.com

DNS Server Address *

DNS Server Address can be an IPv4 address or an IPv6 address

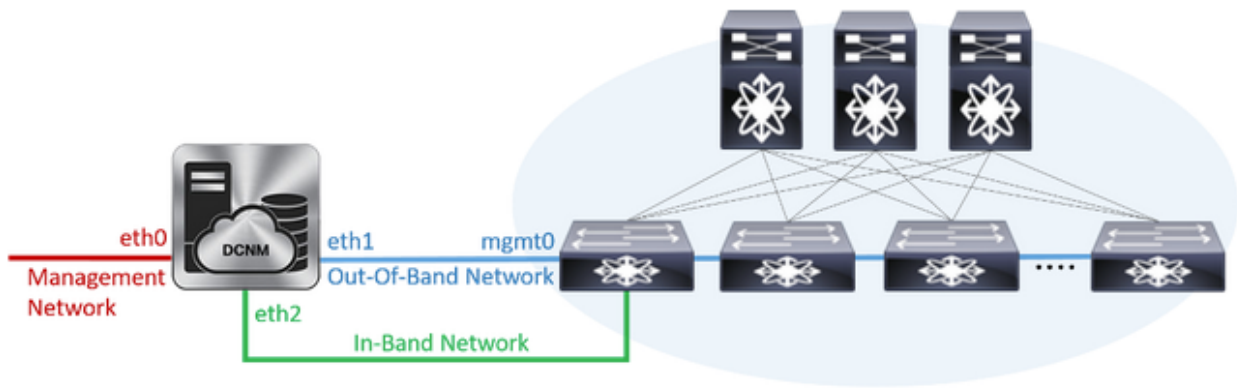
64.102.6.247|

NTP Server *

RFC1123-compliant name or address (IPv4 or IPv6)

172.18.108.15

Step 7. Configure the management IP and management gateway. The management network provides connectivity (SSH, SCP, HTTP, HTTPS) to the DCNM Server. This is also the IP you use to reach the GUI. The IP address should be pre-configured from you from the OVA installation done previously.



Management Network

The Management Network is the main network connection used for reaching the DCNM web user interface. When High Availability is enabled, 3 IP addresses are required on this network.

Management IPv4 Address *

Enter a valid IPv4 address along with prefix, for example: 10.10.10.2/24

Management Network Default IPv4 Gateway *

Out-of-Band Network

The Out-of-Band Network provides connectivity to the device management ports (typically mgmt0). When High Availability is enabled, 3 IP addresses are required on this network.

IPv4 Address *

Enter a valid IPv4 address along with prefix, for example: 1.0.0.2/8

Gateway IPv4 Address

Gateway for the Out-of-Band Network

IPv6 Address

Enter a valid IPv6 address along with prefix, for example: 2001:db8:abcd:0012::0/96

DNS Server Address

If no value is provided, it will be set to Out-of-Band IPv4 address.

Only IPv4 addresses are accepted.

Step 8. Configure the In-Band Network. The In-Band network is used for applications such as Endpoint Locator which requires front-panel port connectivity to the 9Ks in the fabric to work as a Border Gateway Protocol (BGP) session gets established between DCNM and the 9K.

In-Band Network

The In-Band Network provides reachability to the devices via the front-panel ports. When High Availability is enabled, 3 IP addresses are required on this network.

IPv4 Address

Enter a valid IPv4 address along with prefix, for example: 2.0.0.2/8

Gateway IPv4 Address

Gateway for the In-Band Network

Step 9. Configure the Internal Application Services Network --

To start with DCNM 11.0 release, DCNM supports Application Framework (AFW) with DCNM LAN OVA/ISO Installation. This framework uses Docker for orchestrating applications as microservices in both clustered and unclustered environments for realizing a scale-out architecture.

Other applications that ship by default with the DCNM are Endpoint Locator, Watch Tower, Virtual Machine Manager plugin, Config Compliance etc. AFW takes care of the life cycle management of these applications including providing networking, storage, authentication, security, etc. AFW also manages deployment and life cycle of the Network Insights applications namely NIR and NIA This subnet is for Docker services when you have NIA/NIR enabled.

How to install NIA/NIR is covered under the Day 2 Operations section.

Internal Application Services Network

The Internal Application Services Network is used internally.

IPv4 Subnet *

Enter a valid IPv4 subnet with prefix, for example: 172.17.0.0/20.

Prefix length must be 20 to 22.

 **Note:** This subnet should not overlap with the networks assigned to the eth0/eth1/eth2 interfaces assigned to the DCNM and the compute nodes. In addition, this subnet should not overlap with the IPs that are allocated to the switches or other devices that are managed by DCNM. The chosen subnet should remain consistent when installing the DCNM primary and secondary nodes (in case of a native HA deployment).

Step 10. Review and confirm all configuration details and start the installation.

Please review the configuration details

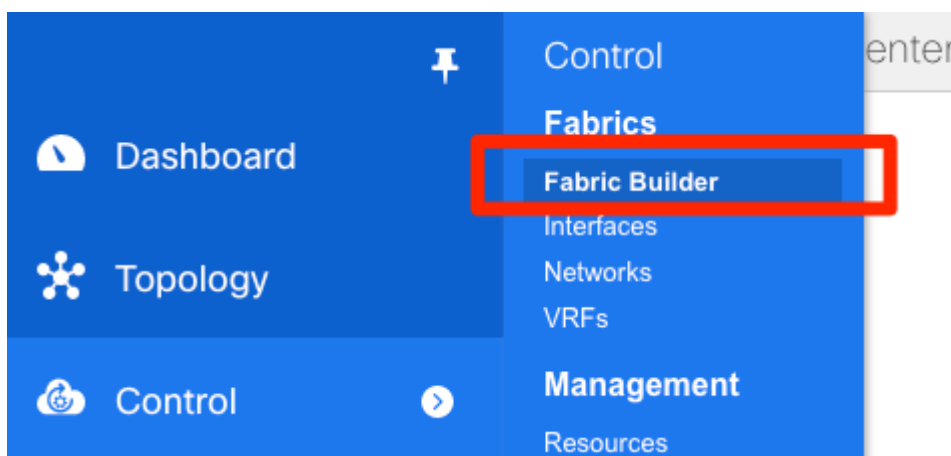
Installation mode	LAN Fabric
Fully Qualified Host Name	dcg-rtp-dcnm-fab.cisco.com
DNS Server Address	64.102.6.247
NTP Server Name	172.18.108.15
Management Network IP Address	172.18.118.56/24
Management Network Default Gateway	172.18.118.1
Management Network IPv6 Address	
Management Network Default IPv6 Gateway	
Out-of-Band Network IP Address	192.168.128.56/24
Out-of-Band Network IPv6 Address	
Out-of-Band Network DNS Server Address	192.168.128.56
Out-of-Band Gateway IP Address	192.168.128.1
In-Band Network IP Address	192.168.128.57/24
In-Band Gateway IP Address	192.168.128.1
Internal App Services IP Subnet	172.17.0.0/20
Administration Password	*****

Start installation

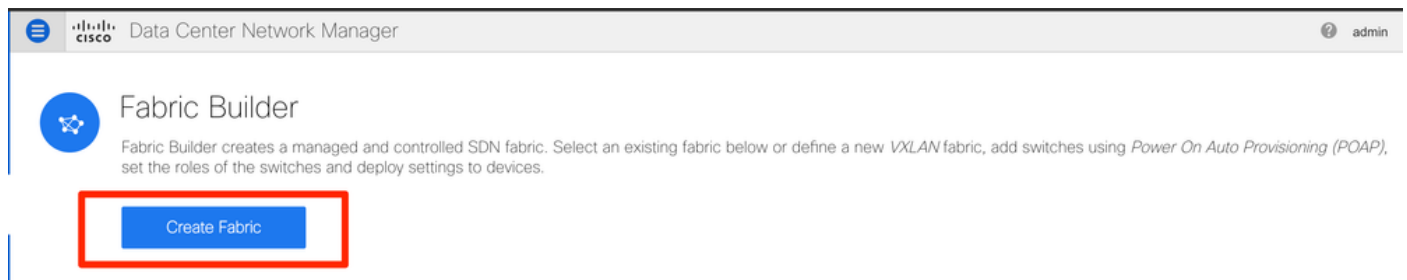
Step 11. Once DCNM is fully installed, login to the GUI (IP address or hostname you previously configured).

Deploy the First Fabric -- RTP Fabric

Step 1. Once in the DCNM GUI, navigate to **Fabric Builder**. **Control** > **Fabrics** > **Fabric Builder** in order to create your first fabric.



Step 2. Click on **Create Fabric** and fill out the forms as needed for your network — Easy Fabric is the correct template for local EVPN VXLAN deployment:



Step 3. Fill out Fabric's Underlay, Overlay, vPC, Replication, Resources, etc requirements.

This section covers all the Underlay, Overlay, vPC, Replication, etc settings required via DCNM. This depends upon the network addressing scheme, requirements, etc. For this example, most fields are left as defaults. The L2VNI and L3VNI were changed such that L2VNIs start with **2** and L3VNIs start with **3** for ease to troubleshoot later. Bidirectional Forwarding Detection (BFD) is also enabled along with other features.

Add Fabric

* Fabric Name :

* Fabric Template :

General	Replication	vPC	Advanced	Resources	Manageability	Bootstrap	Configuration Backup
* BGP ASN 65534 ⓘ 1-4294967295 1-65535[0-65535] * Fabric Interface Numbering p2p ⓘ Numbered(Point-to-Point) or Unnumbered * Underlay Subnet IP Mask 30 ⓘ Mask for Underlay Subnet IP Range * Link-State Routing Protocol ospf ⓘ Supported routing protocols (OSPF/IS-IS) * Route-Reflectors 2 ⓘ Number of spines acting as Route-Reflectors * Anycast Gateway MAC 1010.0000.00aa ⓘ Shared MAC address for all leafs (xxxx.xxxx.xxxx) NX-OS Software Image Version ⓘ If Set, Image Version Check Enforced On All Switches. Images Can Be Uploaded From Control:Image Upload							

Step 4. Under the Bootstrap configuration, configure the range of DHCP Addresses you want DCNM to hand out to the switches within the Fabric during the POAP process. Configure a proper (existing) Default Gateway as well. Click on **Save** once you are done and now you can move on to adding switches into the fabric.

Edit Fabric



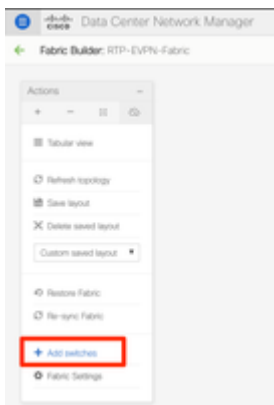
* Fabric Name : RTP-EVPN-Fabric

* Fabric Template : Easy_Fabric_11_1

General	Replication	vPC	Advanced	Resources	Manageability	Bootstrap	Configuration Backup
Enable Bootstrap ☒ ? Automatic IP Assignment For POAP Enable Local DHCP Server ☒ ? Automatic IP Assignment For POAP From Local DHCP Server * DHCP Scope Start Address 192.168.128.100 ? Start Address For Switch Out-of-Band POAP * DHCP Scope End Address 192.168.128.110 ? End Address For Switch Out-of-Band POAP * Switch Management Default Gate... 192.168.128.1 ? Default Gateway For Mgmt VRF On The Switch * Switch Management Subnet Prefix 24 ? Prefix For Mgmt0 Interface On The Switch (Min:8, Max:30)							
							Save Cancel

Add Switches into the Fabric

Step 1. Navigate to **Control > Fabrics > Fabric Builder** then select your Fabric. On the left-side panel, click on **Add Switches**, as shown in the image.



You can discover switches by **either using a Seed IP** (meaning the mgmt0 IP of each switch must be configured manually) or you can discover the switches **via POAP** and have DCNM configure all the mgmt0 IP addresses, VRF management, etc for you. For this example, we will be using POAP.

Step 2. Once you see the switch(es) of your interest, input the desired IP Address and Hostname you want DCNM to use, enter Admin PW, then click on **Bootstrap**, as shown in the image.

Inventory Management

Discover Existing Switches PowerOn Auto Provisioning (POAP)

Please note that POAP can take anywhere between 5 and 15 minutes to complete!

Bootstrap

Admin Password Confirm Admin Password

Serial Number	Model	Version	IP Address	Hostname	Gateway
☐ FDO213001M0	N9K-C9372TX	7.0(3)4(7)			192.168.128.1/24
☒ FDO21331SLK	N9K-93180YC-EX	7.0(3)7(6)	192.168.128.102	rtp-seoul-bb11	192.168.128.1/24

A successful booting log should look as shown in the image here from the switch's console.

```

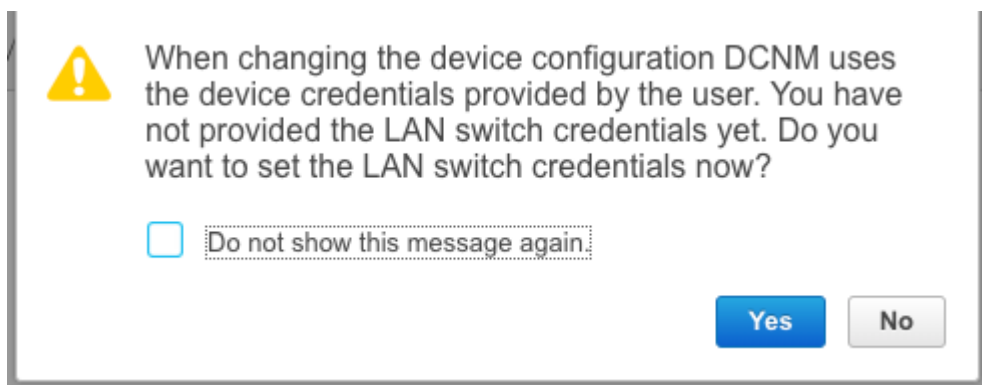
2019 Jun 19 14:58:51 switch %$ VDC-1 %$ %POAP-2-POAP_DHCP_DISCOVER_START: [FD021331SLK-70:7D:B9:4A:72:21] - POAP DHCP Discover phase started
2019 Jun 19 14:59:12 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Start DHCP v4 session
2019 Jun 19 14:59:12 switch %$ VDC-1 %$ %POAP-2-POAP_DHCP_DISCOVER_START: [FD021331SLK-70:7D:B9:4A:72:21] - POAP DHCP Discover phase started
2019 Jun 19 14:59:37 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Using DHCP, information received over mgmt0 from 192.168.128.57
2019 Jun 19 14:59:37 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Assigned IP address: 192.168.128.102
2019 Jun 19 14:59:37 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Netmask: 255.255.255.0
2019 Jun 19 14:59:37 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - DNS Server: 64.102.6.247
2019 Jun 19 14:59:37 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Default Gateway: 192.168.128.1
2019 Jun 19 14:59:37 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Script Server: 192.168.128.56
2019 Jun 19 14:59:37 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Script Name: poap_dcnm.py
2019 Jun 19 14:59:38 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Using DHCP, information received over mgmt0 from 192.168.128.56
2019 Jun 19 14:59:38 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Assigned IP address: 192.168.128.102
2019 Jun 19 14:59:38 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Netmask: 255.255.255.0
2019 Jun 19 14:59:38 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - DNS Server: 64.102.6.247
2019 Jun 19 14:59:38 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Default Gateway: 192.168.128.1
2019 Jun 19 14:59:38 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Script Server: 192.168.128.56
2019 Jun 19 14:59:38 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Script Name: poap_dcnm.py
2019 Jun 19 14:59:48 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - The POAP Script download has started
2019 Jun 19 14:59:48 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - The POAP Script is being downloaded from [copy tftp://192.168.128.56/poap_dcnm.py bootflash:scripts/script.sh vrf management ]
2019 Jun 19 14:59:49 switch %$ VDC-1 %$ %POAP-2-POAP_SCRIPT_DOWNLOADED: [FD021331SLK-70:7D:B9:4A:72:21] - Successfully downloaded POAP script file
2019 Jun 19 14:59:49 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - Script file size 100623, MD5 checksum d44d85cd6433a6efb6467faa17396933
2019 Jun 19 14:59:49 switch %$ VDC-1 %$ %POAP-2-POAP_INFO: [FD021331SLK-70:7D:B9:4A:72:21] - MD5 checksum received from the script file is d44d85cd6433a6efb6467faa17396933
2019 Jun 19 14:59:49 switch %$ VDC-1 %$ %POAP-2-POAP_SCRIPT_STARTED_MD5_VALIDATED: [FD021331SLK-70:7D:B9:4A:72:21] - POAP script execution started(MD5 validated)
2019 Jun 19 14:59:56 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: - CLI : show license host-id - script.sh
2019 Jun 19 14:59:56 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: - INFO: Get serial number: FD021331SLK - script.sh
2019 Jun 19 14:59:56 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: S/N[FD021331SLK] - INFO:device type is n9k - script.sh
2019 Jun 19 14:59:56 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: S/N[FD021331SLK] - INFO:device type is n9k - script.sh
2019 Jun 19 14:59:56 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: S/N[FD021331SLK] - INFO:device os version is - script.sh
2019 Jun 19 14:59:56 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: S/N[FD021331SLK] - INFO: check free space - script.sh
2019 Jun 19 14:59:57 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: S/N[FD021331SLK] - INFO: free space is 34643592 kB - script.sh
2019 Jun 19 14:59:57 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: S/N[FD021331SLK] - Get and set interface default - script.sh
2019 Jun 19 14:59:57 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: S/N[FD021331SLK] - CLI : show run | inc breakout - script.sh
2019 Jun 19 14:59:58 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: S/N[FD021331SLK] - CLI : show run int | inc Ethernet - script.sh
2019 Jun 19 14:59:59 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: S/N[FD021331SLK] - INFO: Ready to copy protocol scp, host 192.168.128.56, source /var/lib/dcnm/dcnm-server-list.cfg vrf management user poap password ***** - script.sh
2019 Jun 19 14:59:59 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: S/N[FD021331SLK] - CLI : terminal dont-ask ; terminal password ***** ; copy scp://poap@192.168.128.56/var/lib/dcnm/dcnm-server-list.cfg dcnm-server-list.cfg vrf management - script.sh
2019 Jun 19 15:00:00 switch %$ VDC-1 %$ %USER-1-SYSTEM_MSG: S/N[FD021331SLK] - INFO: Get Device Image Config File - script.sh

```

Step 3. Before you deploy the configuration for the entire fabric, ensure that you have previously configured DCNM with the device credentials. A popup should've appeared in the GUI as you login. In the event it does not, you can always access this via **Administration > Credentials Management > LAN Credentials**.



Note: If the device credentials are missing, DCNM fails to push configuration to the switches.



Administration / Credentials Management / LAN Credentials

Default Credentials

Default credentials will be used when changing device configuration. You can override the default credentials by specifying credentials for each of the devices in the Switch Table below.

DCNM uses individual switch credentials in the Switch Table. If the Username or Password column is empty in the Switch Table, the default credentials will be used.

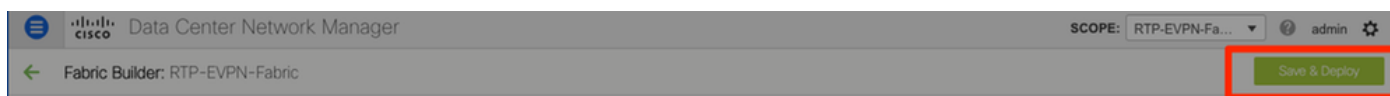
* User Name
* Password
* Confirm Password

Save

Clear

Deploy the Fabric's Configuration

Step 1. Once you have discovered all the switches for the given fabric using the same steps, navigate to **Control > Fabrics > Fabric Builder > <your selected Fabric>**. You should see your switches along with all their links here. Click **Save & Deploy**.



Step 2. In the **Config Deployment** window, you see how many lines of configuration for each switch DCNM pushes. You can preview the configuration as well if desired and compare the before and after:

Config Deployment



Step 1. Configuration Preview

Step 2. Configuration Deployment Status

Switch Name	IP Address	Switch Serial	Preview Config	Status	Re-sync	Progress
rtp-seoul-bb12	192.168.128.106	FDO21332CS5	481 lines	Out-of-sync		100%
rtp-seoul-bb11	192.168.128.102	FDO21331SLK	469 lines	Out-of-sync		100%
rtp-sapporo-bb12	192.168.128.105	FDO21302J5Z	464 lines	Out-of-sync		100%
rtp-sug-sp-bb12	192.168.128.104	FGE21332GQ9	314 lines	Out-of-sync		100%
rtp-sapporo-bb11	192.168.128.101	FDO213001M0	464 lines	Out-of-sync		100%
rtp-sug-sp-bb11	192.168.128.100	FGE21332H1D	313 lines	Out-of-sync		100%

Ensure all switches state COMPLETED and 100% without any errors — If there are any errors, be sure to address them one at a time (see *Problems Encountered During This Deployment* section for examples)

Config Deployment



Step 1. Configuration Preview

Step 2. Configuration Deployment Status

Switch Name	IP Address	Status	Status Description	Progress
rtp-seoul-bb12	192.168.128.106	COMPLETED	No Commands to execute.	100%
rtp-seoul-bb11	192.168.128.102	COMPLETED	No Commands to execute.	100%
rtp-sug-sp-bb12	192.168.128.104	COMPLETED	No Commands to execute.	100%
rtp-sapporo-bb11	192.168.128.101	COMPLETED	Deployed successfully	100%
rtp-sug-sp-bb11	192.168.128.100	COMPLETED	Deployed successfully	100%
rtp-sapporo-bb12	192.168.128.105	COMPLETED	Deployed successfully	100%

Step 3. (Optional) You can login to the devices at this point and issue any **show run** CLIs to verify that configuration was successfully pushed by DCNM.

Example:

```
rtp-sug-sp-bb11# show run bgp
```

```
!Command: show running-config bgp
!Time: Wed Jun 19 17:28:37 2019
```

```
version 7.0(3)I7(5) Bios:version 08.34
feature bgp
```

```
router bgp 65534
  router-id 10.1.0.11
  neighbor 10.1.0.7
    remote-as 65534
    update-source loopback0
    address-family l2vpn evpn
      send-community
      send-community extended
    route-reflector-client
  neighbor 10.1.0.8
    remote-as 65534
    update-source loopback0
    address-family l2vpn evpn
      send-community
      send-community extended
    route-reflector-client
  neighbor 10.1.0.9
    remote-as 65534
    update-source loopback0
    address-family l2vpn evpn
      send-community
      send-community extended
    route-reflector-client
  neighbor 10.1.0.10
    remote-as 65534
    update-source loopback0
    address-family l2vpn evpn
      send-community
      send-community extended
    route-reflector-client
```

Deploy the Second Fabric -- SJ

Perform the same steps as before with the RTP fabric using different values for BGP AS, etc.

Step 1. Navigate to **Control > Fabrics > Fabric Builder > Create Fabric > Name it!**

This section covers all the Underlay, Overlay, vPC, Replication, etc settings required. This depends upon the network addressing scheme, requirements, etc.

 **Note:** The Anycast Gateway MAC here should match the other Fabric if Multi-Site is used, later on, different Anycast Gateway MACs are not supported. This was corrected later on during the Multi-Site deployment section (not shown within article for brevity).

General	Replication	vPC	Advanced	Resources	Manageability	Bootstrap	Configuration Backup
* BGP ASN		65535		1-4294967295 1-65535[0-65535]			
* Fabric Interface Numbering		p2p		Numbered(Point-to-Point) or Unnumbered			
* Underlay Subnet IP Mask		30		Mask for Underlay Subnet IP Range			
* Link-State Routing Protocol		ospf		Supported routing protocols (OSPF/IS-IS)			
* Route-Reflectors		2		Number of spines acting as Route-Reflectors			
* Anycast Gateway MAC		2020.0000.00bb		Shared MAC address for all leafs (xxxx.xxxx.xxxx)			
NX-OS Software Image Version				If Set, Image Version Check Enforced On All Switches. Images Can Be Uploaded From Control:Image Upload			

Step 2. Configure the Bootstrap section as done before. Navigate through **Add Switches** again. Once all discovered, click on **Save & Deploy** to deploy the configuration. This was all covered in the RTP Fabric Deployment section (omitting here for brevity).

Config Deployment

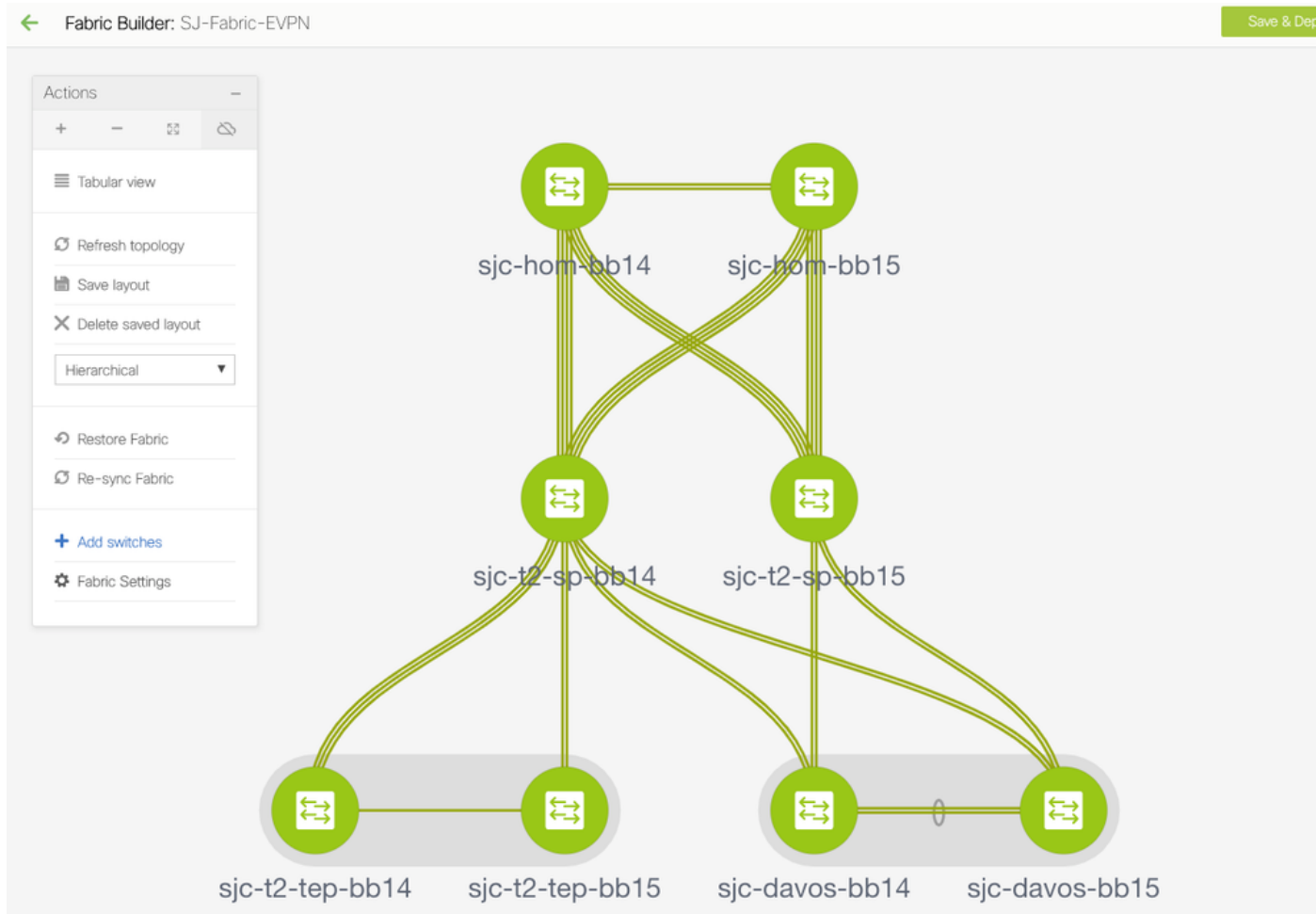


Step 1. Configuration Preview

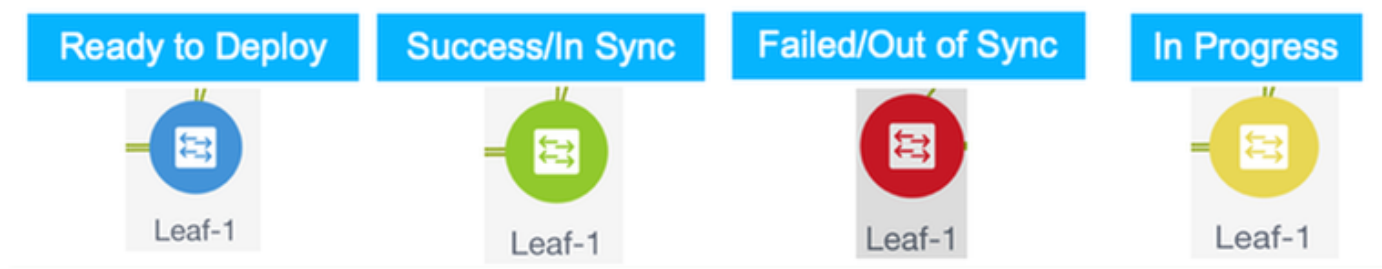
Step 2. Configuration Deployment Status

Switch Name	IP Address	Status	Status Description	Progress
sjc-hom-bb15	192.168.254.103	COMPLETED	No Commands to execute.	100%
sjc-davos-bb14	192.168.254.106	COMPLETED	No Commands to execute.	100%
sjc-hom-bb14	192.168.254.107	COMPLETED	No Commands to execute.	100%
sjc-davos-bb15	192.168.254.102	COMPLETED	No Commands to execute.	100%
sjc-t2-tep-bb14	192.168.254.105	COMPLETED	No Commands to execute.	100%
sjc-t2-tep-bb15	192.168.254.101	COMPLETED	No Commands to execute.	100%
sjc-t2-sp-bb15	192.168.254.100	COMPLETED	Deployed successfully	100%
sjc-t2-sp-bb14	192.168.254.104	COMPLETED	Deployed successfully	100%

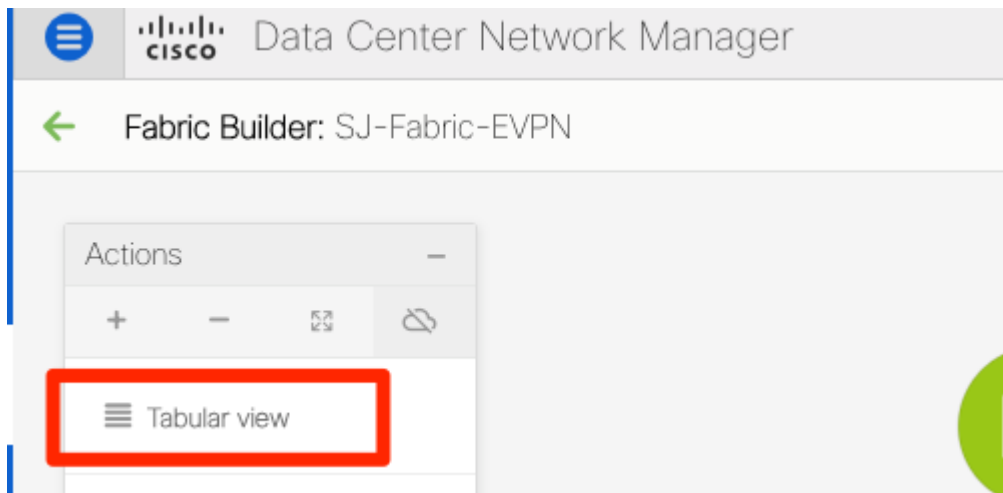
Topology from Fabric Builder's perspective at the end.



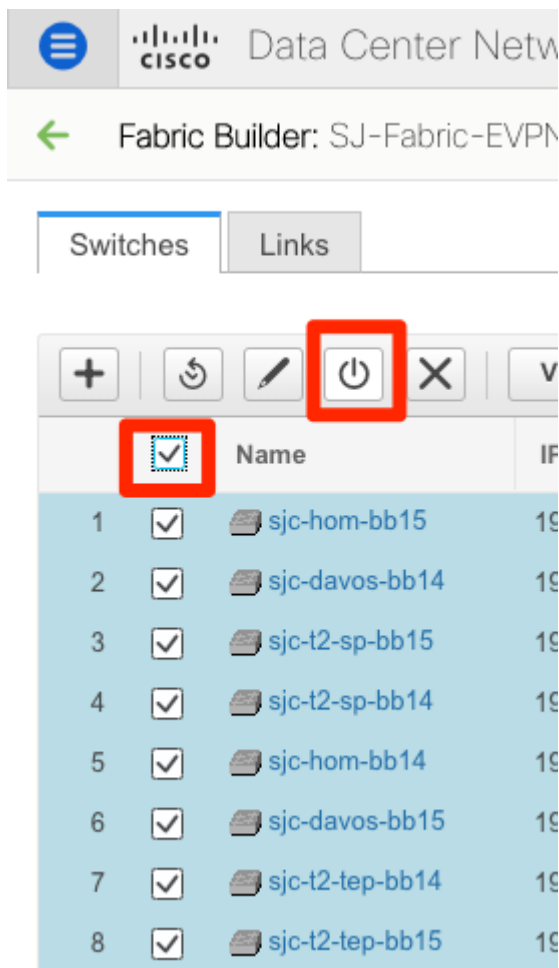
Ideally, all switches should appear in Green along with their links. This image shows the different status colors in DCNM mean.



Step 3. Once both fabrics are configured and deployed, ensure to save config & reload for TCAM changes to take effect. Go to **Controls > Fabrics > Fabric Builder > <your Fabric>**, navigate to **Tabular View**, as shown in the image.

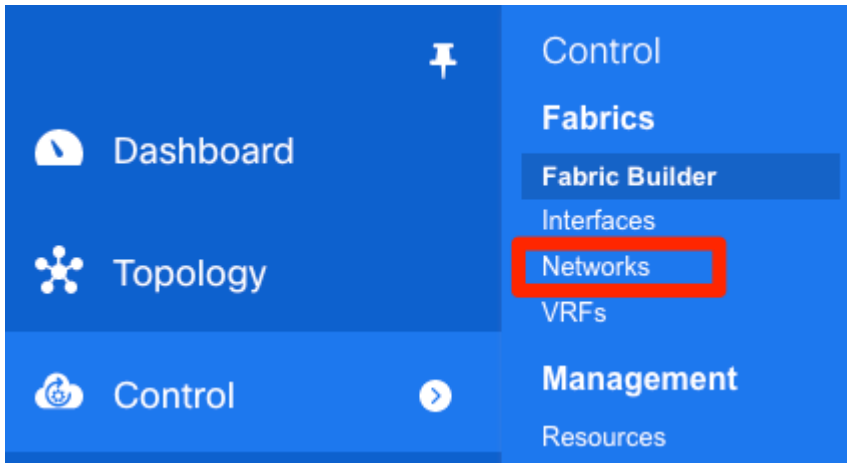


Step 4. Then click the **power** button (this reloads all your switches simultaneously):

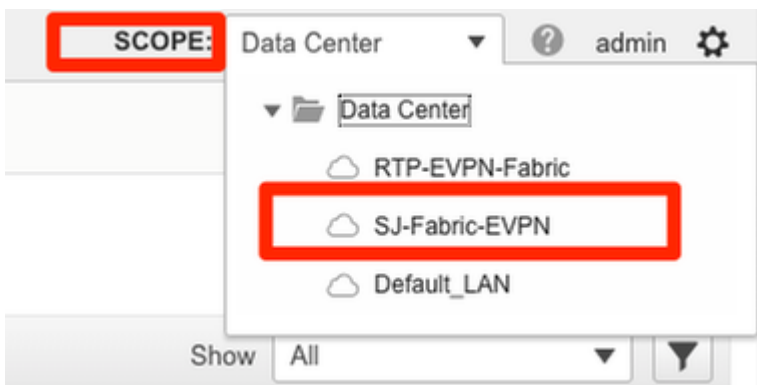


Create a Network (VLAN/L2VNI) and VRFs (L3VNIs)

Step 1. Navigate to **Control > Fabrics > Networks**, as shown in the image.



Step 2. As shown in the image, select the **Scope** for the change. i.e. which Fabric does this configuration need to be applied to?



Step 3. Click on the + sign, as shown in the image.



Step 4. DCNM walks you through the process to create the Switch Virtual Interface (SVI) (or pure L2 VLAN). If no VRFs are created at this stage, click the + button again and this temporarily takes you to the VRFs walk-through before moving forward with the SVI settings.

Create Network



▼ Network Information

* Network ID	20001
* Network Name	Andrea_TestNetwork_20001
* VRF Name	Andrea_VRF_RED 
Layer 2 Only	☐
* Network Template	Default_Network_Universal
* Network Extension Template	Default_Network_Extension_Univer
VLAN ID	2300 

Create VRF



▼ VRF Information

* VRF ID	30000
* VRF Name	Andrea_VRF_RED
* VRF Template	Default_VRF_Universal
* VRF Extension Template	Default_VRF_Extension_Universal

▼ VRF Profile

General	VRF Vlan Name 
Advanced	VRF Intf Description 
	VRF Description 

Create VRF

▼ Network Profile

Generate Multicast IP

①Please click only to generate a New Multicast Group Address and override the default value!

General

Advanced

IPv4 Gateway/NetMask ? example 192.0.2.1/24

IPv6 Gateway/Prefix ? example 2001:db8::1/64

Vlan Name ? if > 32 chars enable:system vlan long-name

Interface Description ?

MTU for L3 interface ? 68-9216

IPv4 Secondary GW1 ? example 192.0.2.1/24

IPv4 Secondary GW2 ? example 192.0.2.1/24

These features can be configured under the **Advanced** tab:

- ARP Suppression
- Ingress Replication
- Multicast Group
- DCHP
- Route Tags
- TRM
- L2 VNI Route-Target
- Enable L3 Gateway on Border

Step 5. Click on **Continue** to deploy the Network/VRF configuration.

The screenshot shows the Cisco Data Center Network Manager (DCNM) interface. At the top, the breadcrumb navigation indicates 'Network / VRF Selection' and 'Network / VRF Deployment'. The 'Continue' button is highlighted with a red box. Below the navigation, the 'Fabric Selected: SJ-Fabric-EVPN' is displayed. A table lists the selected network configuration:

Network Name	Network ID	VRF Name	IPv4 Gateway/Subnet	IPv6 Gateway/Prefix	Status	VLAN ID
Andrea_TestNetwork_20001	20001	Andrea_VRF_RED	10.212.20.1/24	2001:db8::1/64	NA	2300

Step 6. Double click on a device (or devices) in the topology view (DCNM automatically takes you here), to select them for the applicable configuration. Click on **Save**, as shown in the image.

Network Attachment - Attach networks for given switch(es)



Fabric Name: SJ-Fabric-EVPN

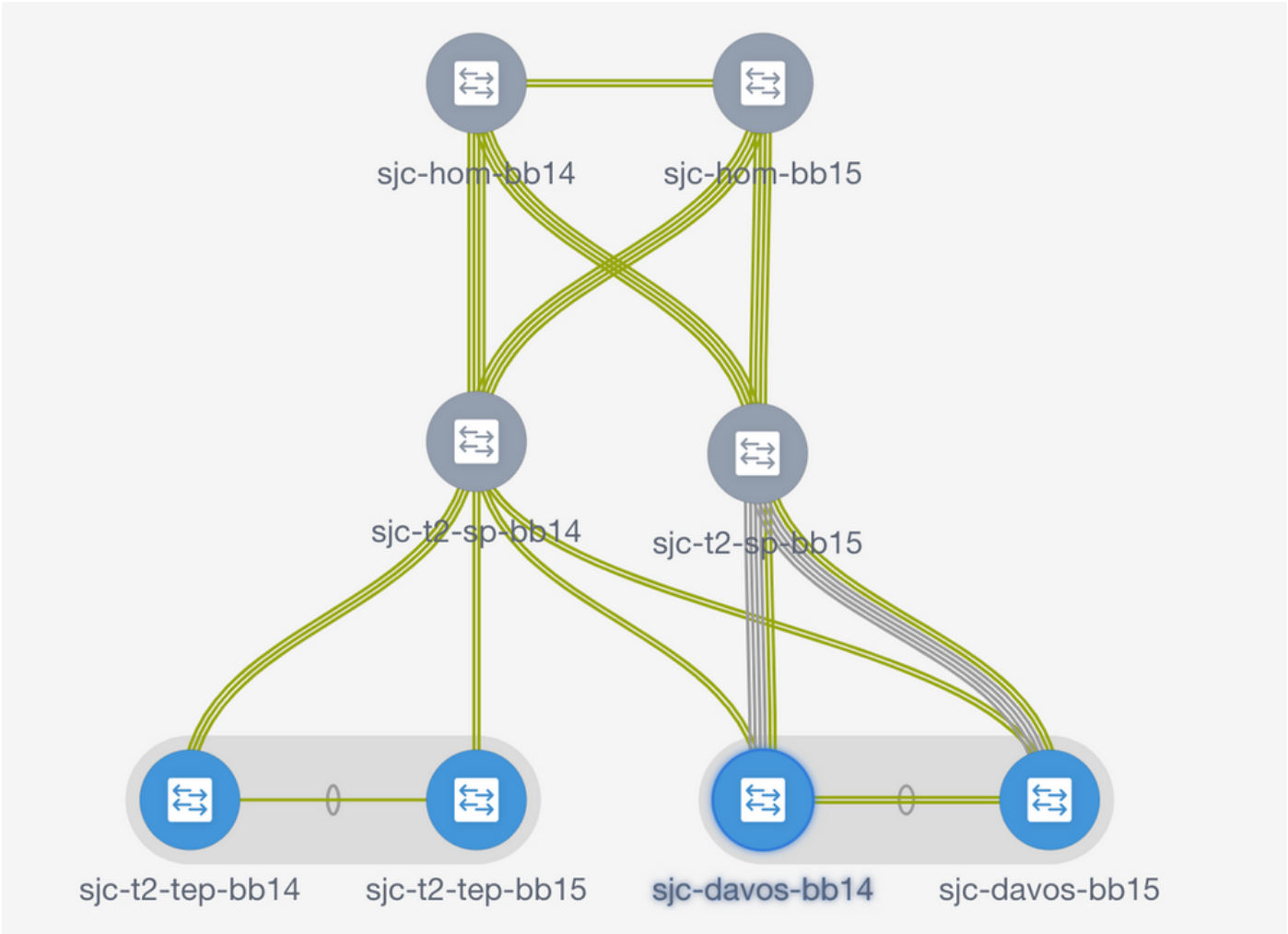
Deployment Options

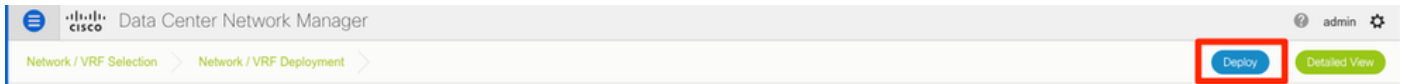
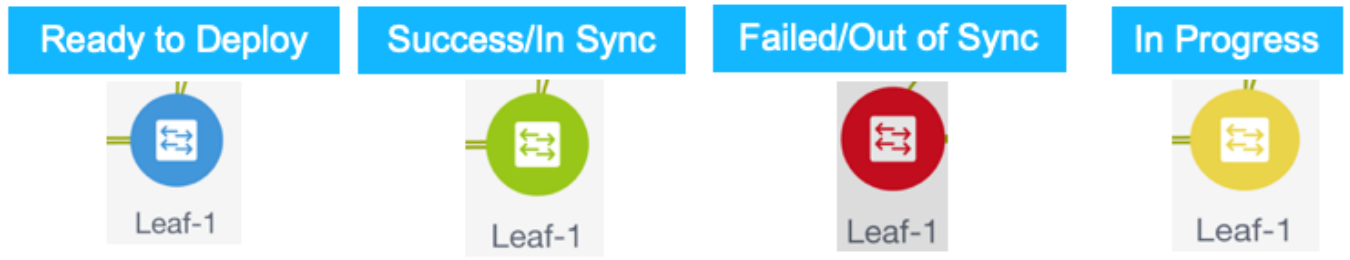
Select the row and click on the cell to edit and save changes

Andrea_TestNetwork_20001							
☒	Switch	▲	VLAN	Interfaces	CLI Freeform	Status	
☒	sjc-t2-tep-bb14		2300	...	Freeform config	NA	
☒	sjc-t2-tep-bb15		2300	...	Freeform config	NA	

Save

Step 7. Once selected, the switches should look blue (Ready to Deploy), as shown in this image.





 **Note:** If you want to verify the configuration for the CLI prior to deploying, you can click on **Detailed View** instead of **Deploy** and click **Preview** on the next screen.

The switches turn Yellow while the configuration is applied and will return to Green once it is completed.

Step 8. (Optional) You can login the CLI to verify the configuration if you so need (remember to use expand-port-profile option):

```

sjc-davos-bb14# show nve peers
Interface Peer-IP      State LearnType Uptime  Router-Mac
-----
nve1      10.2.0.16             Up     CP        00:00:34 00f6.638e.4fd5

sjc-davos-bb14# show nve vni
Codes: CP - Control Plane      DP - Data Plane
       UC - Unconfigured       SA - Suppress ARP
       SU - Suppress Unknown Unicast
       Xconn - Crossconnect
       MS-IR - Multisite Ingress Replication
Interface VNI      Multicast-group  State Mode Type [BD/VRF]  Flags
-----
nve1      20001      239.2.2.0        Up   CP   L2 [2300]
nve1      30000      n/a              Up   CP   L3 [andrea_vrf_red]

sjc-davos-bb14# show nve vrf andrea_vrf_red
VRF-Name  VNI      Interface Gateway-MAC
-----
andrea_vrf_red 30000      nve1      707d.b987.11a3

sjc-davos-bb14# show run int vlan 2300 expand-port-profile

!Command: show running-config interface Vlan2300 expand-port-profile
!Running configuration last done at: Mon Jun 24 15:07:05 2019
!Time: Mon Jun 24 15:08:13 2019

version 9.2(3) Bios:version 07.61

interface Vlan2300
 description SVI 2300
 no shutdown
 mtu 9216
 vrf member andrea_vrf_red
 no ip redirects
 ip address 10.212.20.1/24 tag 12345
 ipv6 address 2001:db8::1/64 tag 12345
 no ipv6 redirects
 fabric forwarding mode anycast-gateway

sjc-davos-bb14# show nve interface nve 1 detail
Interface: nve1, State: Up, encapsulation: VXLAN
VPC Capability: VPC-VIP-Only [notified]
Local Router MAC: 707d.b987.11a3
Host Learning Mode: Control-Plane
Source-Interface: loopback1 (primary: 10.2.0.14, secondary: 10.2.0.15)
Source Interface State: Up
Virtual RMAC Advertisement: No
NVE Flags:
Interface Handle: 0x49000001
Source Interface hold-down-time: 180
Source Interface hold-up-time: 30
Remaining hold-down time: 0 seconds
Virtual Router MAC: 0200.0a02.000f
Interface state: nve-intf-add-complete

```

Multi-Site Configuration

For this Greenfield deployment, MSD Fabric is deployed via direct peering between Border Gateways (BGWs). An alternative is using a centralized route server, not covered in this document.

Step 1. Navigate to **Control > Fabric Builder > Create Fabric**, as shown in the image.



Fabric Builder

Fabric Builder creates a managed and controlled SDN fabric. Select an existing fabric below or define a new VXLAN fabric (POAP), set the roles of the switches and deploy settings to devices.

Create Fabric

Step 2. Give your Multi-Site Fabric a name and choose **MSD_Fabric_11_1** in the drop down for **Fabric Template**.

Step 3. Under **General**, ensure your L2 and L3 VNI Range matches what your individual fabrics are using. Additionally, the Anycast Gateway MAC must match on both fabrics (RTP/SJ in this example). DCNM gives you an error if the Gateway MACs are mismatched and it needs to be corrected prior to moving forward with MSD deployment.

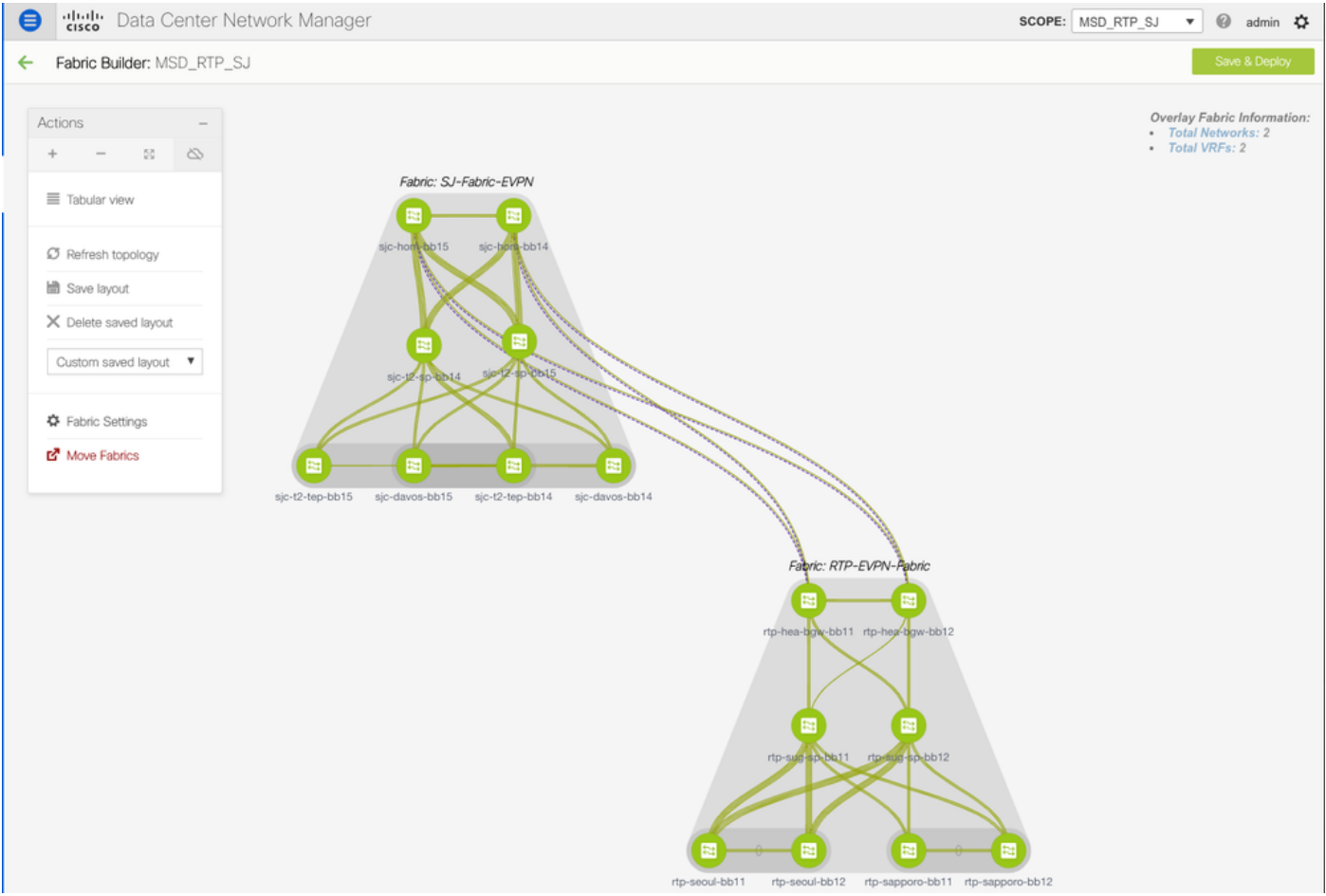
General	DCI	Resources
* Layer 2 VXLAN VNI Range	20000-29000	? Overlay Network Identifier Range (Min:1, Max:16777214)
* Layer 3 VXLAN VNI Range	30000-39000	? Overlay VRF Identifier Range (Min:1, Max:16777214)
* VRF Template	Default_VRF_Universal	? Default Overlay VRF Template For Leafs
* Network Template	Default_Network_Universal	? Default Overlay Network Template For Leafs
* VRF Extension Template	Default_VRF_Extension_Universal	? Default Overlay VRF Template For Borders
* Network Extension Template	Default_Network_Extension_Universal	? Default Overlay Network Template For Borders
Anycast-Gateway-MAC	1010.0000.00aa	? Shared MAC address for all leaves
* Multisite Routing Loopback Id	100	? 0-512

General	DCI	Resources
DCI Subnet IP Range	10.10.1.0/24	? Address range to assign P2P DCI Links
Subnet Target Mask	30	? Target Mask for Subnet Range (Min:8, Max:31)
* Multi-Site Overlay IFC Deployment Method	Direct_To_BGWS	? Manual, Auto Overlay EVPN Peering to Route Servers, Auto Overlay EVPN Direct Peering to Border Gateways
Multi-Site Route Server List		? Multi-Site Router-Server peer list, e.g. 128.89.0.1, 128.89.0.2
Multi-Site Route Server BGP ASN List		? 1-4294967295 1-65535[0-65535], e.g. 65000, 65001
Multi-Site Underlay IFC Auto Deployment Flag	☒ ?	

General
DCI
Resources

★ Multi-Site Routing Loopback IP Range
Typically Loopback100 IP Address Range

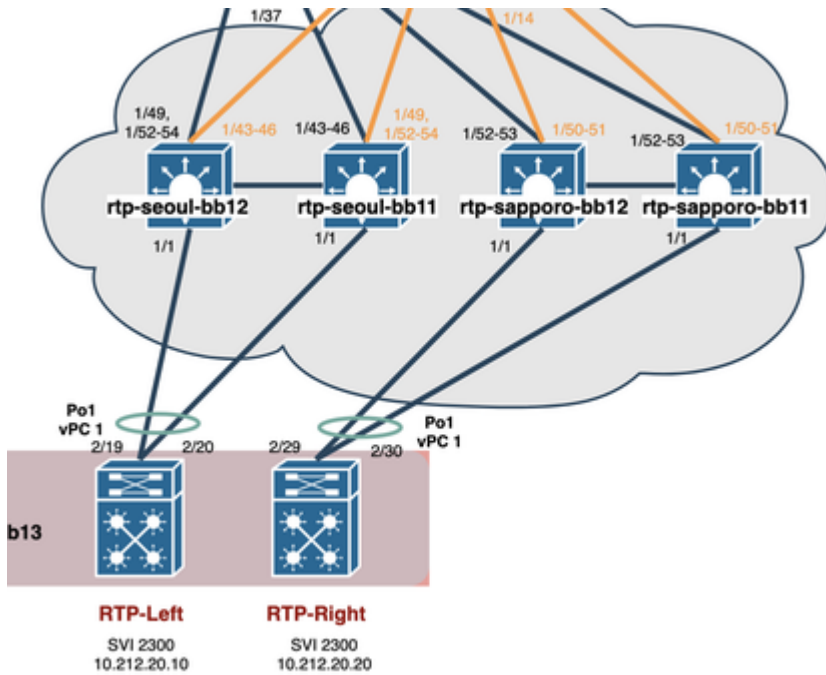
Step 4. Click **Save**, then navigate to the MSD Fabric and click on **Save & Deploy**. Your topology should look similar to these (all switches + links Green) once successfully completed:



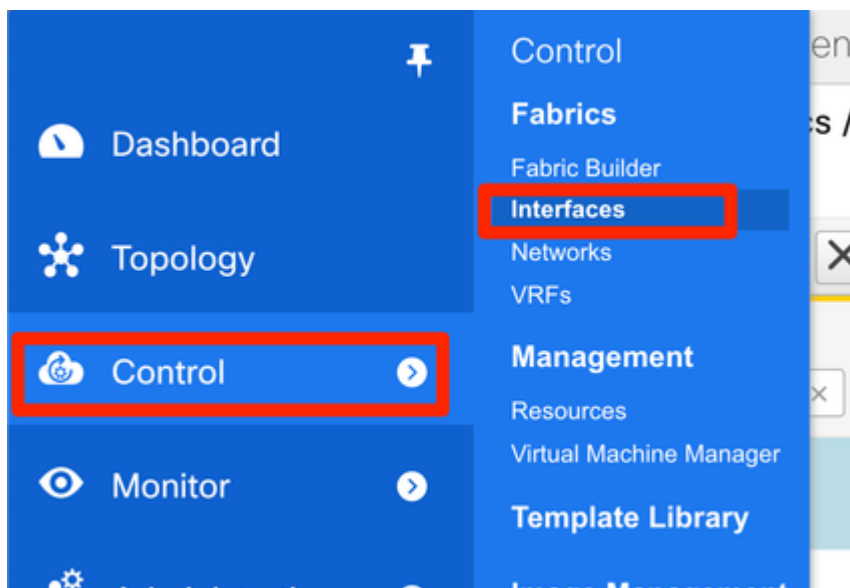
Do not forget to re-deploy any Networks/VRFs across both fabrics + the MSD Fabric!

Deploy Host Access/Trunk Policies

For this example, vPC trunks off two different VTEP pairs are configured and test connectivity within the local RTP fabric. Relevant topology as shown in the image:



Step 1. Navigate to **Control > Fabrics > Interfaces**, as shown in the image.



Step 2. Click the + sign to enter the Add an Interface wizard, as shown in the image.

Interfaces

+ ⋮ ▼ ✎ ✕ ↑ ↓ 👁 🔄 📄 Deploy Sho								
Device Name	Name	Admin	Oper	Reason	Policy	Overlay Network	Status	
sapporo-bb	1/1	up	up	ok				
☒ rtp-sapporo-bb11	Ethernet1/1	↑	↑	ok	int_trunk_host_11_1	NA	☒	
☒ rtp-sapporo-bb12	Ethernet1/1	↑	↑	ok	int_trunk_host_11_1	NA	☒	

In this example, a vPC trunk is created downstream to the N7K which is used to ping tests in this walk-through.

Step 3. Select the appropriate vPC pair, physical interfaces, LACP on/off, BPDUGuard, etc.

Add Interface

* **Type:** virtual Port Channel (vPC) ▼

* **Select a vPC pair** rtp-sapporo-bb11---rtp-sapporo-bb12 ▼

* **vPC ID** 1

* **Policy:** int_vpc_trunk_host_11_1 ▼

Note : PeerOne = rtp-sapporo-bb11 & PeerTwo = rtp-sapporo-bb12

General

Peer-1 Port-Channel ID

1

Peer-1 VPC port-channel number (Min:1, Max:4096)

Peer-2 Port-Channel ID

1

Peer-2 VPC port-channel number (Min:1, Max:4096)

Peer-1 Member Interfaces

Eth1/1

A list of member interfaces for Peer-1 [e.g. e1/5,eth1/7-9]

Peer-2 Member Interfaces

Eth1/1

A list of member interfaces for Peer-2 [e.g. e1/5,eth1/7-9]

* Port Channel Mode

active

Channel mode options: on, active and passive

* Enable BPDU Guard

false

Enable spanning-tree bpduguard

Enable Port Type Fast

☐

Enable spanning-tree edge port behavior

Save

Preview

Deploy

Note : PeerOne = rfp-sapporo-bb11 & PeerTwo = rfp-sapporo-bb12

General

* MTU ⓘ MTU for the Port Channel

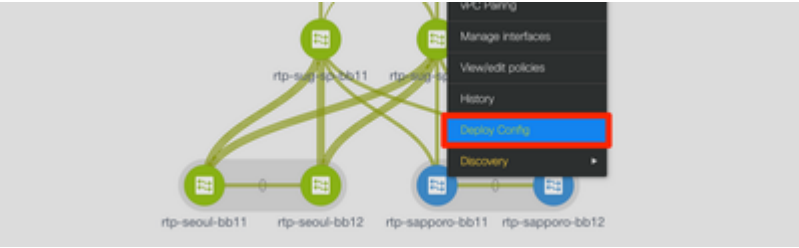
* Peer-1 Trunk Allowed... ⓘ Allowed values: 'none', 'all', or vlan ranges (ex: 1-200,500-2000,3000)

* Peer-2 Trunk Allowed... ⓘ Allowed values: 'none', 'all', or vlan ranges (ex: 1-200,500-2000,3000)

Peer-1 PO Description ⓘ Add description to Peer-1 VPC port-channel (Max Size 254)

Peer-2 PO Description ⓘ Add description to Peer-2 VPC port-channel (Max Size 254)

Step 4. Click on **Save** when finished. Alternatively, you may directly Deploy, as shown in the image.



Config Deployment

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

Switch Name	IP Address	Switch Serial	Preview Config	Status	Re-sync	Progress
rtp-sapporo-bb12	192.168.128.105	FD021302J5Z	15 lines	Out-of-sync		100%
rtp-sapporo-bb11	192.168.128.101	FD0213001M0	15 lines	Out-of-sync		100%

Step 5. (Optional) Review the configuration to be applied.

Config Preview - Switch 192.168.128.105

Pending Config

Side-by-side Comparison

```
interface ethernet1/1
  no spanning-tree port type edge trunk
interface port-channel1
  switchport
  switchport mode trunk
  mtu 9216
  vpc 1
  spanning-tree bpduguard disable
  description To N7K RTP-Right Eth2/29
  no shutdown
  switchport trunk allowed vlan 1-4094
interface ethernet1/1
  channel-group 1 force mode active
  no shutdown
configure terminal
```

Config Deployment

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

Switch Name	IP Address	Status	Status Description	Progress
rtp-sapporo-bb11	192.168.128.101	COMPLETED	Deployed successfully	100%
rtp-sapporo-bb12	192.168.128.105	COMPLETED	Deployed successfully	100%

Step 6. (Optional) Manual configuration on 7K:

```
RTP-Right# show run interface port-channel 1 membership
```

```
!Command: show running-config interface port-channel1 membership
!Running configuration last done at: Mon Sep  9 17:29:39 2019
!Time: Mon Sep  9 17:33:01 2019
```

```
version 8.2(4)
```

```
interface port-channel1
  switchport
  switchport mode trunk
```

```
interface Ethernet2/29
  description vPC from sapporo-bb11/12 eth1/1
  switchport
  switchport mode trunk
  channel-group 1 mode active
  no shutdown
```

```
interface Ethernet2/30
  description vPC from sapporo-bb11/12 eth1/1
  switchport
  switchport mode trunk
  channel-group 1 mode active
  no shutdown
```

```
RTP-Right# show port-channel summary interface po1
```

```
Flags:  D - Down          P - Up in port-channel (members)
        I - Individual    H - Hot-standby (LACP only)
        s - Suspended    r - Module-removed
        b - BFD Session Wait
        S - Switched      R - Routed
        U - Up (port-channel)
        M - Not in use. Min-links not met
```

```
-----
Group Port-      Type      Protocol  Member Ports
Channel
-----
1      Po1(SU)    Eth       LACP      Eth2/29(P)  Eth2/30(P)
```

Step 7.(Optional) Creating a test SVI on N7K to ping the VTEPs in RTP (VTEPs have Anycast Gateway of 10.212.20.1 in VRF andrea_red):

```

RTP-Right# show run interface vlan 2300

!Command: show running-config interface Vlan2300
!Running configuration last done at: Mon Sep  9 17:41:10 2019
!Time: Mon Sep  9 17:44:30 2019

version 8.2(4)

interface Vlan2300
  description VRF Andrea_Red in TEPs
  no shutdown
  no ip redirects
  ip address 10.212.20.20/24
  no ipv6 redirects

RTP-Right# ping 10.212.20.1
PING 10.212.20.1 (10.212.20.1): 56 data bytes
64 bytes from 10.212.20.1: icmp_seq=0 ttl=254 time=1.235 ms
64 bytes from 10.212.20.1: icmp_seq=1 ttl=254 time=0.832 ms
64 bytes from 10.212.20.1: icmp_seq=2 ttl=254 time=0.819 ms
64 bytes from 10.212.20.1: icmp_seq=3 ttl=254 time=0.81 ms
64 bytes from 10.212.20.1: icmp_seq=4 ttl=254 time=0.828 ms

--- 10.212.20.1 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.81/0.904/1.235 ms

```

Step 8. (Optional) Verify that other VTEPs within RTP see this host via EVPN/HMM:

```

rtp-seoul-bb12# show bgp l2vpn evpn 10.212.20.20 vrf andrea_vrf_red
BGP routing table information for VRF default, address family L2VPN EVPN
Route Distinguisher: 10.1.0.10:35067 (L2VNI 20001)
BGP routing table entry for [2]:[0]:[0]:[48]:[002a.6a5c.6045]:[32]:[10.212.20.20]/272, version 168
Paths: (2 available, best #1)
Flags: (0x000212) (high32 00000000) on xmit-list, is in l2rib/evpn, is not in HW

Advertised path-id 1
Path type: internal, path is valid, is best path, in rib
  Imported from 10.1.0.13:35067:[2]:[0]:[0]:[48]:[002a.6a5c.6045]:[32]:[10.212.20.20]/272
AS-Path: NONE, path sourced internal to AS
 10.1.0.1 (metric 6) from 10.1.0.11 (10.1.0.11)
  Origin IGP, MED not set, localpref 100, weight 0
  Received label 20001 30000
  Extcommunity: RT:65534:20001 RT:65534:30000 S00:10.1.0.1:0 ENCAP:8
  Router MAC:3890.a5eb.05cf
  Originator: 10.1.0.13 Cluster list: 10.1.0.11

```

Step 9.(Optional) Repeat the same process for seoul-bb11/12 (create vPC port-channel, create SVI 2300). Pinging from RTP-Left to RTP-Right to confirm L2 connectivity over EVPN within RTP Fabric:

```

RTP-Left# ping 10.212.20.20
PING 10.212.20.20 (10.212.20.20): 56 data bytes
64 bytes from 10.212.20.20: icmp_seq=0 ttl=254 time=1.385 ms
64 bytes from 10.212.20.20: icmp_seq=1 ttl=254 time=1.03 ms
64 bytes from 10.212.20.20: icmp_seq=2 ttl=254 time=0.98 ms
64 bytes from 10.212.20.20: icmp_seq=3 ttl=254 time=0.997 ms
64 bytes from 10.212.20.20: icmp_seq=4 ttl=254 time=0.974 ms

--- 10.212.20.20 ping statistics ---
5 packets transmitted, 5 packets received, 0.00% packet loss
round-trip min/avg/max = 0.974/1.073/1.385 ms

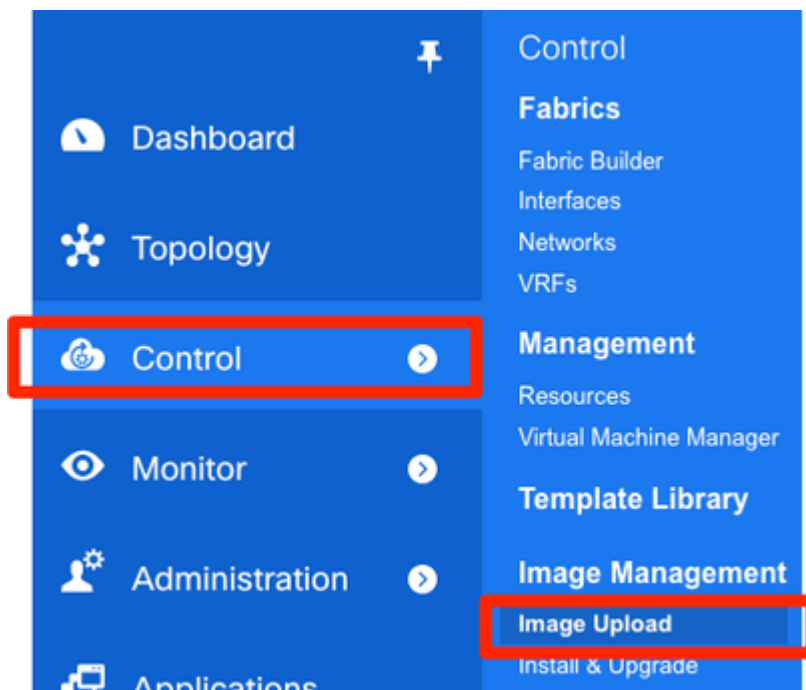
```

Similar steps can be followed to create non-vPC port-channels, access interfaces, etc under the **Add Interfaces** context.

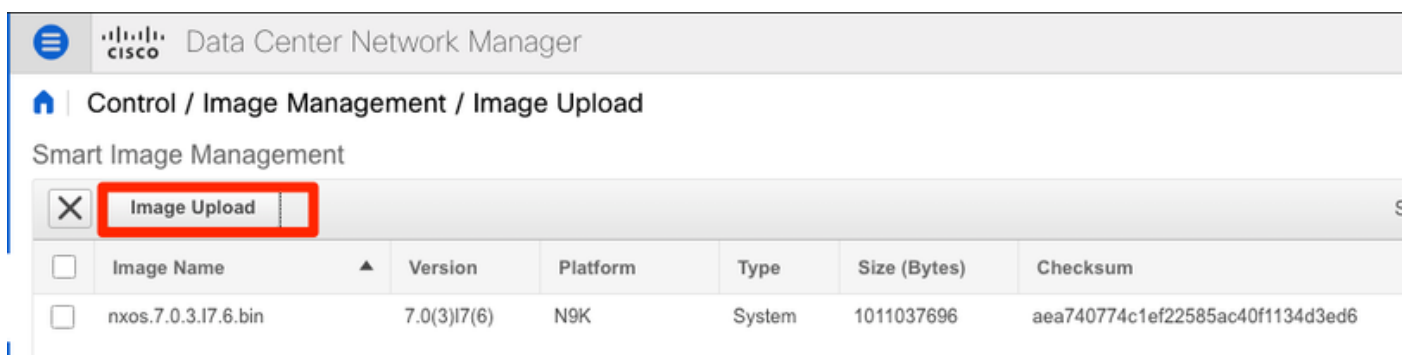
Day 2 Operations

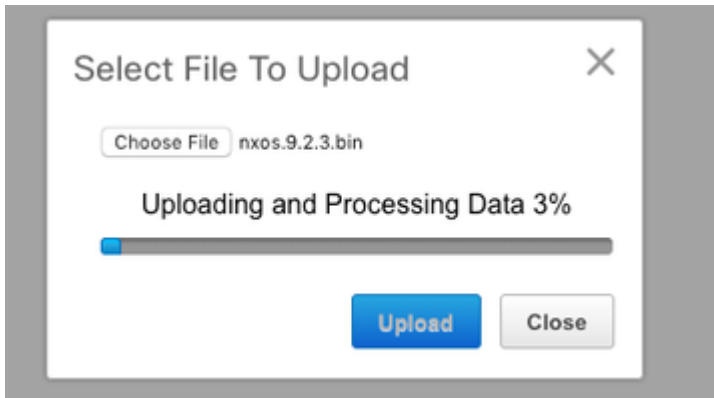
Upgrade NX-OS Software via DCNM

Step 1. Upload an image (or set of images to DCNM's server), and then navigate to **Control > Image Management > Image Upload**, as shown in the image.

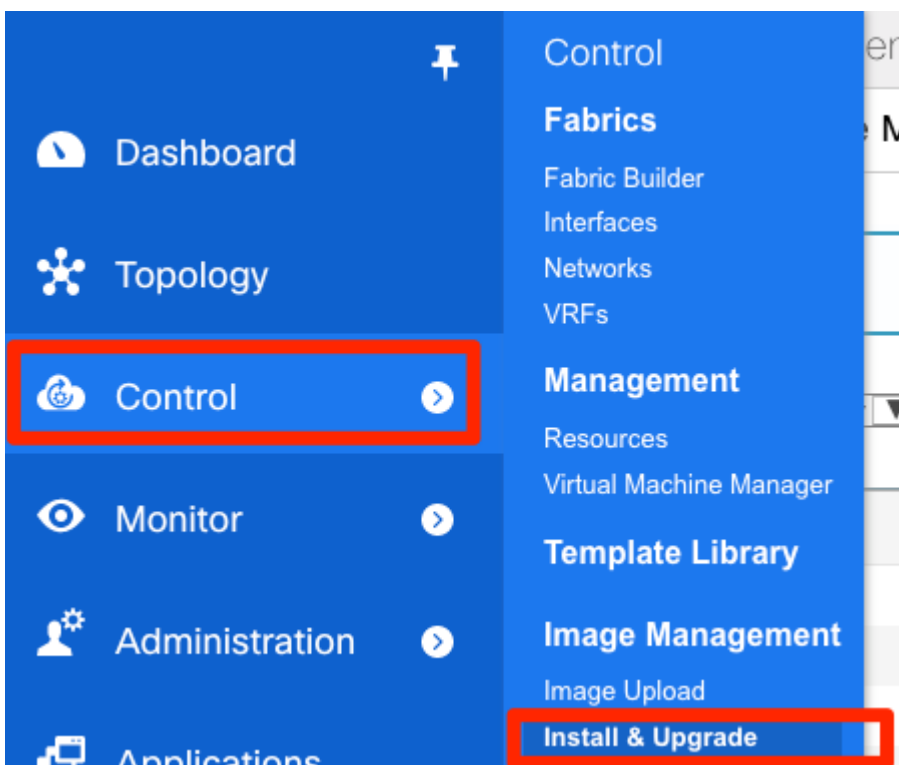


Step 2. Follow the prompts for a local upload, then the file(s) should appear as shown in this image:





Step 3. Once the file(s) are uploaded, you can move on to **Install & Upgrade** if the switches require an upgrade. Navigate to **Control > Image Management > Install & Upgrade**, as shown in the image.



Step 4. Select the switches you'd like upgraded. For this example, the entire RTP Fabric is upgraded.



Control / Image Management / Install & Upgrade

1 Select Switches



2 Specify Software Images



3 Pre-Installation Checks



4 Schedule Job

Device Scope: Data Center ▼

Available Switches

☐	Switch Name	IP Address	Model	Version
☐	sjc-davos-bb14	192.168.254.106	N9K-C92160YC-X	9.2(2.71)
☐	sjc-davos-bb15	192.168.254.102	N9K-C92160YC-X	7.0(3)I7(5)
☐	sjc-hom-bb14	192.168.254.107	N9K-C93180YC-FX	9.2(1)
☐	sjc-hom-bb15	192.168.254.103	N9K-C93180YC-FX	9.2(1)
☐	sjc-t2-sp-bb14	192.168.254.104	N9K-C9508	7.0(3)I7(1)
☐	sjc-t2-sp-bb15	192.168.254.100	N9K-C9508	7.0(3)I7(3)
☐	sjc-t2-tep-bb14	192.168.254.105	N9K-C9372TX-E	7.0(3)I7(5a)
☐	sjc-t2-tep-bb15	192.168.254.101	N9K-C9372TX-E	7.0(3)I7(4)



Selected Switches

☐	Switch Name
☐	rtp-sug-sp-bb12
☐	rtp-sug-sp-bb11
☐	rtp-seoul-bb12
☐	rtp-seoul-bb11
☐	rtp-sapporo-bb12
☐	rtp-sapporo-bb11
☐	rtp-hea-bgw-bb12
☐	rtp-hea-bgw-bb11

Previous

Next

Finish

Cancel

Step 5. Select which NX-OS version you want the switches upgraded to (as a best practice, upgrade all switches to the same NX-OS version):

Data Center Network Manager
admin

Control / Image Management / Install & Upgrade

1 Select Switches ✓
→
2 Specify Software Images ✓
→
3 Pre-Installation Checks
→
4 Schedule Job

☒ Auto File Selection
Select File Server: Default_S...
Image Version: 7.0(3)I7(6)
Path*: /var/lib/dcnm/images/
Apply

Name	Version	Kickstart Image	System Image	OSI Image	Vrf	Available Space (MB)		Selected Files Size(MB)	Skip Ver... Compati...	Select P... Line Ca...	Upgrade Options
						Primary Supervi...	Secondary Supervisor				
rtp-hea-b...	7.0(3)I7(5)	Not Applicab	nxos.7.0.3.I7.	Not Applicable	manage...	115145	Not Available	1012	☐	☐	Options
rtp-hea-b...	7.0(3)I7(5)	Not Applicab	nxos.7.0.3.I7.	Not Applicable	manage...	115146	Not Available	1012	☐	☐	Options
rtp-sapp...	7.0(3)I7(3)	Not Applicab	nxos.7.0.3.I7.	Not Applicable	manage...	49821	Not Available	1012	☐	☐	Options
rtp-sapp...	7.0(3)I7(3)	Not Applicab	nxos.7.0.3.I7.	Not Applicable	manage...	50535	Not Available	1012	☐	☐	Options
rtp-seoul...	7.0(3)I7(6)	Not Applicab	nxos.7.0.3.I7.	Not Applicable	manage...	35476	Not Available	1012	☐	☐	Options
rtp-seoul...	7.0(3)I7(...)	Not Applicab	nxos.7.0.3.I7.	Not Applicable	manage...	33780	Not Available	1012	☐	☐	Options
rtp-sug-s...	7.0(3)I7(5)	Not Applicab	nxos.7.0.3.I7.	Not Applicable	manage...	20294	Not Available	1012	☐	☐	Options
rtp-sug-s...	7.0(3)I7(5)	Not Applicab	nxos.7.0.3.I7.	Not Applicable	manage...	46651	Not Available	1012	☐	☐	Options

*Provide absolute path in case of SCP and SFTP servers. For TFTP and FTP servers, please provide the relative path from TFTP/FTP home directory. For more information on auto file selection refer to online help.

Previous
Next
Finish
Cancel

Step 6. Click **Next** and DCNM runs the switches through pre-installation checks. This window can take quite some time, so you can alternatively select **Finish Installation Later** and schedule the upgrade while you're away.

Data Center Network Manager
admin

Control / Image Management / Install & Upgrade

1 Select Switches ✓
→
2 Specify Software Images ✓
→
3 Pre-Installation Checks
→
4 Schedule Job

Compatibility Check May take considerable time. To finish this installation later click Finish Installation Later

Elapsed time: 00hrs 00min 45sec

Name	Current Action	Version Compatibility Verification
☒ rtp-sug-sp-bb12	Compatibility check in progress	STARTED
☐ rtp-sug-sp-bb11	Compatibility check in progress	STARTED
☐ rtp-seoul-bb12	Compatibility check in progress	STARTED
☐ rtp-seoul-bb11	Compatibility check in progress	STARTED
☐ rtp-sapporo-bb12	Compatibility check in progress	STARTED
☐ rtp-sapporo-bb11	Compatibility check in progress	STARTED
☐ rtp-hea-bgw-bb12	Compatibility check in progress	STARTED

Compatibility Logs

In Progress

Previous
Next
Finish
Close

This queues the task and appears similar to as shown in the image here, once completed.

Software Upgrade Tasks

Selected 1 / Total 1

Buttons: View, Delete, New Installation, **Finish Installation**

☐	Task Id	Task Type	Owner	Devices	Job Status	Created Time	Scheduled At	Completed Time
☒	1	Compatibility	admin	rtp-hea-bgw-bb11,rtp-hea...	COMPLETED WITH EXCEPTION	2019-06-20 12...	2019-06-20 12...	2019-06-20 13:03...

Note: The exception on the above case was one of the RTP switches did not have enough room for the NX-OS image.

Step 7. Once the compatibility is done, click on **Finish Installation** in the same window, as shown in the image.

Some of the upgrade(s) are disruptive. Do you want to skip the disruptive upgrades?

Buttons: **Don't Skip**, Skip

Bottom button: Schedule Job

Step 8. You can select the upgrades to be done concurrent (all at the same time) or sequential (one at a time). Since this is a lab environment, selected is **concurrent**.

 Data Center Network Manager

Control / Image Management / Install & Upgrade

1 Switches 

 →

2 Schedule Job 

☒ Save running configuration to startup before installation

Schedule

☒ Deploy now

☐ Choose time to deploy (Server time)

Jun/20/2019 13:05:36 

Execution mode

☐ Sequential

☒ Concurrent

Comment

Upgrading RTP Fabric all at once. This is a lab environment.

The task is created and it appears **IN PROGRESS**, as shown in the image.

Upgrade History

Switch Level History

Software Upgrade Tasks

Selected 0 / Total 1

View

Delete

New Installation

Finish Installation

Show

Quick Filter

☐	Task Id	Task Type	Owner	Devices	Job Status	Created Time	Scheduled At	Completed Time	Comment
☐	1	Upgrade	admin	rtp-hea-bgw-bb11,rtp-hea...	IN PROGRESS	2019-06-20 13...	2019-06-20 13...		Upgrading RTP Fabric all

Upgrade History

Switch Level History

Software Upgrade Tasks

Selected 0 / Total 1

View

Delete

New Installation

Finish Installation

Show

Quick Filter

☐	Task Id	Task Type	Owner	Devices	Job Status	Created Time	Scheduled At	Completed Time	Comment
☐	1	Upgrade	admin	rtp-hea-bgw-bb11,rtp-hea...	COMPLETED	2019-06-20 13...	2019-06-20 13...	2019-06-20 13:20:...	Upgrading RTP Fabric all

An alternate way to select the image is shown here.

sjc-t2-sp...	7.0(3)I7(1)	Not Applicabl	Select Image	Not Applicable	manage...	6326	2683	Not Applicable	☐	☐	Options
sjc-t2-sp...	7.0(3)I7(3)	Not Applicabl	Select Image	Not Applicable	manage...	4437	Not Available	Not Applicable	☐	☐	Options

Software Image Browser

Switch Name: sjc-davos-bb14

Switch IP: 192.168.254.106

Switch Model: N9K-C92160YC-X

Select System Image from

☒ File Server
 ☐ Switch File System

Select the file server:

Default_SCP_Repos... ▼

Select Image:

nxos.9.2.3.bin ▼

Select Vrf:

management

☒ Use this Vrf for all other selected device
 ☒ Use this Image for all other selected device platform type

FLASH

← ▾ ≡

Search All

nxos.7.0.3.I7.6.bin

nxos.9.2.3.bin

Install Endpoint Locator

In order for DCNM Apps to work properly, you must have inband connectivity between the DCNM Server and a front-panel port to one of the Nexus 9000s in the Fabric. For this example, the DCNM Server is connected to Ethernet1/5 of one of the Spines in the RTP Fabric.

Step 1. This CLI is added manually to the Nexus 9000:

```
rtp-sug-sp-bb12# show run interface ethernet1/5

!Command: show running-config interface Ethernet1/5
!Running configuration last done at: Wed Sep 11 14:41:05 2019
!Time: Wed Sep 11 14:53:25 2019

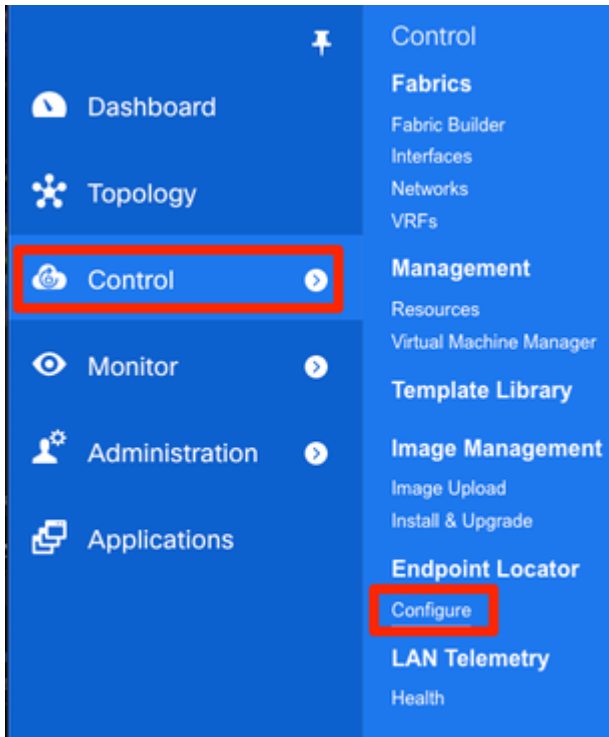
version 7.0(3)I7(7) Bios:version 08.36

interface Ethernet1/5
  description To DCNM Server for Endpoint Locator & Apps
  mtu 9216
  no ip redirects
  ip address 99.99.99.2/30
  no ipv6 redirects
  no shutdown
```

Step 2. Ensure that you can ping the DCNM Server and vice-versa on this point-to-point connection.

```
[root@dcg-rtp-dcnm-fab ~]# ping 99.99.99.2
PING 99.99.99.2 (99.99.99.2) 56(84) bytes of data:
64 bytes from 99.99.99.2: icmp_seq=1 ttl=255 time=0.780 ms
64 bytes from 99.99.99.2: icmp_seq=2 ttl=255 time=0.802 ms
64 bytes from 99.99.99.2: icmp_seq=3 ttl=255 time=0.772 ms
^C
--- 99.99.99.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2001ms
rtt min/avg/max/mdev = 0.772/0.784/0.802/0.034 ms
```

Step 3. Navigate to the **DCNM GUI > Control > Endpoint Locator > Configure**, as shown in the image.



Step 4. Select which Fabric you want Endpoint Locator to be enabled, as shown in the image.

1. Select a Fabric

Choose a fabric where you want the Endpoint Locator functionality to be enabled.

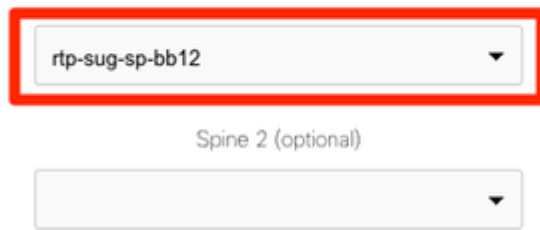
Continue

Step 5. As shown in the image, select a Spine.

2. Select Spine

For an iBGP-based fabric, choose the Route-Reflectors.

For an eBGP-based fabric, choose the transit spines.



rtp-sug-sp-bb12 ▼

Spine 2 (optional)

▼

Step 6. (Optional). Before moving forward to the next step, eth2's IP was changed from the original deployment via this CLI on the DCNM Server (this step is not needed if the original IP configured during the DCNM Server fresh installation remains correct):

```
[root@dcg-rtp-dcnm-fab ~]# ifconfig eth2 0.0.0.0
[root@dcg-rtp-dcnm-fab ~]# appmgr setup inband
Configuring Interface for InBand Connectivity...
Please enter the information as prompted:
InBand Physical IP [e.g. 2.2.2.69]: 99.99.99.1
InBand Network Mask [e.g. 255.255.255.0]: 255.255.255.252
InBand Gateway [e.g. 2.2.2.1]: 99.99.99.2
Validating Inputs ...
You have entered these values..
PIP=99.99.99.1
NETMASK=255.255.255.252
GATEWAY=99.99.99.2

Press 'y' to continue configuration, 'n' to discontinue [y] y
{"ResponseType":0,"Response":"Refreshed"}
Done.

[root@dcg-rtp-dcnm-fab ~]# ifconfig eth2
eth2: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 99.99.99.1 netmask 255.255.255.252 broadcast 99.99.99.3
    inet6 fe80::250:56ff:fe9e:23f5 prefixlen 64 scopeid 0x20<link>
    ether 00:50:56:9e:23:f5 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 11 bytes 698 (698.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

Step 7. Verify the In-band Interface configuration. This should match what was configured in the previous step.

3. Verify DCNM In-band Interface

Choose the Ethernet interface on the DCNM that will provide reachability to the Spine(s) within the fabric.

eth2

▼

Interface IP

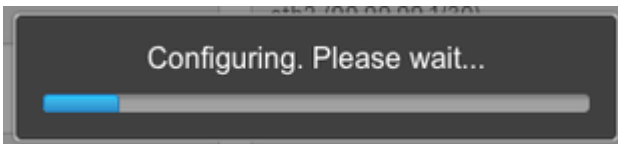
99.99.99.1

/

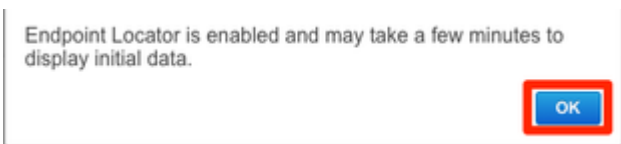
30

▼

Step 8. Once you review the configuration, click on **Configure**. This step may take a few minutes:



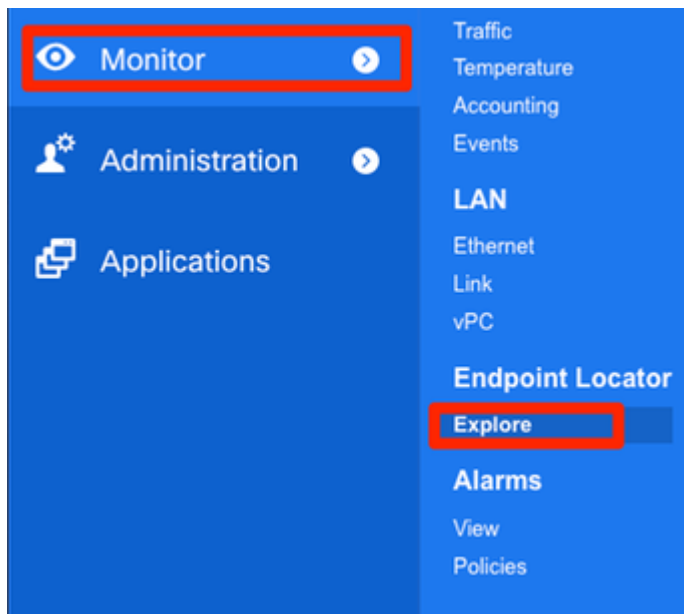
Once completed, the notification, as shown in the image appears.



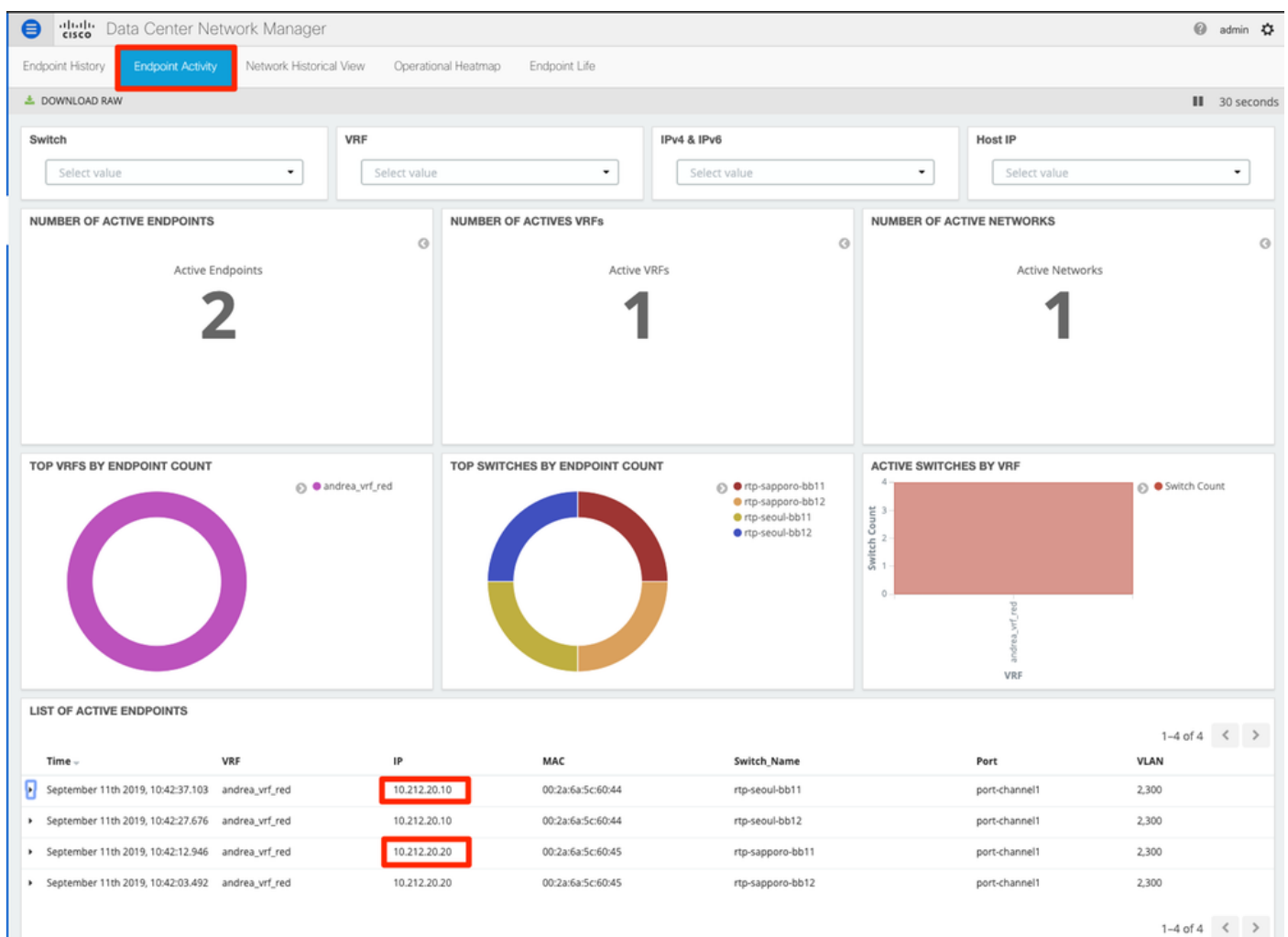
Notice DCNM has configured a BGP neighbor on the selected Spine in the L2VPN EVPN family.

```
rtp-sug-sp-bb12# show run bgp | sec "neighbor 99"
neighbor 99.99.99.1
remote-as 65534
address-family l2vpn evpn
send-community
send-community extended
route-reflector-client
```

Step 9. You can now use Endpoint Locator. Navigate to **Monitor > Endpoint Locator > Explore**.



In this example, you can see the two hosts that were configured for the local ping tests in the RTP Fabric:



Problems Encountered During This Deployment

Bad Cabling

A pair of switches had bad cabling which caused a bundling error for the vPC peer-link port-channel500.

Example:

Config Deployment

Step 1. Configuration Preview

Step 2. Configuration Deployment Status

Switch Name	IP Address	Status	Status Description	Progress
rtp-sapporo-bb11	192.168.128.101	FAILED	feature ngoam is an invalid command	2%
rtp-sapporo-bb12	192.168.128.105	FAILED	channel-group 500 force mode active Failed with follo...	15%
rtp-sug-sp-bb11	192.168.128.100	COMPLETED	Deployed successfully	100%
rtp-sug-sp-bb12	192.168.128.104	COMPLETED	Deployed successfully	100%
rtp-seoul-bb11	192.168.128.102	COMPLETED	Deployed successfully	100%
rtp-seoul-bb12	192.168.128.106	COMPLETED	Deployed successfully	100%

Step 1. Navigate back to **Control** > **Fabric Builder** and review the errors:

2 pending errors

Fabric errors & warnings

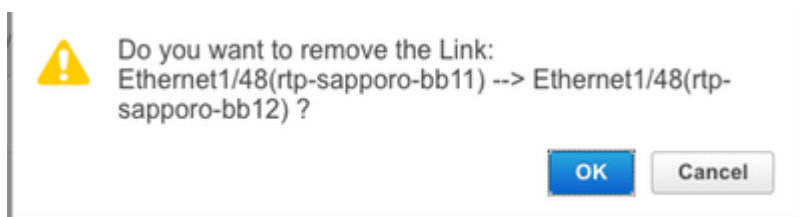
2 Errors, 0 Warnings, 0 Info

Delete all

Switch[FDO21302J5Z] - CLI command ' channel-group 500 force mode active' failed with following error:command failed: port not compatible:[Buffer boost] ** You can use force option to override the port's parameters ** (e.g. "channel-group X force") ** Use "show port-channel compatibility-parameters" to get more information on failure

Switch[FDO213001M0] - CLI command 'feature ngoam' failed with following error:CLI command is invalid.

Step 2. For the first error regarding the port-channel500 command failing — Verified via **show cdp neighbors** that the connection to the vPC peer was on a 10G and a 40G port (not compatible). Removed the 10G port physically and deleted the link from DCNM as well:



Failed to Configure a Feature

For the second error regarding “feature ngoam” failing to configure — The switch was upgraded to a more recent NX-OS version where “feature ngoam” is supported and click **Save & Deploy** again. Both issues were resolved.

Overlap the Management Subnets for Different Fabrics

While the second fabric is deployed, SJ, the same subnet was used (if physically separate, this should be OK); however, DCNM logs a conflict and POAP fails. This is resolved as the SJ Fabric is put in a different management VLAN and changing the range of the DHCP addresses.

Add Fabric

* Fabric Name :

* Fabric Template :

General	Replication	vPC	Advanced	Resources	Manageability	Bootstrap	Configuration Backup
Enable Bootstrap ☒ ? Automatic IP Assignment For POAP							
Enable Local DHCP Server ☒ ? Automatic IP Assignment For POAP From Local DHCP Server							
* DHCP Scope Start Address		192.168.128.108		? Start Address For Switch Out-of-Band POAP			
* DHCP Scope End Address		192.168.128.115		? End Address For Switch Out-of-Band POAP			
* Switch Management Default Gate...		192.168.128.1		? Default Gateway For Mgmt VRF On The Switch			
* Switch Management Subnet Prefix		24		? Prefix For Mgmt0 Interface On The Switch (Min:8, Max:30)			



The fabric **SJ-EVPN-Fabric** was added with below message:

Management Default Gateway network 192.168.128.0 for fabric SJ-EVPN-Fabric has conflict with fabric RTP-EVPN-Fabric's Management Default Gateway network 192.168.128.0. Same Gateway network cannot be used within the same or different fabrics, please use different Gateway Network.

Close

Breakout Interfaces

Step 1. For breakout interfaces in some of the switches (refer to topology), this CLI was added manually for the T2 Spines:

```
sjc-t2-sp-bb14# show run | i i breakout
interface breakout module 1 port 6-7 map 10g-4x
```

Step 2. Navigate to **Control > Interfaces**, and delete the parent interfaces:

Data Center Network Manager

SCOPE: SJ-Fabric-EVPN

Control / Fabrics / Interfaces

Interfaces Selected 4 / Total 520

	Device Name	Name	Admin	Oper	Reason	Policy	Overlay Network	Status	Port-C
☒	sjc-t2-sp-bb14	Ethernet1/7			Not discovered	int_trunk_host_11_1	NA	✗	
☒	sjc-t2-sp-bb14	Ethernet1/6			Not discovered	int_trunk_host_11_1	NA	✗	
☒	sjc-t2-sp-bb15	Ethernet1/7			Not discovered	int_trunk_host_11_1	NA	✗	
☒	sjc-t2-sp-bb15	Ethernet1/6			Not discovered	int_trunk_host_11_1	NA	✗	

The actually used interfaces are Eth1/6/1-4 and Eth1/7/1-4. If you don't correct this, the Save & Deploy will fail later on. There's a way to do the breakout through DCNM itself (button next to the + sign; however, not covered in this article)

Fabric Error When Deployed to Unsupported Capability

Data Center Network Manager
 SCOPE: SJ-Fabric-EVPN ? admin

Network / VRF Selection > Network / VRF Deployment
VRF View | Continue

Fabric Selected: SJ-Fabric-EVPN

Networks Selected 1 / Total 2

	Network Name	Network ID	VRF Name	IPv4 Gateway/Subnet	IPv6 Gateway/Prefix	Status	VLAN ID
☐	Andrea_TestNetwork_20001	20001	Andrea_VRF_RED	10.212.20.1/24	2001:db8::1/64	DEPLOYED	2300
☒	mesau-22302	22302	mesau-southeas...	10.23.2.1/24		OUT-OF-SYNC	2302

Edit Network

Network Information

* Network ID

* Network Name

* VRF Name

Layer 2 Only ☐

* Network Template

* Network Extension Template

VLAN ID Propose VLAN ?

Network Profile

Generate Multicast IP

Please click only to generate a New Multicast Group Address and override the default value!

General

Advanced

DHCPv4 Server 2 ? DHCP Relay IP

DHCPv4 Server VRF ?

Loopback ID for DHCP Relay interface (Min:0, Max:1023) ?

Routing Tag ? 0-4294967295

TRM Enable ☒ ? Enable Tenant Routed Multicast

L2 VNI Route-Target Both Enable ☐ ?

Enable L3 Gateway on Border ☐ ?

Some of the chassis (T2s) in SJ Fabric do not support TRM so when DCNM tried to push this configuration, it was unable to move forward. TRM support here:

https://www.cisco.com/c/en/us/td/docs/switches/datacenter/nexus9000/sw/92x/vxlan-92x/configuration/guide/b-cisco-nexus-9000-series-nx-os-vxlan-configuration-guide-92x/b_Cisco_Nexus_9000_Series_NX-OS_VXLAN_Configuration_Guide_9x_chapter_01001.html#concept_vw1_syb_zfb

Unchecked the **TRM Enable** box under both the **Network** and **VRF Edit** windows is shown in the image.

Repeat the same process under **Control > Fabric Builder > VRF**.

Data Center Network Manager

SCOPE: SJ-Fabric-EVPN admin

Network / VRF Selection > Network / VRF Deployment

Network View Continue

Fabric Selected: SJ-Fabric-EVPN

VRFs

Selected 1 / Total 2

☐	VRF Name	VRF ID	Status
☐	Andrea_VRF_RED	30000	DEPLOYED
☒	mesau-southeast-corner	32302	PENDING

Edit VRF

VRF Information

* VRF ID

32302

* VRF Name

mesau-southeast-corner

* VRF Template

Default_VRF_Universal

* VRF Extension Template

Default_VRF_Extension_Universal

VRF Profile

General

Advanced

VRF Intf MTU

9216

68-9216

Loopback Routing Tag

12345

0-4294967295

Redistribute Direct Route Map

FABRIC-RMAP-REDIST-SUBNET

Max BGP Paths

1

1-64

Max iBGP Paths

2

1-64

TRM Enable

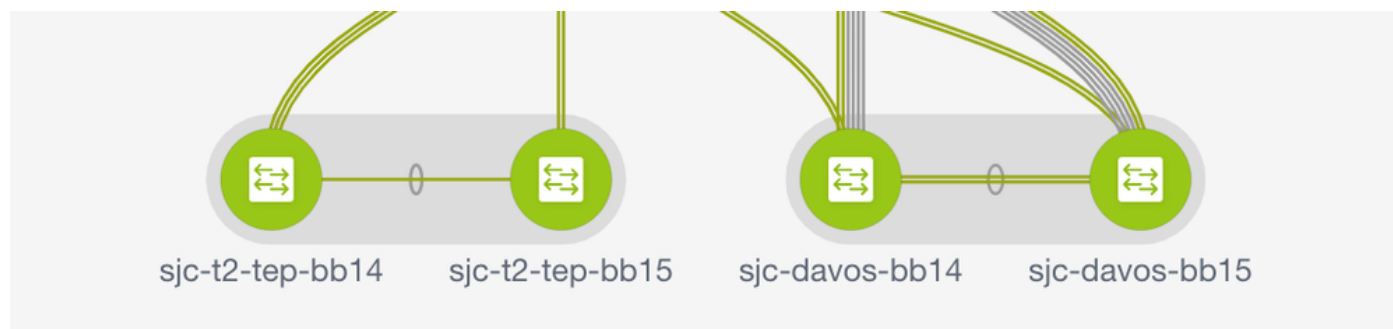
☒

Enable Tenant Routed Multicast

* Is RP External

☐

Is RP external to the fabric?



Click **Continue** and then **Deploy** respectively as done previously.

What's new in DCNM 11.2?

- vPC Fabric Peering
- eBGP based Routed Fabrics
 - Enable EVPN on top
- Easy Fabric Brownfield Enhancements
 - Border Spine/Border GW Spine
 - PIM Bidir
 - Tenant Routed Multicast
- Day-0/Bootstrap with External DHCP server

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

Changing from traditional vPC to MCT-Less vPC using DCNM:

Benefits of MCT-Less vPC:

- Enhanced dual-homing solution without wasting physical ports
- Preserves traditional vPC characteristics
- Optimized routing for singled homed endpoints with PIP

Related Information

- Cisco DCNM LAN Fabric Configuration Guide, Release 11.2(1)

<https://www.cisco.com/c/en/us/support/cloud-systems-management/prime-data-center-network-manager/series.html>

- Chapter: Border Provisioning Use Case in VXLAN BGP EVPN Fabrics - Multi-Site
<https://www.cisco.com/c/en/us/support/cloud-systems-management/prime-data-center-network-manager/series.html>
- NextGen DCI with VXLAN EVPN Multi-Site Using vPC Border Gateways White Paper
https://www.cisco.com/c/en/us/products/collateral/switches/nexus-9000-series-switches/whitepaper-c11-742114.html#_Toc5275096
- Chapter: DCNM Applications
<https://www.cisco.com/c/en/us/support/cloud-systems-management/prime-data-center-network-manager/series.html>