



Border Provisioning Use Case in VXLAN BGP EVPN Fabrics - VRF Lite

External connectivity from data centers is a prime requirement. Virtual eXtensible Local Area Network (VXLAN) Border Gateway Protocol (BGP) Ethernet VPN (EVPN) based data center fabrics provide east-west connectivity by distributing IP-MAC reachability information among various devices within the fabric. Tenants, typically represented by virtual routing and forwarding instances (VRFs) can procure external connectivity via special nodes called borders. In this way, tenant workloads in one data center fabric can have Layer 3 connectivity to the global Internet as well as to workloads in other data center fabrics. This chapter describes LAN Fabric provisioning of the Nexus 9000-based border devices through the Cisco® Data Center Network Manager (DCNM) for the VRF Lite use case. Two common deployment models are covered:

- IP Core model - VRF extension from border devices connected to edge routers that in turn provide connectivity to other fabrics and/or connectivity to the global Internet.
 - B2B model - VRF extension from border devices directly connected to border devices in other fabrics.
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Prerequisites

- The DCNM version required to support this feature is 10.4(2).
- The VRF Lite feature requires Cisco Nexus 9000 Series NX-OS Release 7.0(3)I6(2) or later.
- Familiarity with VXLAN BGP EVPN data center fabric architecture and top-down based LAN fabric provisioning through the DCNM.

- Fully configured VXLAN BGP EVPN fabrics including underlay and overlay configurations on the various leaf and spine devices.
- VXLAN BGP EVPN fabrics (and their interconnection) can be configured manually or using DCNM. This document explains the process to connect the fabrics through DCNM. So, you should know how to configure and deploy a VXLAN BGP EVPN fabric through DCNM. For more details, see the LAN Fabric Provisioning section under the Configure chapter in [Cisco DCNM Web Client Online Help, 10.4\(2\) Release](#).

**Note**

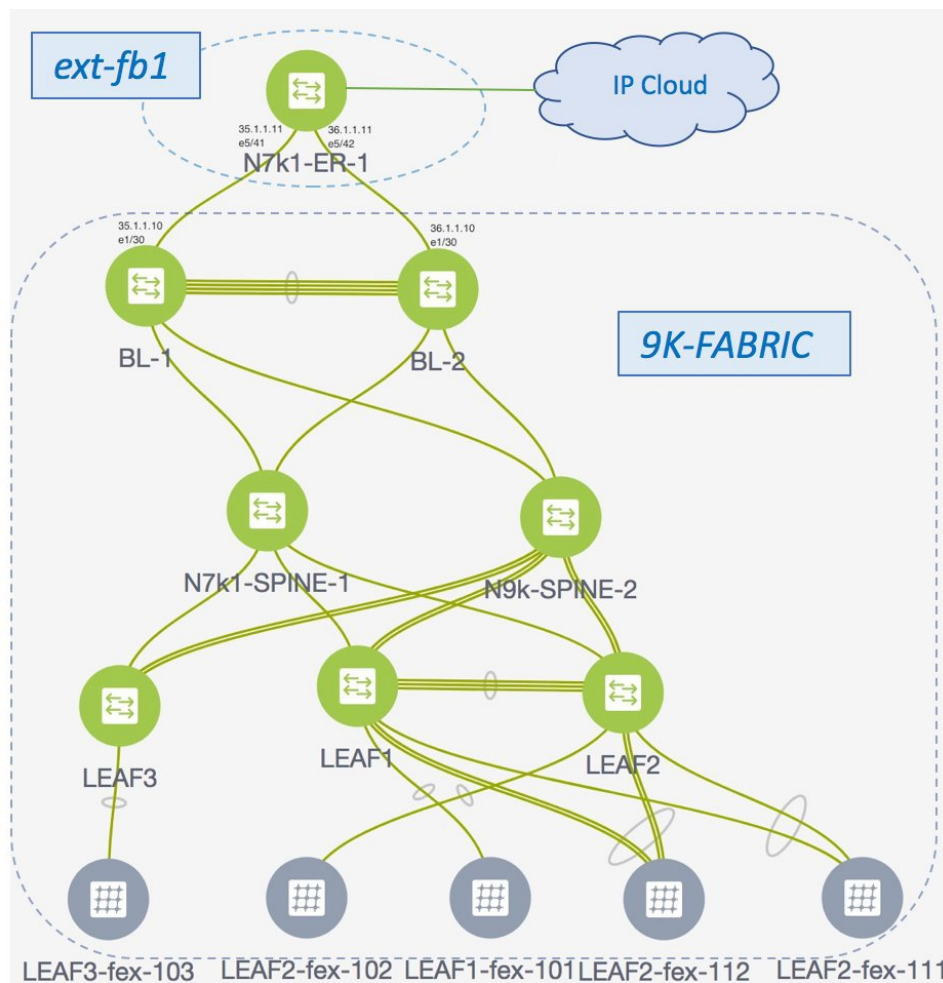
For an explanation on the VRF Lite feature, see the [Cisco Programmable Fabric with VXLAN BGP EVPN Configuration Guide](#) document.

Sample Scenario

The VRF Lite feature is explained through an example scenario. Consider a VXLAN BGP EVPN fabric, *9K-FABRIC*, where the border devices are connected through an edge router to a shared IP core. This document will show you how to enable Layer 3 traffic between hosts in the two fabrics.

**Note**

In the IP core scenario, DCNM allows provisioning for fabric switches and the border devices. The Edge Router (ER) connected to the border devices needs to be manually configured (in *9K-FABRIC*, the edge router N7k1-ER1 [or ER1] is connected to BL1 and BL2). Appropriate CLI templates can also be employed to deploy this configuration on the Cisco Nexus 7000 Series edge devices using DCNM. In the B2B setup, the border leafs on both fabrics can be configured through DCNM.



Network configurations for the fabric is provisioned through DCNM. For external Layer 3 reachability from hosts connected to leaf switches within the fabric, border devices need to be provisioned with the appropriate VRF configuration. Multiple border devices in the fabric ensure redundancy in the case of failures as well as effective load distribution.

**Note**

The DCI functions VRF Lite and VRF Lite + Multi-Site are in the scope of this document, but MPLS L3VPN and LISP technologies are not in the scope of this document.

VRF Lite—This requires setting up the border leaf configuration for enabling the VRF Lite feature by establishing eBGP peering from the border leaf to appropriate external devices, either ERs or border leafs in other fabrics. In this context, border leafs are special devices that allow clear control and data plane segregation from one site to another while allowing for policy enforcement points for any inter-fabric traffic.

The steps involved to enable VRF Lite and traffic flow across the fabric are:

- 1 **Inter-Fabric Connect**—Top-Down deployment for the VRF Lite feature configures route maps and an eBGP session in the default VRF through an interface (parent interface) connected to the ER. This is a one-time setup for each ER connected to a border leaf.

- 2 *VRF Extensions*—For each VRF that is to be extended, a unique sub interface towards the ER and an eBGP session through this sub interface is configured on the border leaf. This is a per-VRF configuration. For a B2B scenario, VRF extension configurations on all border leafs can be deployed through DCNM itself. For the IP core setup, the corresponding configurations have to be manually enabled on the ERs.

**Note**

VRF extensions on a vPC setup of a pair of border leafs have to be enabled on both the vPC peers. DCNM does not allow you to enable extensions on a single vPC switch.

The end-to-end configurations can be split into these 2 steps:

1 VRF Lite inter-fabric configurations on the border leafs (BL-1, BL-2)

- 1 VRF Lite function on BL-1 and BL-2, the vPC pair of border leafs in *9K-FABRIC* that are directly connected to ER-1.
- 2 Configurations on edge routers ER-1 and ER-2 - These configurations are not in the scope of DCNM provisioning and this document. It is mentioned here for completeness and sample configurations are provided in the Appendix section. Again, as mentioned earlier, appropriate CLI templates can be employed to provision the edge router if it is a Nexus device.

2 Deploying VRF instances on the border leafs (BL-1, BL-2)

For this example, multiple VRFs will be configured on the vPC pair of border leafs in *9K-FABRIC*.

After successful VRF Lite deployment at the border leaf and on the edge routers, traffic will flow between them.

**Note**

In the DCNM topology view, the lines connecting devices managed by DCNM (for example, BL-1 to N7k1-SPINE-1) symbolize a physical cable connection. They do not indicate that the connection is functional and traffic flows between them.

To start off with, let us consider VRF Lite provisioning on border leafs BL-1 and BL-2 through DCNM Top-Down LAN Fabric Provisioning.

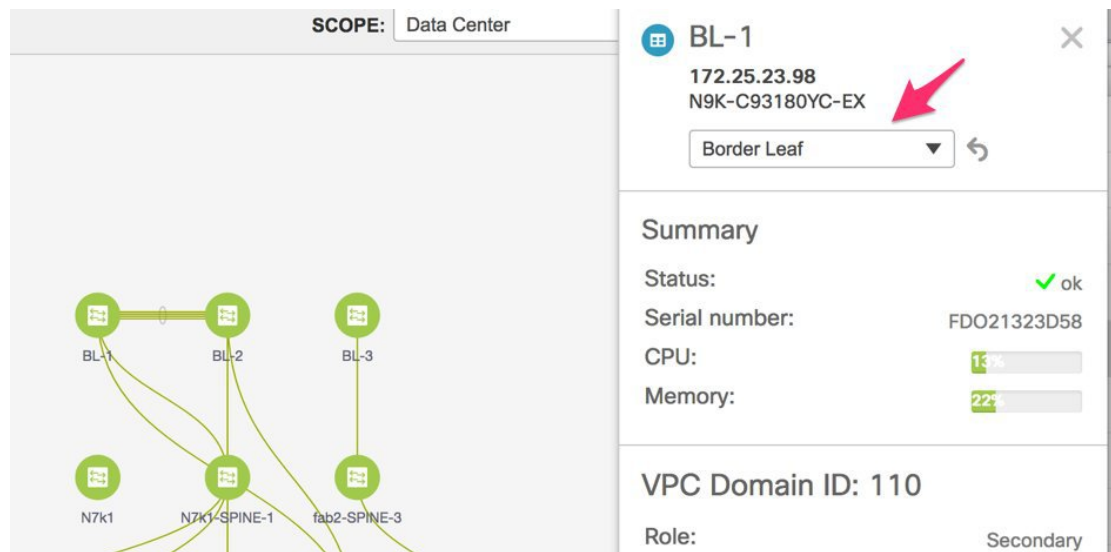
VRF Lite Inter-Fabric Configuration

Prerequisite Configuration for VRF Lite Configuration

- Setting the *Leaf* role to *Border Leaf*— By default a device will be treated as a leaf switch. You need to change its role to that of a border leaf.

To update the switch role, login to DCNM, and click **Topology** from the main menu at the left part of the screen. In the Topology screen, from the **Scope** drop down box, select the fabric and click on the BL-1. A screen pops up with the switch information.

Change the entry from *Leaf* to *Border Leaf* as shown in the image.



This is required for configuring the VRF Lite feature through the DCNM GUI. After completing the VRF Lite specific prerequisites, start DCNM VRF Lite configuration on BL-1 with extensions to the edge router ER-1.

VRF Lite Inter-Fabric Configuration (on BL-1 towards ER-1 in 9K-FABRIC)

From the Cisco DCNM Web Client, choose **Configure > LAN Fabric Provisioning > Network Deployment**. The LAN Fabric Provisioning page appears.

Click **Continue**. The **Select a Fabric** page comes up.

Select a Fabric

Choose a fabric with appropriate switches where you want the Top Down functionality to be enabled or create a new fabric.

9K-FABRIC

[Fabric Extension Settings](#)

OR

[+ Create a new fabric](#)

Select *9K-FABRIC* from the drop-down box since you are configuring border leaf *BL-1* in the fabric *9K-FABRIC*.

In the same page, click **Fabric Extension Settings** since the purpose of this task is to allow *9K-FABRIC* to communicate to external fabrics through ER-1 and ER-2. The **Fabric Extension** screen comes up.

Fabric Extension ✕

Inter-Fabric Connections Selected 0 / Total 0 ↻

+ ✕
Show Quick Filter ▼

Type	Source Fabric	Source Device	Source Interface	Destination Fabric	Destination Device	Destination Interface	Configuration	Status
No data available								

The **Inter-Fabric Connections** section lists previously created external connections from the border leafs in *9K-FABRIC*. This section is empty as this is the first time you are adding an external connection. Each row represents a physical or logical connection between a border leaf in *9K-FABRIC* and an external device in another fabric. For each connection, the source fabric, source device, source interface, destination fabric, destination device, and destination interface are listed along with the type of external connectivity.

To extend the fabric through VRF-Lite, you should first create an extension.

Extension from BL-1 to ER-1

Click on the + icon (at the top left part of the screen) to add a new external connection. The **Add Inter-Fabric Connection** screen appears.

Add Inter-Fabric Connections ✕

1 Fabric Interconnect

→

2 Define Variables

→

3 Preview & Deploy

● ● ●

*

Extension Type

VRF_LITE ▼

*

Base Template

BorderBase_v1 ▼

*

Extension Template

FabricSetup ▼

*

Source Fabric

9K-FABRIC

*

Destination Fabric

▼

*

Source Device

▼

*

Source Interface

▼

*

Destination Device

▼

*

Destination Interface

▼

① VRF_LITE: Set switch role - Border; MULTISITE: Set switch role - "Border Gateway"

Previous

Next

Save & Deploy

Cancel

By default, VRF_LITE is populated in the **Extension Type** field. Since the inter-fabric extension is through VRF Lite, retain this entry.

Base Template—By default, the *BorderBase_v1* base template is populated. This template represents a one-time configuration pushed to the border leaf BL-1.

Extension Template—*FabricSetup*, as the name indicates, represents the template that outputs the configuration required to setup the inter-fabric connection. As opposed to the configuration represented by the Base Template that is applied only once per border leaf, the Extension Template generated configuration is executed once for every inter-fabric connection.

These templates are auto-populated with corresponding pre-packaged default templates based on your selection.

Source Fabric—This field is pre-populated with *9K-FABRIC* since the VRF Lite connection is between BL-1 in *9K-FABRIC* and ER-1 in the *ext-fb1* fabric.

Destination Fabric—Choose *ext-fb1*.

Source Device and **Source Interface**—Choose *BL-1* as the source device and an Ethernet interface that needs to be connected to ER-1.

Destination Device and **Destination Interface**—Choose *ER-1* as the destination device and the Ethernet interface that connects to the border leaf BL-1.

Note that based on the selection of the source device and source interface, the destination information will be auto-populated based on CDP information if available. There is extra validation performed to ensure that the destination external device is indeed part of the destination fabric.

After filling up the Fabric Interconnect section, the screen looks like this.

Add Inter-Fabric Connections

1 Fabric Interconnect → 2 Define Variables → 3 Preview & Deploy

• • •

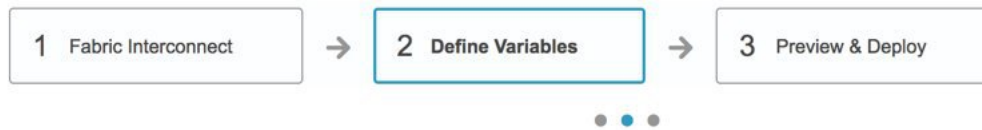
* Extension Type	VRF_LITE	▼
* Base Template	BorderBase_v1	▼
* Extension Template	FabricSetup	▼
* Source Fabric	9K-FABRIC	
* Destination Fabric	ext-fb1	▼
* Source Device	BL-1	▼
* Source Interface	Ethernet1/30	▼
* Destination Device	N7k1-ER-1	▼
* Destination Interface	Ethernet5/41	▼

ⓘ VRF_LITE: Set switch role - Border; MULTISITE: Set switch role - "Border Gateway"

Previous Next Save & Deploy Cancel

Click **Next** to go to the **Define Variables** section.

Add Inter-Fabric Connections



▼ Network Profile

General	
* IF_NAME	Ethernet1/30 ?
* IP_MASK	35.1.1.10/24 ?
* NEIGHBOR_IP	35.1.1.11 ?
* NEIGHBOR_ASN	3000 ?
* Extension Type	VRF_LITE ?

IF_NAME—In this field, the interface name is auto-populated from the previous step.

Interface IP_MASK—Fill up this field with the IP address of the BL-1 interface that connects to ER-1.

NEIGHBOR_IP—Fill up this field with the IP address of the ER-1 interface that connects to BL-1.

NEIGHBOR_ASN—In this field, the AS number of ER-1 will be auto-populated.

Now that all the information is filled in, click **Next** to go to the **Preview and Deploy** section. The two sections of the screen are shown in the 2 images:

Add Inter-Fabric Connections

1 Fabric Interconnect

→

2 Define Variables

→

3 Preview & Deploy

Switch:

Generated Configuration:

```
ip prefix-list default-route seq 5 permit 0.0.0.0/0 le 1
ip prefix-list host-route seq 5 permit 0.0.0.0/0 eq 32
route-map EXTCON-RMAP-FILTER deny 10
  match ip address prefix-list default-route
route-map EXTCON-RMAP-FILTER deny 20
  match ip address prefix-list host-route
route-map EXTCON-RMAP-FILTER permit 1000

ipv6 prefix-list default-route-v6 seq 5 permit 0::/0
ipv6 prefix-list host-route-v6 seq 5 permit 0::/0 eq 128
route-map EXTCON-RMAP-FILTER-V6 deny 10
  match ipv6 address prefix-list default-route-v6
route-map EXTCON-RMAP-FILTER-V6 deny 20
  match ip address prefix-list host-route-v6
route-map EXTCON-RMAP-FILTER-V6 permit 1000

interface Ethernet1/30
```

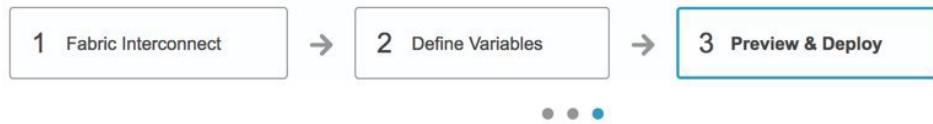
Previous

Next

Save & Deploy

Cancel

Add Inter-Fabric Connections

Switch:

Generated Configuration:

```

interface Ethernet1/30
  no switchport
  ip address 35.1.1.10/24
  no shutdown

router bgp 2000
  address-family ipv4 unicast
    redistribute direct route-map RMAP-REDIST-DIRECT
  neighbor 35.1.1.11 remote-as 3000
  update-source Ethernet1/30
  address-family ipv4 unicast
    next-hop-self
  
```

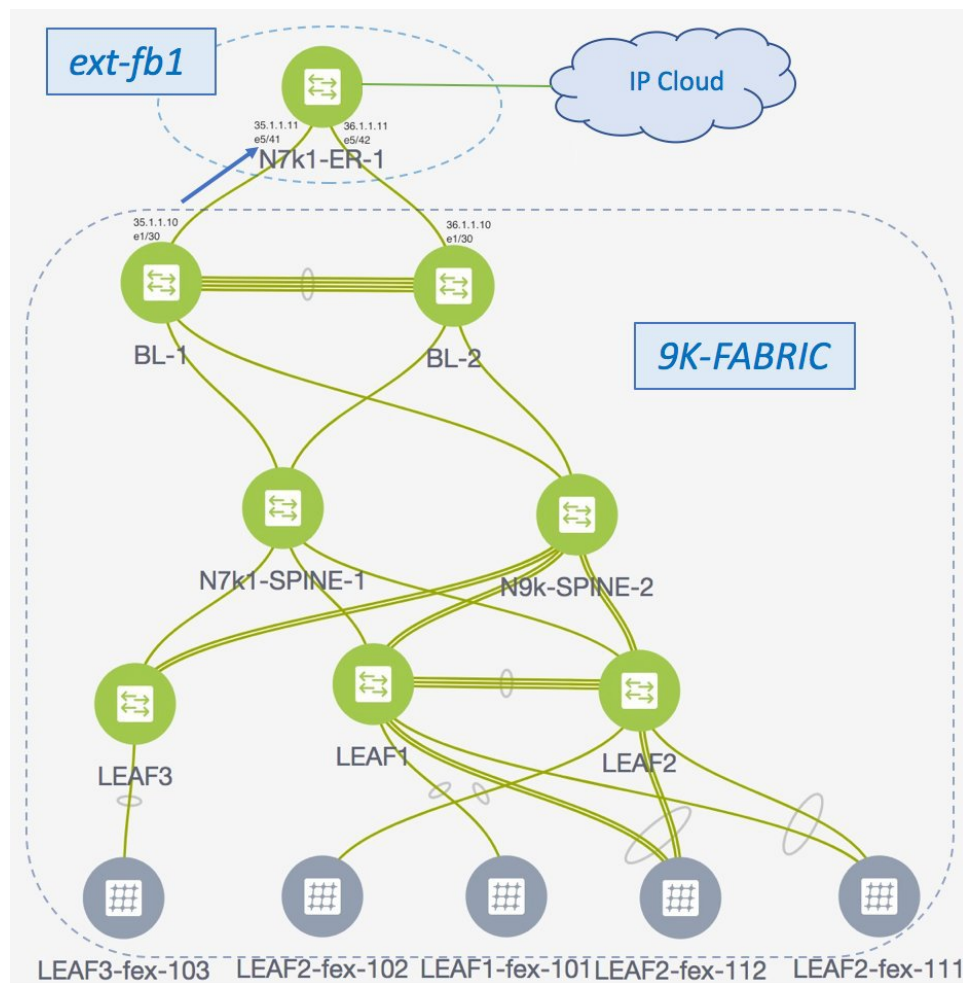
**Note**

In an Inter-Fabric connection, if one border leaf is connected to more than one ER or border leaf, the prefix-list and route map configurations are pushed only for the first fabric extension instance. Similarly when deleting fabric extension instances on a border leaf, the global configurations (prefix-list and route-maps) are removed from the border leaf only after the last fabric extension instance is deleted.

In this screen, you can preview the configuration that will be deployed to BL-1. Note that no configuration will be pushed to the external device (also known as edge router) itself.

A one-time configuration of route maps along with the parent interface connection is displayed. Also, you can see that BGP peering information in the default routing table is configured for BL-1. The corresponding BGP configurations should be enabled manually on ER-1.

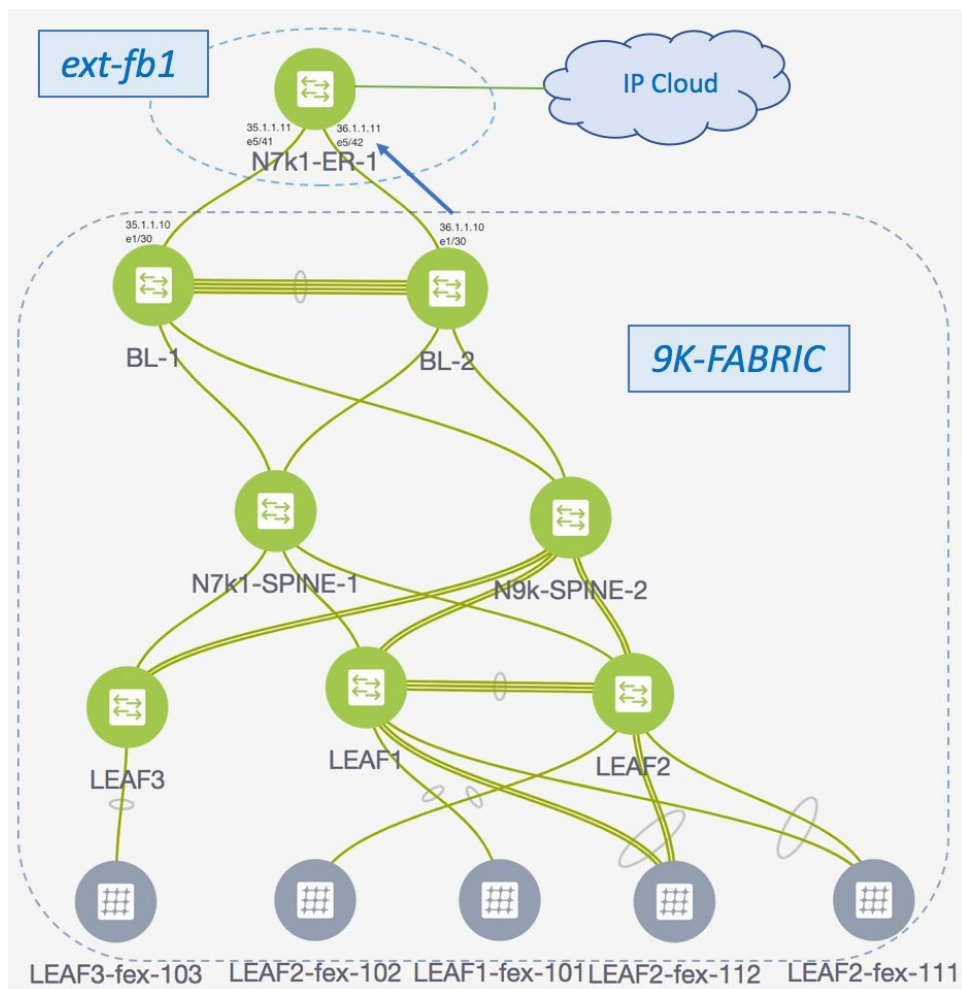
Click **Save and Deploy** to complete the task. This results in the configuration getting pushed to BL-1. The external connection will appear in the Fabric Extension screen.



At this stage, an extension is enabled from BL-1 to ER-1. Next, you need to enable an extension from BL-2 to ER-1 too, since BL-1 and BL-2 form a vPC border leaf pair.

VRF Lite Inter-Fabric Configuration (on BL-2 towards ER-1 in 9K-FABRIC)

As described in the previous section, enable an extension from BL-2 to ER-1. After configurations are pushed to BL-2, an extension will be enabled from BL-2 to ER-1, as shown in the screen shot.



A preview of the configurations on BL-2 is given in these 2 screen shots.

Add Inter-Fabric Connections



1 Fabric Interconnect



2 Define Variables



3 Preview & Deploy

Switch:

Generated Configuration:

```
ip prefix-list default-route seq 5 permit 0.0.0.0/0 le 1
ip prefix-list host-route seq 5 permit 0.0.0.0/0 eq 32
route-map EXTCON-RMAP-FILTER deny 10
  match ip address prefix-list default-route
route-map EXTCON-RMAP-FILTER deny 20
  match ip address prefix-list host-route
route-map EXTCON-RMAP-FILTER permit 1000

ipv6 prefix-list default-route-v6 seq 5 permit 0::/0
ipv6 prefix-list host-route-v6 seq 5 permit 0::/0 eq 128
route-map EXTCON-RMAP-FILTER-V6 deny 10
  match ipv6 address prefix-list default-route-v6
route-map EXTCON-RMAP-FILTER-V6 deny 20
  match ip address prefix-list host-route-v6
route-map EXTCON-RMAP-FILTER-V6 permit 1000

interface Ethernet1/30
```

Generated Config

Previous

Next

Save & Deploy

Cancel

Add Inter-Fabric Connections



1 Fabric Interconnect

→

2 Define Variables

→

3 Preview & Deploy

Switch: BL-2

Generated Configuration:

```

interface Ethernet1/30
  no switchport
  ip address 36.1.1.10/24
  no shutdown

router bgp 2000
  address-family ipv4 unicast
    redistribute direct route-map RMAP-REDIST-DIRECT
  neighbor 36.1.1.11 remote-as 3000
  update-source Ethernet1/30
  address-family ipv4 unicast
    next-hop-self

```

Previous

Next

Save & Deploy

Cancel

Edge Router Configurations

Apart from the DCNM provisioning on the border leafs in the two fabrics, you should also enable appropriate configurations on ER-1 for connectivity between the edge router and the border leafs. Sample ER-1 configuration is provided in the *Appendix* section for your reference.

What to do next—As noted earlier, the end-to-end VRF-Lite configurations through DCNM Top-Down provisioning includes these 2 steps:

- 1 VRF Lite inter-fabric configurations on the border leafs (BL-1, BL-2)
- 2 Deploying VRF Instances on the border leafs (BL-1, BL-2)

At this stage, the first step explanation is complete. The next section explains how VRF extension configuration is pushed to the border leafs.

Deploying VRF Instances on Border Leafs

Before you begin—In this scenario, we will deploy three VRF instances, *MyVRF-50016*, *MyVRF-50018*, and *MyVRF-50019* on the border leafs BL-1 and BL-2 in *9K-FABRIC*. You should ensure that you have already deployed the corresponding network(s) on the fabric's leaf switches.

After deploying one network on the leaf switches, you will have to deploy the associated VRF on the border leafs so that the network(s) can be extended from/to the *9K-FABRIC*. To know how to create a new fabric, network, and VRF, see LAN Fabric Provisioning section in the [DCNM user guide](#).

**Note**

VRF extension on vPC switch pairs can be either deployed or undeployed together on both the peers.

In the Select a Fabric page, click the **Continue** button at the top right part of the screen.

(After VRF Lite extensions are created, the DCNM GUI automatically takes you to the Select a Fabric page).

Select a Fabric

Choose a fabric with appropriate switches where you want the Top Down functionality to be enabled or create a new fabric.

9K-FABRIC

 [Fabric Extension Settings](#)

OR

[+ Create a new fabric](#)



Ensure that you select *9K-FABRIC* in the drop-down box and click **Continue** (at the top right part of the screen). After clicking **Continue**, the **Networks** page comes up.

Click on **VRF View**. The **VRFs** page comes up.

We will deploy 3 new VRF instances *MyVRF-50016*, *MyVRF-50018*, and *MyVRF-50019* on the border leafs. To do that, select the checkboxes (in the extreme left column).

Fabric Selection > Network Selection > Network Deployment > [Network View](#) | [Continue](#)

Fabric Selected: 9K-FABRIC

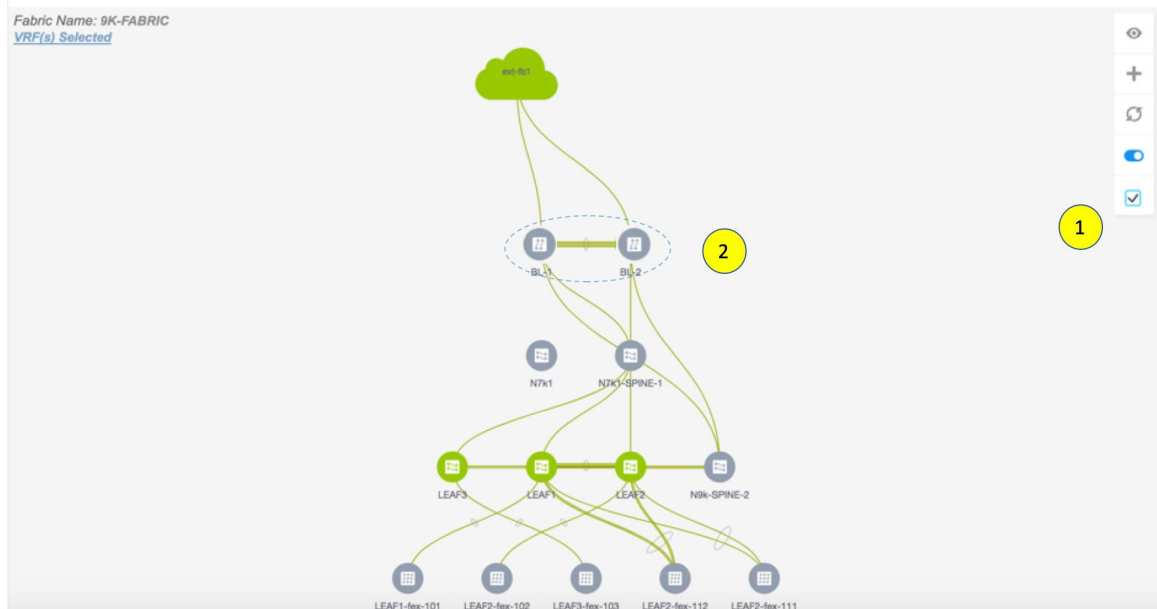
VRFs Selected 3 / Total 138  

<input type="checkbox"/>	VRF Name	VRF ID	Status
<input type="checkbox"/>	MyVRF_50000	50000	DEPLOYED
<input checked="" type="checkbox"/>	MyVRF_50016	50016	DEPLOYED
<input checked="" type="checkbox"/>	MyVRF_50018	50018	NA
<input checked="" type="checkbox"/>	MyVRF_50019	50019	NA
<input type="checkbox"/>	MyVRF_50500	50500	DEPLOYED

Click the **Continue** button at the top right part of the screen. The VRF Deployment page (Topology View) comes up. You can deploy VRFs on multiple switches simultaneously, but with the same role. So, deploy the selected VRFs on the border leafs.

**Note**

In the image, you can see that the VRF instances are deployed on the leaf switches (green color indicates deployed status). Note that the color code, and hence the deployment state on switches is contextual and specific to the selection. In this scenario, the deployed state only depicts that the 3 selected VRFs are deployed on leaf switches LEAF3, LEAF1 and LEAF2. It does not display information about other VRF deployment instances, if any.



Select the multi-select check box at the bottom of the panel of options available (Step 1 in the image) at the right part of the page.

Then, click your mouse (or track pad) and drag the cursor across BL-1 and BL-2 (Step 2 in the image). Note that this is a vPC switch pair of border leafs.

Immediately, the **Switches Deploy** screen (for VRFs) appears.

**Note**

For VRF extension on vPC switches, error messages will be displayed if only one border leaf is selected for VRF Lite extension, or if both the switches are selected for extension but only one (on no) border leaf extension is selected with extension details. Error messages:

Switches Deploy

Deploy Options:

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

Switch	VLAN	Extend	Status
<input checked="" type="checkbox"/> BL-1	2002	VRF_LITE	NA
<input checked="" type="checkbox"/> BL-2	2002	NONE	NA

☒ **Extension Details**

Switch	Type	IF_NAME	DOT1Q_ID	IP_MASK
<input type="checkbox"/> BL-1	VRF_LITE	Ethernet1/30	4	35.1.1.10/24

Save

Warning: You have edited a VPC device BL-1. Edit the Extension-type of the Paired Device to match its peer. **OK**

Switches Deploy

Deploy Options:

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

Switch	VLAN	Extend	Status
<input checked="" type="checkbox"/> BL-1	2002	VRF_LITE	NA
<input checked="" type="checkbox"/> BL-2	2002	VRF_LITE	NA

☒ **Extension Details**

Switch	Type	IF_NAME	DOT1Q_ID	IP_MASK
<input checked="" type="checkbox"/> BL-1	VRF_LITE	Ethernet1/30	4	35.1.1.10/24
<input type="checkbox"/> BL-2	VRF_LITE	Ethernet1/30	4	36.1.1.10/24

Save

In the VRF extension on vPC switch pairs scenario, a tab is displayed for each VRF.

Click the checkbox next to the **Switch** column. Both the border leaf check boxes will be selected automatically and the **Extension Details** section will appear at the bottom part of the screen.

In the **Extension Details** section, select the **Switch** checkbox (or ensure that you select the check box in each row). This is how the screen looks when you select both the switches and the Extension Details section.

Switches Deploy

Fabric Name: 9K-FABRIC

MyVRF_50016 MyVRF_50018 MyVRF_50019

Deploy Options:

① Select the row and click on the cell to edit and save changes

<input type="checkbox"/>	Switch	▲	VLAN	Extend	Status
<input checked="" type="checkbox"/>	BL-1		2001	VRF_LITE	DEPLOYMENT PENDING
<input checked="" type="checkbox"/>	BL-2		2001	VRF_LITE	DEPLOYMENT PENDING

☒ Extension Details

<input type="checkbox"/>	Switch	▲	Type	IF_NAME	DOT1Q_ID	IP_MASK
<input checked="" type="checkbox"/>	BL-1		VRF_LITE	Ethernet1/30	3	35.1.1.10/24
<input checked="" type="checkbox"/>	BL-2		VRF_LITE	Ethernet1/30	3	36.1.1.10/24

OK

Cancel

Now, select the MyVRF_50018 and MyVRF_50019 and similarly update relevant parameters.

Switches Deploy

Fabric Name: 9K-FABRIC

MyVRF_50016 MyVRF_50018 MyVRF_50019

Deploy Options:

① Select the row and click on the cell to edit and save changes

<input type="checkbox"/>	Switch	▲	VLAN	Extend	Status
<input checked="" type="checkbox"/>	BL-1		2002	VRF_LITE	DEPLOYMENT PENDING
<input checked="" type="checkbox"/>	BL-2		2002	VRF_LITE	DEPLOYMENT PENDING

☒ Extension Details

<input type="checkbox"/>	Switch	▲	Type	IF_NAME	DOT1Q_ID	IP_MASK
<input checked="" type="checkbox"/>	BL-1		VRF_LITE	Ethernet1/30	4	35.1.1.10/24
<input checked="" type="checkbox"/>	BL-2		VRF_LITE	Ethernet1/30	4	36.1.1.10/24

Deploying VRF Instances on Border Leafs

Switches Deploy

Fabric Name: 9K-FABRIC

MyVRF_50016 MyVRF_50018 MyVRF_50019

Deploy Options:

① Select the row and click on the cell to edit and save changes

<input type="checkbox"/>	Switch	▲	VLAN	Extend	Status
<input checked="" type="checkbox"/>	BL-1		2003	VRF_LITE	DEPLOYMENT PENDING
<input checked="" type="checkbox"/>	BL-2		2003	VRF_LITE	DEPLOYMENT PENDING

☒ Extension Details

<input type="checkbox"/>	Switch	▲	Type	IF_NAME	DOT1Q_ID	IP_MASK
<input checked="" type="checkbox"/>	BL-1		VRF_LITE	Ethernet1/30	5	35.1.1.10/24
<input checked="" type="checkbox"/>	BL-2		VRF_LITE	Ethernet1/30	5	36.1.1.10/24

Click the **Save** button at the bottom right part of the Switches Deploy screen to save all VRFs' configurations on the selected switches. The VRF Deployment screen (Topology view) appears.

BL-1 and BL-2 icons will be displayed in blue color, indicating that a deployment is pending. If you want to check your configurations, click on the Preview (eye) icon.

The screenshot displays the Cisco DCNM Web Client interface. On the left, a 'Preview Configuration' window is open, showing the generated configuration for a selected switch (BL-1) and VRF (MyVRF_50016). The configuration includes BGP settings, route maps, and interface configurations for Ethernet1/30.3. On the right, the 'Network Deployment' topology view is visible, showing a hierarchical network structure with a cloud icon at the top, followed by BL-1 and BL-2 icons, and then a series of leaf and spine switches (LEAF3, LEAF2, N7K1, N7K2, N7K3, N7K4, N7K5, N7K6, N7K7, N7K8, N7K9, N7K10, N7K11, N7K12, N7K13, N7K14, N7K15, N7K16, N7K17, N7K18, N7K19, N7K20, N7K21, N7K22, N7K23, N7K24, N7K25, N7K26, N7K27, N7K28, N7K29, N7K30, N7K31, N7K32, N7K33, N7K34, N7K35, N7K36, N7K37, N7K38, N7K39, N7K40, N7K41, N7K42, N7K43, N7K44, N7K45, N7K46, N7K47, N7K48, N7K49, N7K50, N7K51, N7K52, N7K53, N7K54, N7K55, N7K56, N7K57, N7K58, N7K59, N7K60, N7K61, N7K62, N7K63, N7K64, N7K65, N7K66, N7K67, N7K68, N7K69, N7K70, N7K71, N7K72, N7K73, N7K74, N7K75, N7K76, N7K77, N7K78, N7K79, N7K80, N7K81, N7K82, N7K83, N7K84, N7K85, N7K86, N7K87, N7K88, N7K89, N7K90, N7K91, N7K92, N7K93, N7K94, N7K95, N7K96, N7K97, N7K98, N7K99, N7K100, N7K101, N7K102, N7K103, N7K104, N7K105, N7K106, N7K107, N7K108, N7K109, N7K110, 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N7K1431, N7K1432, N7K1433, N7K1434, N7K1435, N7K1436, N7K1437, N7K1438, N7K1439, N7K1440, N7K1441, N7K1442, N7K1443, N7K1444, N7K1445, N7K1446, N7K1447, N7K1448, N7K1449, N7K1450, N7K1451, N7K1452, N7K1453, N7K1454, N7K1455, N7K1456, N7K1457, N7K1458, N7K1459, N7K1460, N7K1461, N7K1462, N7K1463, N7K1464, N7K1465, N7K1466, N7K1467, N7K1468, N7K1469, N7K1470, N7K1471, N7K1472, N7K1473, N7K1474, N7K1475, N7K1476, N7K1477, N7K1478, N7K1479, N7K1480, N7K1481, N7K1482, N7K1483, N7K1484, N7K1485, N7K1486, N7K1487, N7K1488, N7K1489, N7K1490, N7K1491, N7K1492, N7K1493, N7K1494, N7K1495, N7K1496, N7K1497, N7K1498, N7K1499, N7K1500, N7K1501, N7K1502, N7K1503, N7K1504, N7K1505, N7K1506, N7K1507, N7K1508, N7K1509, N7K1510, N7K1511, N7K1512, N7K1513, N7K1514, N7K1515, N7K1516, N7K1517, N7K1518, N7K1519, N7K1520, N7K1521, N7K1522, N7K1523, N7K1524, N7K1525, N7K1526, N7K1527, N7K1528, N7K1529, N7K1530, N7K1531, N7K1532, N7K1533, N7K1534, N7K1535, N7K1536, N7K1537, N7K1538, N7K1539, N7K1540, N7K1541, N7K1542, N7K1543, N7K1544, N7K1545, N7K1546, N7K1547, N7K1548, N

Preview Configuration

Select a Switch:

BL-2

Select a VRF

MyVRF_50019

Generated Configuration:

```

configure profile 9K-FABRIC-Default_VRF_Extension-50019
vlan 2003
  vn-segment 50019
  interface vlan 2003
    vrf member MyVRF_50019
    ip forward
    ipv6 forward
    no ip redirects
    no ipv6 redirects
    mtu 9216
    no shut

interface nve 1
  member vni 50019 associate-vrf

vrf context MyVRF_50019
  vni 50019
  rd auto
  address-family ipv4 unicast
    route-target both auto
    route-target both auto evpn

    ip route 0/0 36.1.1.11
  address-family ipv6 unicast
    route-target both auto
    route-target both auto evpn

    ipv6 route 0::/0 36.1.1.1::2

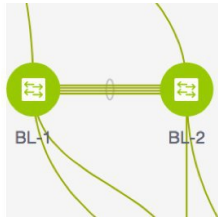
```

Generated Co

You can select a switch and a VRF to view corresponding configurations. Configuration details of MyVRF_5016 that is pushed to BL-1 are included in the *Appendix* section.

After you verify that the configurations that are generated from the profiles are correct for the selected switches, click the **Deploy** button (on the top right part of the Topology View screen) to deploy the MyVRF_50016, MyVRF_50018, and MyVRF_50019 VRF configurations on BL-1 and BL-2.

DCNM shows the deployment status in the topology by highlighting the switch icons with different colors, yellow for *In Progress*, green for *Deployed*, and red for *Error* status.



From the snapshot, you can see that the MyVRF_50016, MyVRF_50018, and MyVRF_50019 VRF configurations have been implemented on the vPC border leafs of the *9K-FABRIC*. You can also click the **Detailed View** option to see the status.

Fabric Selection > Network Selection > Network Deployment >			Topology View	
Fabric Name: 9K-FABRIC VRF(s) Selected			Selected 0 / Total 9	
<input type="checkbox"/>	Deploy	Preview	History	Show All
<input type="checkbox"/>	Name	Switch	Ports	Status
<input type="checkbox"/>	MyVRF_50016	BL-1		DEPLOYED
<input type="checkbox"/>	MyVRF_50016	BL-2		DEPLOYED
<input type="checkbox"/>	MyVRF_50016	LEAF1		DEPLOYED
<input type="checkbox"/>	MyVRF_50016	LEAF2		DEPLOYED
<input type="checkbox"/>	MyVRF_50016	LEAF3		DEPLOYED
<input type="checkbox"/>	MyVRF_50018	BL-1		DEPLOYED
<input type="checkbox"/>	MyVRF_50018	BL-2		DEPLOYED
<input type="checkbox"/>	MyVRF_50019	BL-1		DEPLOYED
<input type="checkbox"/>	MyVRF_50019	BL-2		DEPLOYED

After configurations in *9K-FABRIC* are complete, you should enable configurations in Fabric2 too.

Resource Manager

Resource Manager gives information of all the resources allocated/deployed on each device per fabric. This includes the network VLANs, VRF VLANs, and the sub interface dot1q identifiers employed for the VRF Lite extension. Once a VRF is undeployed, the associated resources on the Resource Manager will be unallocated/updated immediately.

To access the Resource Manager page, click **Configure > LAN Fabric Provisioning > Resource Manager**

As we can see in the screenshot below, after deploying VRF instances *MyVRF_50016*, *MyVRF_50018* and *MyVRF_50019* on the vPC border leafs, the Resource Manager has the associated VLAN-VRF mapping displayed.

Configure / LAN Fabric Provisioning / Resource Manager

Fabrics: 9K-FABRIC Switches: BL-1

Resource Objects Selected 0 / Total 4

Show All

<input type="checkbox"/>	Scope Type ▲	Allocated ID	Allocated To	Resource Type	Is Allocated?	Allocated On
<input type="checkbox"/>	Device	2002	MyVRF_50018	TOP_DOWN_VRF_VLAN	Yes	2/14/2018, 4:18:52 PM
<input type="checkbox"/>	Device	2000	MyVRF_50000	TOP_DOWN_VRF_VLAN	Yes	1/31/2018, 12:59:06 AM
<input type="checkbox"/>	Device	2001	MyVRF_50016	TOP_DOWN_VRF_VLAN	Yes	2/6/2018, 2:27:46 PM
<input type="checkbox"/>	Device	2003	MyVRF_50019	TOP_DOWN_VRF_VLAN	Yes	2/14/2018, 4:20:16 PM

The VRF instances MyVRF_50016, MyVRF_50018, and MyVRF_50019 are deployed on BL-1, with their corresponding VLANs 2001, 2002, and 2003.

Undeploying VRF Instances on the Border Leafs

VRFs can be deployed/undeployed on the border leafs. The following steps will demonstrate undeployment of VRFs on the vPC border leafs.

For *9K-FABRIC*, navigate to the **Networks** page and click **VRF View**. The VRFs page will be displayed.

Select MyVRF-50018 and MyVRF-50019 and click **Continue**.

Fabric Selection > Network Selection > Network Deployment > Network View Continue

Fabric Selected: 9K-FABRIC

VRFs Selected 2 / Total 138

☐ ☐ ☐

Show All

<input type="checkbox"/>	VRF Name ▲	VRF ID	Status
<input type="checkbox"/>	MyVRF_50000	50000	DEPLOYED
<input type="checkbox"/>	MyVRF_50016	50016	DEPLOYED
<input checked="" type="checkbox"/>	MyVRF_50018	50018	DEPLOYED
<input checked="" type="checkbox"/>	MyVRF_50019	50019	DEPLOYED
<input type="checkbox"/>	MyVRF_50500	50500	DEPLOYED
<input type="checkbox"/>	VRF 50011	50011	UNDEPLOYED

The Topology View page is displayed. Follow similar steps as described in the Deploying VRFs section on the vPC border leafs.

Select BL-1 and BL-2 switches in the topology page. The **Switches Deploy** screen will be displayed.

A tab is displayed for each VRF. MyVRF_50018 is currently selected in the below screenshot.

Undeploying VRF Instances on the Border Leafs

Switches Deploy

Fabric Name: 9K-FABRIC

MyVRF_50018 MyVRF_50019

Deploy Options:

① Select the row and click on the cell to edit and save changes

<input type="checkbox"/>	Switch	▲	VLAN	Extend	Status
<input checked="" type="checkbox"/>	BL-1		2002	VRF_LITE	DEPLOYED
<input checked="" type="checkbox"/>	BL-2		2002	VRF_LITE	DEPLOYED

☒ Extension Details

<input type="checkbox"/>	Switch	▲	Type	IF_NAME	DOT1Q_ID	IP_MASK
<input checked="" type="checkbox"/>	BL-1		VRF_LITE	Ethernet1/30	4	35.1.1.10/24
<input checked="" type="checkbox"/>	BL-2		VRF_LITE	Ethernet1/30	4	36.1.1.10/24

Double click the checkbox next to the Switch column or uncheck the check box next to BL-1 and BL-2. Both of the check boxes will be de-selected and the Extension Details section will disappear at the bottom part of the screen.

Switches Deploy

Fabric Name: 9K-FABRIC

MyVRF_50018 MyVRF_50019

Deploy Options:

① Select the row and click on the cell to edit and save changes

<input type="checkbox"/>	Switch	▲	VLAN	Extend	Status
<input type="checkbox"/>	BL-1		2002	VRF_LITE	DEPLOYED
<input type="checkbox"/>	BL-2		2002	VRF_LITE	DEPLOYED

Save

Now, select the MyVRF_50019 and update similarly.

Switches Deploy

Fabric Name: 9K-FABRIC

MyVRF_50018 MyVRF_50019

Deploy Options:

① Select the row and click on the cell to edit and save changes

<input type="checkbox"/>	Switch	VLAN	Extend	Status
<input type="checkbox"/>	BL-1	2003	VRF_LITE	DEPLOYED
<input type="checkbox"/>	BL-2	2003	VRF_LITE	DEPLOYED

Status: Sortable

Save

Click on the **Save** button at the bottom right part of the Switches Deploy screen to save undeployment of all VRFs configurations on the selected switches. The VRF Deployment screen (Topology view) appears.

Similar to the deployment process, the BL-1 and BL-2 switch icons will be displayed in blue color, indicating pending undeployment. You can preview the information by clicking the Preview (eye) icon.

The configurations for MyVRF_50018 on BL-1 switch will be removed as displayed in the following screen. You can select a switch and VRF to view corresponding configurations.

Preview Configuration

Select a Switch:

BL-1

Select a VRF

MyVRF_50018

Generated Configuration:

```
configure terminal
no apply profile 9K-FABRIC-Default_VRF_Extension-50018
no configure profile 9K-FABRIC-Default_VRF_Extension-50018
```

After you verify that the configuration profiles that will be removed are correct for the selected switches, click the **Deploy** button (on the top right part of the screen) to undeploy the MyVRF_50018 and MyVRF_50019 configurations on BL-1 and BL-2.

Resource Manager Update

As we can see in the screenshot below, after undeploying the VRFs *MyVRF_50018* and *MyVRF_50019* on the vPC border leafs, the Resource Manager has the associated VLAN-VRF mapping removed/unallocated.

Configure / LAN Fabric Provisioning / Resource Manager

Fabrics: 9K-FABRIC Switches: BL-1

Resource Objects Selected 0 / Total 2

Show All

<input type="checkbox"/>	Scope Type ▲	Allocated ID	Allocated To	Resource Type	Is Allocated?	Allocated On
<input type="checkbox"/>	Device	2000	MyVRF_50000	TOP_DOWN_VRF_VLAN	Yes	1/31/2018, 12:59:06 AM
<input type="checkbox"/>	Device	2001	MyVRF_50016	TOP_DOWN_VRF_VLAN	Yes	2/6/2018, 2:27:46 PM

In the screenshot, it shows that MyVRF_50018 and MyVRF_50019 that was deployed on BL-1 with VLAN 2002 and 2003 is now removed/unallocated.

Configure / LAN Fabric Provisioning / Resource Manager

Fabrics: 9K-FABRIC Switches: BL-2

Resource Objects Selected 0 / Total 2

Show All

<input type="checkbox"/>	Scope Type ▲	Allocated ID	Allocated To	Resource Type	Is Allocated?	Allocated On
<input type="checkbox"/>	Device	2000	MyVRF_50000	TOP_DOWN_VRF_VLAN	Yes	1/31/2018, 12:59:06 AM
<input type="checkbox"/>	Device	2001	MyVRF_50016	TOP_DOWN_VRF_VLAN	Yes	2/6/2018, 2:27:46 PM

Remove VRF Lite Inter-fabric configuration on vPC border leafs

VRF Lite inter-fabric configuration can also be removed in a similar manner as long as there are no VRF extensions enabled over that connection. The following steps will demonstrate removal of BL-1 and BL-2 VRF Lite inter-fabric connections.

Follow similar steps as described in the VRF Lite inter-fabric configuration for BL-1 in *9K-FABRIC*.

From the Cisco DCNM Web Client, choose **Configure > LAN Fabric Provisioning > Network Deployment**.

Select *9K-FABRIC* from the drop-down box and click **Fabric Extension Settings**. The **Fabric Extension** screen comes up.

Fabric Extension

Inter-Fabric Connections

Selected 0 / Total 2

Type	Source Fabric	Source Device	Source Interface	Destination Fa...	Destination De...	Destination Int...	Configuration	Status
<input type="radio"/> VRF_LITE	9K-FABRIC	BL-1	Ethernet1/30	ext-fb1	N7k1-ER-1	Ethernet5/41	View Config	DEPLOYED
<input type="radio"/> VRF_LITE	9K-FABRIC	BL-2	Ethernet1/30	ext-fb1	N7k1-ER-1	Ethernet5/42	View Config	DEPLOYED

Click on the radio button next to VRF_LITE in the first row with Source Device *BL-1*.

Then, click the **X** button to delete this entry.

Fabric Extension

Inter-Fabric Connections

Selected 1 / Total 2

Type	Source Fabric	Source Device	Source Interface	Destination Fa...	Destination De...	Destination Int...	Configuration	Status
<input checked="" type="radio"/> VRF_LITE	9K-FABRIC	BL-1	Ethernet1/30	ext-fb1	N7k1-ER-1	Ethernet5/41	View Config	DEPLOYMENT
<input type="radio"/> VRF_LITE	9K-FABRIC	BL-2	Ethernet1/30	ext-fb1	N7k1-ER-1	Ethernet5/42	View Config	DEPLOYED

The next screen shows that the BL-1 inter-fabric connection is removed from the fabric extension list.

Fabric Extension

Inter-Fabric Connections

Selected 0 / Total 1

Type	Source Fabric	Source Device	Source Interface	Destination Fa...	Destination De...	Destination Int...	Configuration	Status
<input type="radio"/> VRF_LITE	9K-FABRIC	BL-2	Ethernet1/30	ext-fb1	N7k1-ER-1	Ethernet5/42	View Config	DEPLOYED

Similarly, select BL-2 and click **X** to remove the BL-2 inter-fabric connection. After both BL-1 and BL-2 VRF Lite inter-fabric connections are removed, the Fabric Extension screen will have no entries.

Fabric Extension

Inter-Fabric Connections Selected 0 / Total 0

Show Quick Filter

Type	Source Fabric	Source Device	Source Interface	Destination Fa...	Destination De...	Destination Int...	Configuration	Status
No data available								

Additional References

Document Title and Link	Document Description
Cisco Programmable Fabric with VXLAN BGP EVPN Configuration Guide	This document explains external connectivity using VRF Lite.

Appendix

Edge Router Configurations

ER-1 Configuration Example for vPC Border Leafs—The following configurations are enabled on ER-1 for inter-fabric connections to BL-1 and BL-2 (vPC border leafs), and reproduced here for reference.



Note

switch(config)# refers to the global configuration mode. To access this mode, type the following on your switch: **switch# configure terminal**.

```
switch(config)#

interface Ethernet5/41    ## ER-1 interface to BL-1 (vpc BL peer)
 ip address 35.1.1.11/24
 no shutdown

interface Ethernet5/42    ## ER-1 interface to BL-2 (vpc BL peer)
 ip address 36.1.1.11/24
 no shutdown

router bgp 3000           ## eBGP sessions
 neighbor 35.1.1.10 remote-as 2000  ###Peering to BL-1 (eBGP)
  update-source Ethernet5/41
  address-family ipv4 unicast
  next-hop-self
```

```

neighbor 36.1.1.10 remote-as 2000  ###Peering to BL-2 (eBGP)
update-source Ethernet5/42
address-family ipv4 unicast
next-hop-self

```

The following configurations are manually enabled on ER-1 for VRF extension to the vPC border leafs:

```

configure profile 9K-FABRIC-Default_VRF_Extension-50016
vrf context MyVRF_50016
vni 50016
address-family ipv4 unicast
route-target import 65000:3
route-target export 65000:3
rd 3000:3
interface Ethernet5/41.3
encapsulation dot1Q 3
vrf member MyVRF_50016
ip address 35.1.1.11/24
ipv6 address 35:1:1:1::2/64
no shutdown
interface Ethernet5/42.3
encapsulation dot1Q 3
vrf member MyVRF_50016
ip address 36.1.1.11/24
ipv6 address 36:1:1:1::2/64
no shutdown
router bgp 3000
vrf MyVRF_50016
address-family ipv4 unicast
maximum-paths ibgp 2
neighbor 35.1.1.10 remote-as 2000
address-family ipv4 unicast
send-community both
neighbor 36.1.1.10 remote-as 2000
address-family ipv4 unicast
send-community both

```

Configurations Pushed to BL-1 Through DCNM:

VRF extension pushed to BL-1 through DCNM

```

### Route map
ip prefix-list default-route seq 5 permit 0.0.0.0/0 le 1
ip prefix-list host-route seq 5 permit 0.0.0.0/0 eq 32
route-map EXTCON-RMAP-FILTER deny 10
match ip address prefix-list default-route
route-map EXTCON-RMAP-FILTER deny 20
match ip address prefix-list host-route
route-map EXTCON-RMAP-FILTER permit 1000

ipv6 prefix-list default-route-v6 seq 5 permit 0::/0
ipv6 prefix-list host-route-v6 seq 5 permit 0::/0 eq 128
route-map EXTCON-RMAP-FILTER-V6 deny 10
match ipv6 address prefix-list default-route-v6
route-map EXTCON-RMAP-FILTER-V6 deny 20
match ip address prefix-list host-route-v6
route-map EXTCON-RMAP-FILTER-V6 permit 1000

### VRF-Lite interface of BL-1
interface Ethernet1/30
no switchport
ip address 35.1.1.10/24
no shutdown

### External BGP (eBGP) session of BL-1
router bgp 2000
address-family ipv4 unicast
redistribute direct route-map RMAP-REDIST-DIRECT
neighbor 35.1.1.11 remote-as 3000

```

```

update-source Ethernet1/30
address-family ipv4 unicast
next-hop-self

```

The following configuration profile is pushed through DCNM when MyVRF_50016 is deployed on BL-1:

```

configure profile 9K-FABRIC-Default_VRF_Extension-50016
vlan 2001
  vn-segment 50016
  interface vlan 2001
    vrf member MyVRF_50016
    ip forward
    ipv6 forward
    no ip redirects
    no ipv6 redirects
    mtu 9216
    no shut

interface nve 1
  member vni 50016 associate-vrf

vrf context MyVRF_50016
  vni 50016
  rd auto
  address-family ipv4 unicast
    route-target both auto
    route-target both auto evpn
    ip route 0/0 35.1.1.11
  address-family ipv6 unicast
    route-target both auto
    route-target both auto evpn
    ipv6 route 0::/0 35.1.1.1.2

router bgp 2000
  vrf MyVRF_50016 ## bgp VRF configured
  address-family ipv4 unicast
    advertise l2vpn evpn
    redistribute direct route-map FABRIC-RMAP-REDIST-SUBNET
    maximum-paths ibgp 2
    network 0/0
  address-family ipv6 unicast
    advertise l2vpn evpn
    redistribute direct route-map FABRIC-RMAP-REDIST-SUBNET
    maximum-paths ibgp 2
    network 0::/0
  neighbor 35.1.1.11 remote-as 3000
  address-family ipv4 unicast
    send-community both
    route-map EXTCON-RMAP-FILTER out
  neighbor 35.1.1.1.2 remote-as 3000
  address-family ipv6 unicast
    send-community both
    route-map EXTCON-RMAP-FILTER-V6 out

interface Ethernet1/30.3 #sub interface member of VRF deployed
  encapsulation dot1q 3
  vrf member MyVRF_50016
  ip address 35.1.1.10/24
  ipv6 address 35:1:1:1::1/64
  no shutdown

configure terminal
  apply profile 9K-FABRIC-Default_VRF_Extension-50016

```