

Configuring ToR Switches, Release 12.2.2/12.2.3

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New and Changed Information

The following table provides an overview of the significant changes up to this current release. The table does not provide an exhaustive list of all changes or of the new features up to this release.

Release Version	Feature	Description
NDFC release 12.2.2	Support for assigning a vPC/port-channel ID range for leaf-ToR pairings and for specifying a custom vPC/port-channel ID	With this feature, you can assign one virtual port channel (vPC)/port-channel ID range for leaf-ToR pairings and also specify a custom vPC/port-channel ID in a Data Center VXLAN EVPN fabric. Beginning with NDFC 12.2.2, NDFC added an **Action > Edit Pairing** option on the **TOR Pairing** page for editing leaf and ToR vPC/port-channel IDs. For more information, see Configuring a Specific vPC/Port-Channel ID Range for Leaf-ToR Pairing.

Configuring ToR Switches and Deploying Networks in Data Center VXLAN EVPN Fabrics

Overview

Layer 2 Top-of-Rack (ToRs) are considered as replacements for FEXs. In earlier NDFC releases, you can add the Layer 2 ToR switches in an external fabric, and connect them to the leaf switches in a Data Center VXLAN EVPN fabric. The network overlay attachments were managed from the VXLAN EVPN Multi-Site domain as both Data Center VXLAN EVPN fabrics with spine/leaf and external fabrics with ToRs were added to a VXLAN EVPN Multi-Site domain. From Cisco NDFC Release 12.1.1e, you can add Layer 2 ToR devices in the same fabric as in a spine/leaf Data Center VXLAN EVPN fabric. This allows a single configuration point for deploying and extending networks for a VXLAN fabric topology with Layer 2 ToRs.



It is not recommended to have a combination of FEX and ToRs in leaf switches due to a scale limitation.

You can physically connect a Layer 2 ToR in one of the following ways:

- Connected to a leaf through a port-channel
- Connected to a vPC pair of leafs through a vPC
- Connected to one of the leafs in a vPC pair through a port-channel

You can configure a pair of Layer 2 ToRs in a vPC. A ToR vPC pair can only be connected to a leaf vPC pair through back-to-back vPC (also known as a double-sided vPC).

Guidelines for Configuring ToR Switches in Data Center VXLAN EVPN Fabrics

You add ToR devices to a Data Center VXLAN EVPN fabric in the same way as all other devices.

- ToR role must be set on ToR devices before you perform a **Recalculate and Deploy** operation.
- Perform a **Recalculate and Deploy** after any change of ToR pairings/unpairings.
- ToRs must be physically connected to the intended parent leaf switches.
- vPC pairing should be done before a leaf-ToR pairing/unpairing.
- ToR pairing/unpairing can be done on an individual leaf, or a leaf vPC pair.
- Network-overlay association for ToR switches are managed from their parent leaf(s).
- ToR ports are shown as additional ports under a leaf.
- NDFC handles all intermediate configurations transparently.
- Deletion of a leaf will also delete all associated child ToR devices.
- A leaf can be connected to many ToRs, but a ToR can be connected to only one leaf or leaf-vPC pair.

Limitations for Configuring ToR Switches in Data Center VXLAN EVPN Fabrics

- Interface groups on Layer 2 ToRs are not supported.
- Brownfield import on Layer 2 ToRs is not supported.

Configuring ToR Switches in Data Center VXLAN EVPN Fabrics

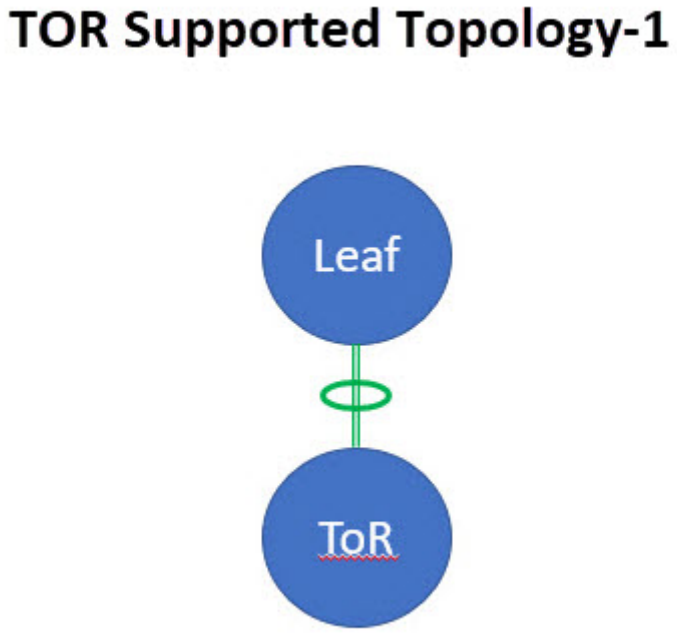
On the **Edit Fabric** page, click the **Advanced** tab and specify the applicable fabric settings.

Field	Description
Spanning Tree Root Bridge Protocol	Choose the protocol from the drop-down list for configuring a root bridge. The available protocols are: - **rpvst** - Rapid Per-VLAN Spanning Tree - **mst** - Multiple Spanning Tree - **unmanaged** (default) - STP root is not managed by NDFC. It is recommended to use the **mst** protocol for a Layer 2 ToR.
Spanning Tree VLAN Range	Specify the VLAN range. The default value is 1 - 3967.
MST Instance Range	Specify the MST instance range. The default value is 0.
Spanning Tree Bridge Priority	Specify the bridge priority for the spanning tree in increments of 4096.

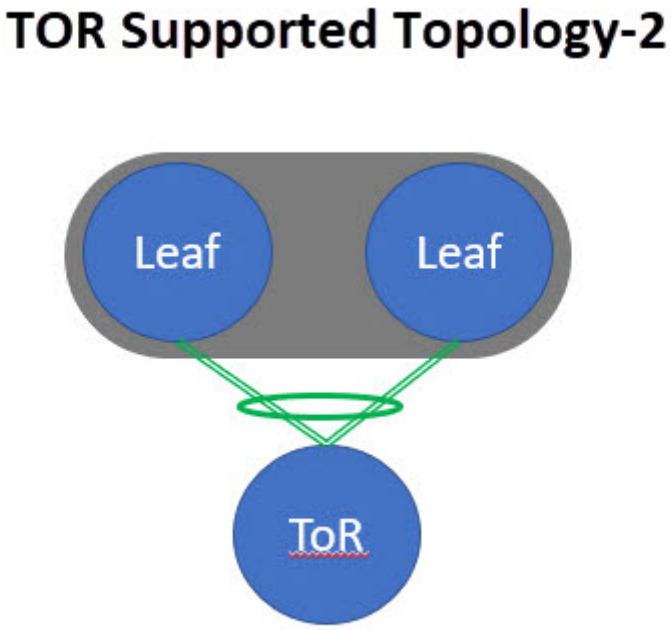
Supported Topologies for ToR Switches

The following topologies with ToR switches are supported:

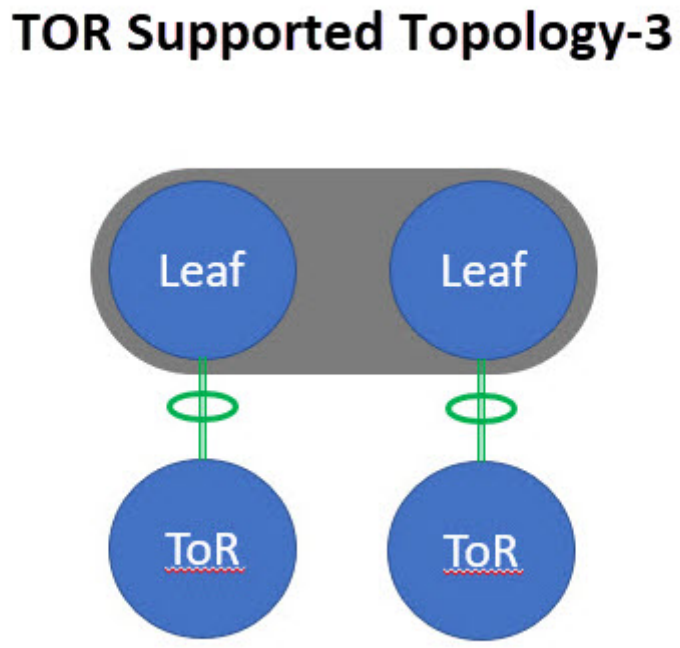
Only Cisco Nexus 9000 series switches are supported as ToR switches.



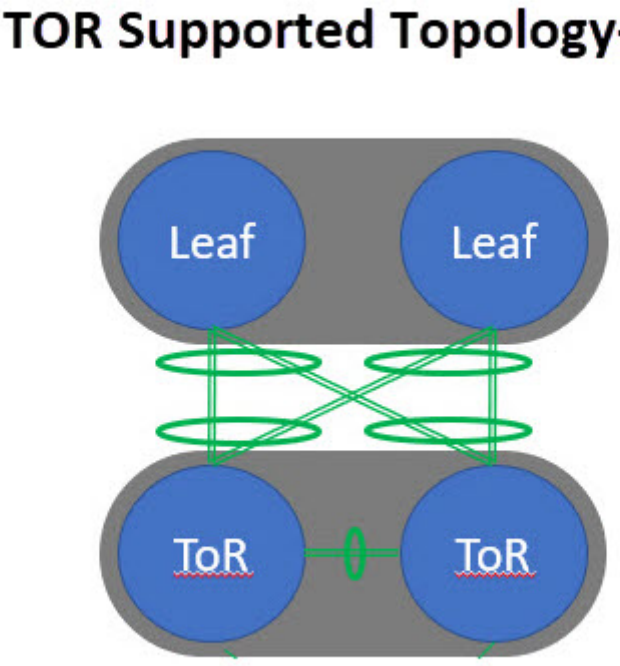
Topology-1: ToR switch with port channel directly connected to the leaf switch



Topology-2: ToR switch connected to leaf switches in a vPC pair



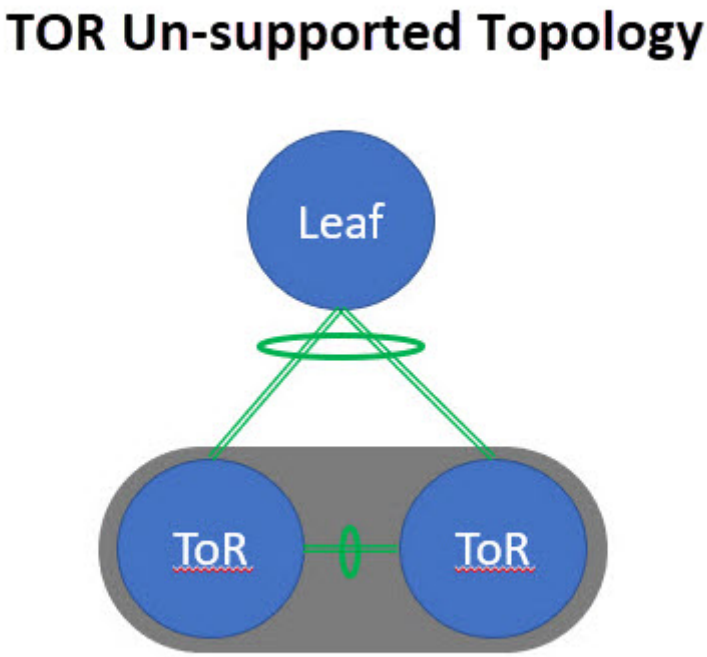
Topology-3: ToR switches with port channels connected individually to leaf switches in a vPC pair



Topology-4: ToR switches with back-to-back vPC connections with leaf and ToR switches in vPC pair

Unsupported Topology for ToR Switches

The following topology with ToR switches is not supported: ToR vPC pair connected to a single leaf switch.



ToR Unsupported Topology

Configuring ToR Switches

Create a fabric with a Data Center VXLAN EVPN template and add switches to the fabric, including switches used as ToRs. For more information, see the section "Creating a VXLAN EVPN Fabric Using the Data Center VXLAN EVPN Template" in Data Center VXLAN EVPN. Based on the selection of topology, perform any of the following steps:

Create Leaf-ToR Pairings

Perform the following procedure to configure a ToR and a leaf switch as shown in the ToR Topology-1 and 3, where ToR switch(s) are connected to leaf switch(s) through a port channel. For Topology-1 and 3, there is only one ToR and one leaf. Add switches used as ToR switches. For all four topologies, NDFC only uses port channels in the ToR pairings.

1. Add ToR switches to the Data Center VXLAN EVPN fabric and set the role as **ToR**.
2. On the **Fabric Overview > Switches** page, choose a ToR switch.
3. Click **Actions > TOR Pairing**.

   The **TOR Pairing** page displays the ToR switches on the top horizontal bar and a list of potential pairing leaf switches below the ToR switches. The status of the switches displays in the **Details** column.

   Only one ToR switch is connected to a single leaf switch or a leaf switch in a vPC pair.
4. Click **Save**.
5. On the **Fabric Overview** page, click **Actions > Recalculate and Deploy**.
6. After the configuration deployment is completed on the **Deploy Configuration** page, click **Close**.

Perform the following procedure to configure a ToR and a leaf switch as shown in the ToR Topology-2 and 4. For Topology-2, a ToR switch is connected to leaf switches in a vPC pair. For Topology-4, vPC ToR switches are connected to the vPC leaf switches through back-to-back vPC connections.

1. Select either of the vPC-paired leaf switches and click **Actions > TOR Pairing**. For more information on configuring vPC on ToR switches, see the "Creating a vPC Setup" section in External Connectivity Network.

   The **TOR Pairing** page appears with the list of ToR and vPC leaf switches.

2. Click **Edit Pairing** under the **Action** column.
3. Check the **Enable <switch-name> Pairing as TOR Pairing** check box.
4. Click **Save**.
5. On the **Fabric Overview** page, click on **Actions > Recalculate and Deploy**.
6. After the configuration deployment is completed on the **Deploy Configuration** page, click **Close**.

Unpair Leaf-ToR Pairings

Perform the following procedure to unpair the ToR switch.

1. Remove the overlay attachment before unpairing the ToR.
2. On the **Fabric Overview** page, click the **Switches** tab.
3. Select any leaf switch that has ToR pairing and click on **Actions > TOR Pairing**.

   The **TOR Pairing** page appears with the list of paired switches.

4. Click **Edit Pairing** under the **Action** column.
5. Uncheck the **Enable <switch-name> Pairing as TOR Pairing** check box.
6. Click **Save**.
7. On the **Fabric Overview** page, click **Actions > Recalculate and Deploy**.
8. On the **Deploy Configuration** page, click **Deploy**.
9. After the configuration deployment is completed on the **Deploy Configuration** page, click **Close**.

Configuring a Specific vPC/Port-Channel ID Range for Leaf-ToR Pairing

With this feature, you can:

- Configure a specific vPC/port-channel ID range for leaf-ToR pairing by enabling the **Use Specific vPC/Port-Channel ID Range** field. NDFC then displays the **vPC/Port-Channel ID Range** field with the recommended vPC/port-channel ID range.
- Edit a vPC/port-channel ID for paired switches by clicking the **Action > Edit Pairing** option on the **TOR Pairing** page.

Configure Fabric Settings for Specifying a vPC/Port-Channel ID Range for Leaf-ToR Pairing

1. Create a fabric with the Data Center VXLAN EVPN fabric and add ToR switches to the fabric.

   For more information, see the section "Creating a VXLAN EVPN Fabric Using the Data Center VXLAN EVPN Template" in Data Center VXLAN EVPN and the section "Adding Switches to a Fabric" in Add Switches for LAN Operational Mode.

   You need to use the same version of Cisco NX-OS when configuring your vPC switches.

2. On the **Fabric Overview** page, choose the Data Center VXLAN EVPN fabric that you want to edit, and click **Actions > Edit Fabric**.
3. Click on the **vPC** tab.
4. Check the **Use Specific vPC/Port-Channel ID Range** check box to use a specific vPC/port-channel ID range for leaf-ToR pairing.

   The **vPC/Port-Channel ID Range** field displays the recommended values.

   The recommended values are from 1-499.

   You can increase the existing range or add more ranges if the values are exhausted.

5. Specify a range for the **vPC/Port-Channel ID Range** field if you do not want to use the recommended values.
6. Click **Save**.

   The new range applies to the new pairing.

Create Leaf-ToR Pairings

For configuring leaf-ToR pairings, see Configuring ToR Switches and Deploying Networks in Data Center VXLAN EVPN Fabrics > Configuring ToR Switches.

Edit the Leaf and the ToR Port-Channel IDs

1. On the **Fabric Overview > Switches** page, choose the leaf switch you want to edit and click **Actions > TOR Pairing**.

   The **TOR Pairing** page appears with a horizontal bar of the paired leaf switches.

2. Click **Edit Pairing** under the **Action** column.

   The **leaf** page displays.

   The **Enable <switch-name> Pairing as TOR Pairing** check box is checked due to auto leaf-ToR pairing.

3. Click the arrow on the right-hand corner of the page to view the fields.

4. In the **Leaf Port Channel ID** field, add or edit the existing ID value.
5. In the **vPC ID** field, add or edit the existing ID value.
6. In the **ToR Port Channel ID** field, add or edit the existing ID value.
7. Click **Save**.



If you have overlays attached to the paired switches, you cannot change the vPC/port-channel IDs.

8. Navigate to the **Fabric Overview > Switches** page and click **Actions > Recalculate and Deploy**.

   The **Deploy Configuration** page displays with the list of leaf switches.

   After successful deployment, the **Fabric Status** column displays as **In-Sync**.

Deploying Networks on ToR Switches

To deploy networks on ToR switches in the Data Center VXLAN EVPN fabric, perform the following steps:

1. Choose **Manage > Fabrics**, then double-click on the Data Center VXLAN EVPN fabric.
2. On the **Networks** page, select the networks that you want to deploy or create a new network. For information about creating a network, see the section " Creating Network for Standalone Fabrics" in Data Center VXLAN EVPN.
3. On the **Fabric Overview** page, click **Networks > Network Attachments**.
4. Select the leaf switches you want to edit and click on **Actions > Edit**.

   The **Edit Network Attachment** page appears.

5. On the **Edit Network Attachment** page, choose **Attach**.
6. (Optional) You can enter a value in the **VLAN** field when you use **Actions > Create** to create a network, but not when you edit a network using **Actions > Edit**.
7. If a leaf is in a vPC pair, you can select interfaces/ports on a leaf switch and/or associated ToR(s), attach the ports, and click **Save**.

   Port channels that are used to connect the ToR(s) toward the leaf switch(es) or vPC pairs are automatically updated with the required VLAN deployed in the server interfaces of the ToR switch.

8. Select the leaf switch and click on **Actions > Deploy**.

Configuring ToR Switches and Deploying Networks in External Fabrics

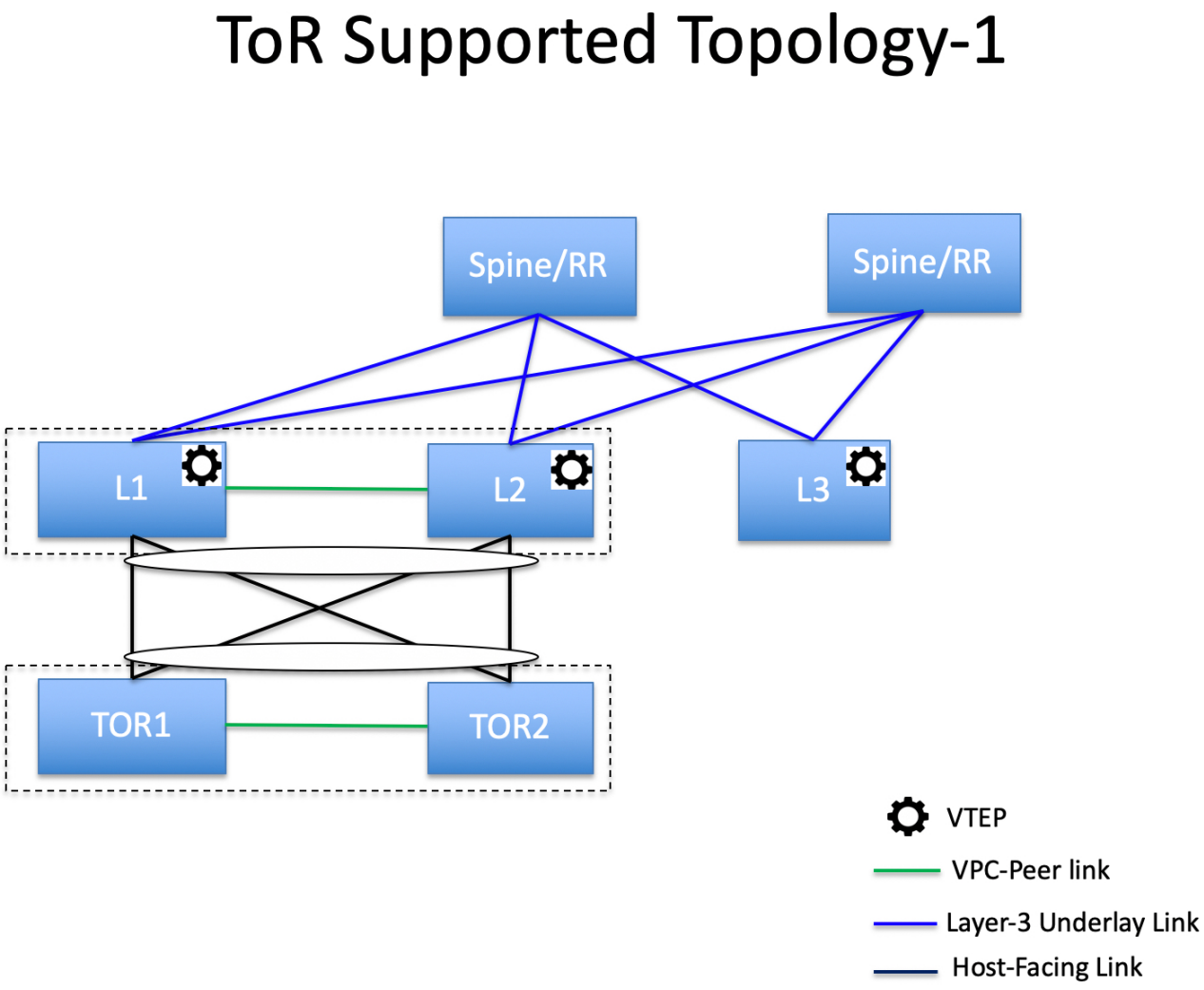
Overview

NDFC supports Top-of-Rack (ToR) switches. You can add the Layer 2 ToR switches in an external fabric, and the ToR switches can be connected to the leaf switches in a Data Center VXLAN EVPN fabric. Typically, you connect the leaf and ToR switches with a back-to-back vPC connection. For more information, see Supported Topologies for ToR Switches.

Supported Topologies for ToR Switches

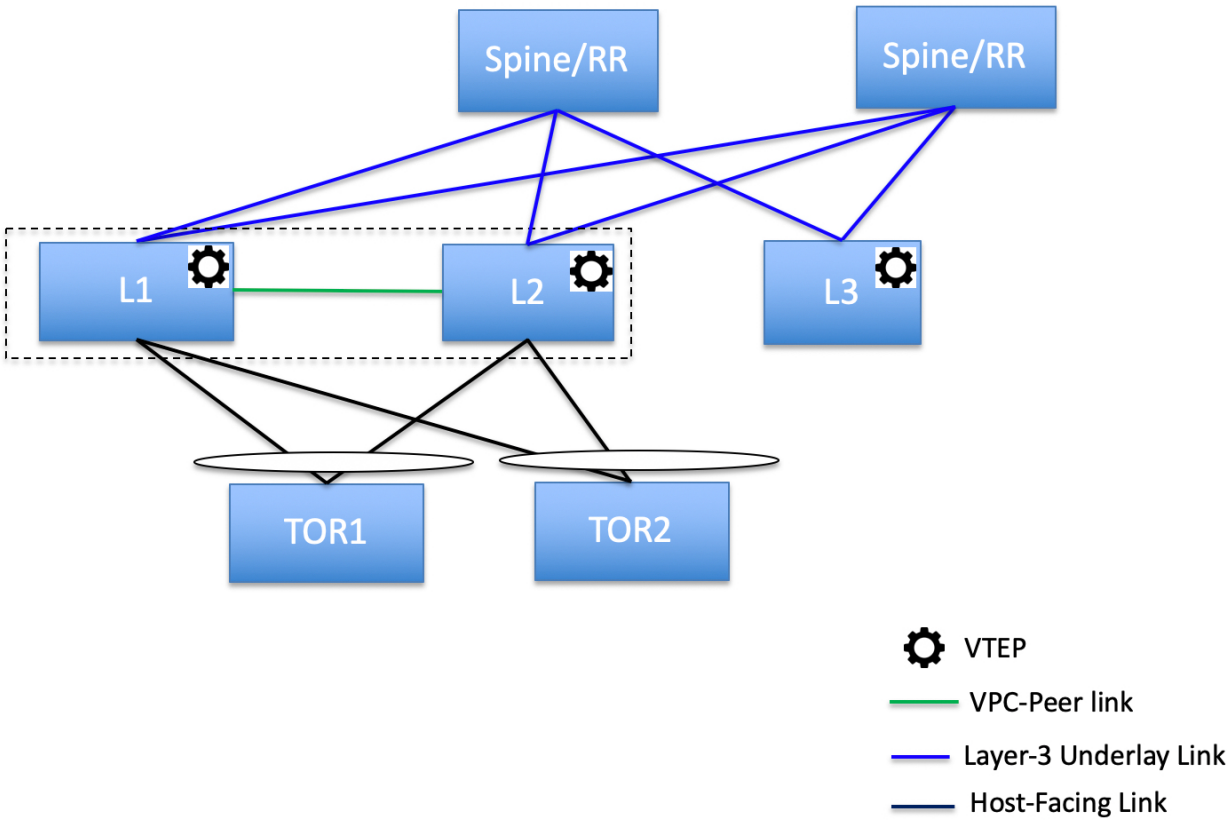
The following topologies with ToR switches are supported in NDFC:

Cisco Nexus 7000 Series Switches do not support the **ToR** switch role in Cisco NDFC.



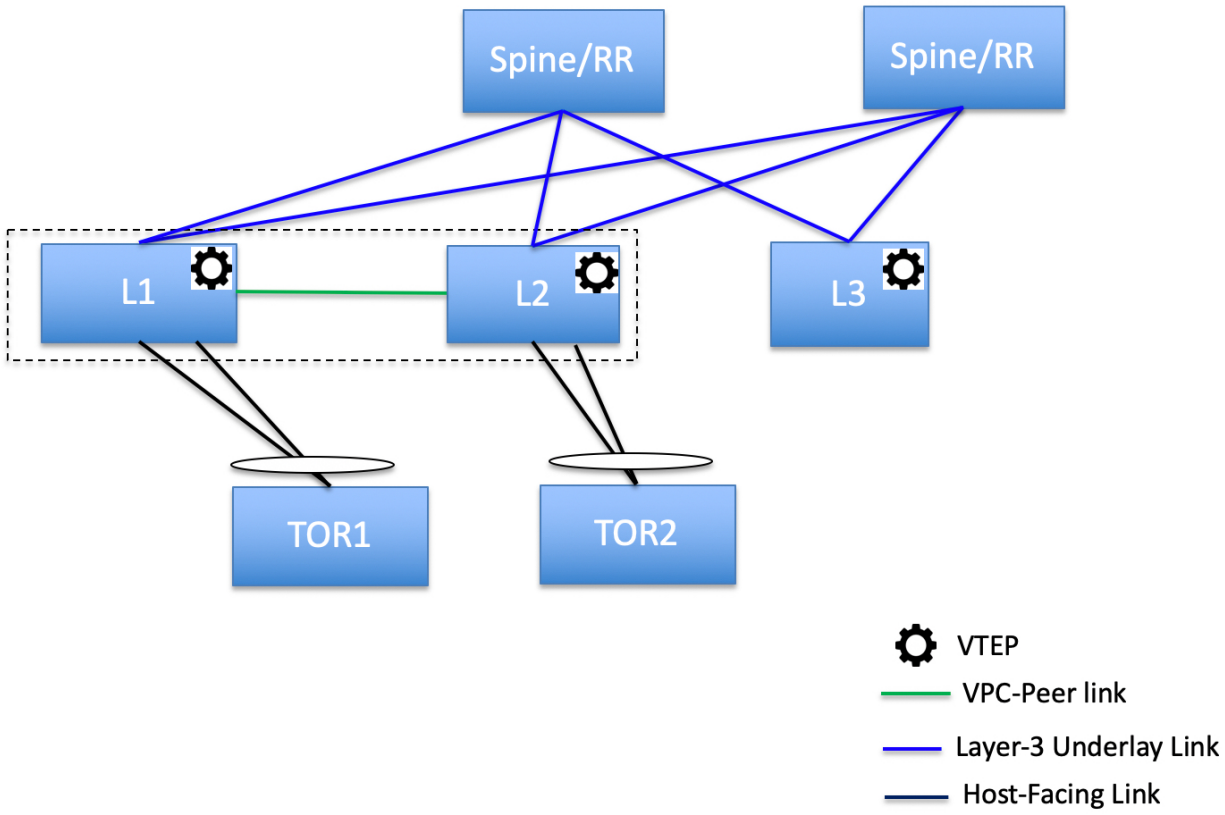
ToR switches with back-to-back vPC connection to the leaf switches

ToR Supported Topology-2



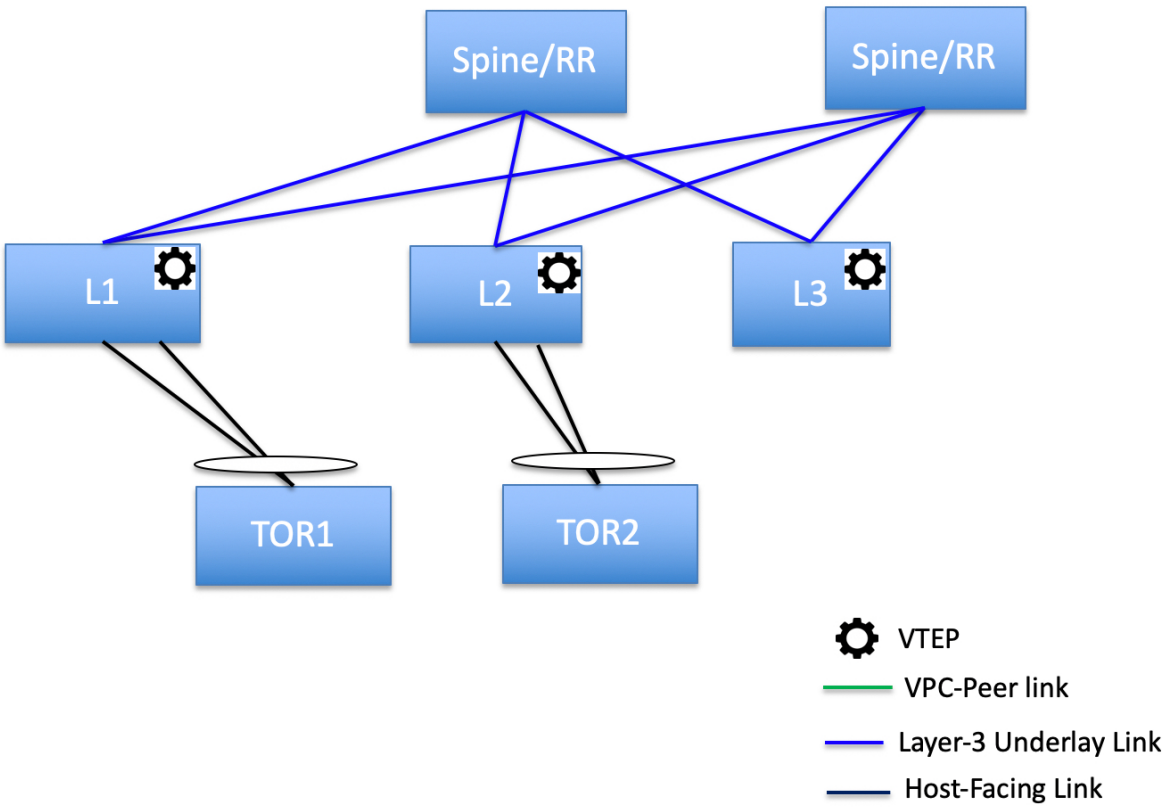
ToR switches with port channels connected to both the leaf switches. The L1 and L2 switches are connected as a vPC pair.

ToR Supported Topology-3



ToR switches with port channels directly connected to the leaf switches. The L1 and L2 switches are connected as a vPC pair.

ToR Supported Topology-4

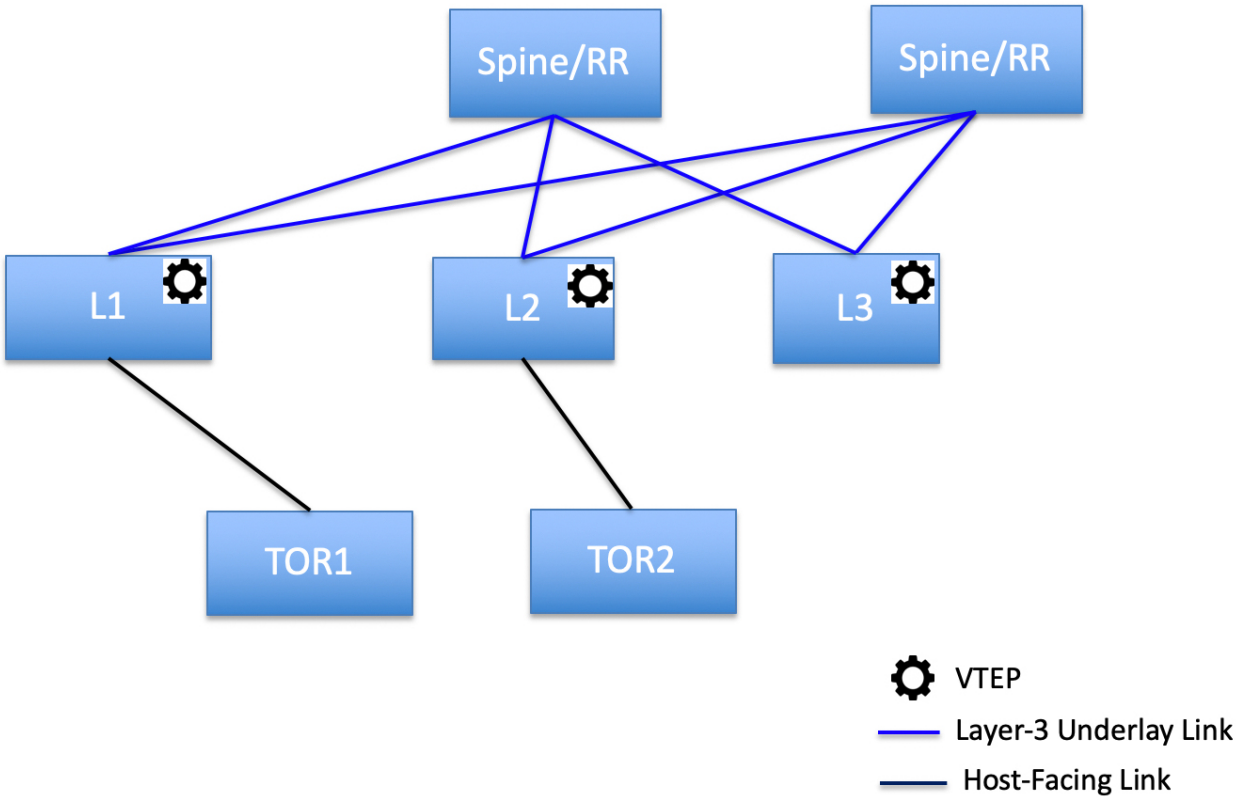


ToR switches with port channels directly connected to the leaf switches. vPC pairs are not configured for the leaf or ToR switches.

Unsupported Topologies for ToR Switches

The following topology with ToR switches is not supported in NDFC:

ToR Unsupported Topology



Configuring ToR Switches

Before you begin, make sure you have a Data Center VXLAN EVPN or create and deploy a new fabric. For more information, see the section "Creating a VXLAN EVPN Fabric Using the Data Center VXLAN EVPN Template" in Data Center VXLAN EVPN.

NDFC supports the trunk_host policies for ToR switches. Make sure the ToR switch has a vPC and port channel policy attached on the interfaces connected to the leaf. These policies are used to connect the ToR switches in the external fabric to the leaf switches in the Data Center VXLAN EVPN fabric.

1. Create an external fabric and add two ToR switches. For more information, see the section "Creating an External Fabric" in External Connectivity Network.

   The number of ToR switches can be more than two.

   This procedure shows how to configure ToR switches as shown in the ToR Topology-1, where ToR switches are connected using a vPC.

   The following are the different scenarios for connecting the ToR switches:

   - If a vPC is not configured on the ToR switches, then the vPC policy needs to be applied on the ToR-facing interfaces, if the uplinks for these ToR switches are connected to vPC leaf switches.
   - If ToR switches are connected to a leaf using a port channel, then port-channel policies need

to be applied on the ToR interfaces connected to the leaf switches.

- If ToR switches are connected to leaf switches as standalone, trunk policies need to be applied on the TOR interfaces.



- While creating the Data Center VXLAN EVPN fabric, make sure that the **Fabric Monitor Mode** check box is not chosen.
- The two ToR switches must be connected and have the same switch role.

After adding the ToR switches, make sure that the role for the ToR switches is **ToR**.

2. Select one of the ToR switches and click **Actions > vPC Pairing**.
3. Choose the second ToR switch as a vPC peer.
4. Under the **vPC Pair Template**, you can choose the **No Policy** option. Perform a **Recalculate and Deploy** to generate a vPC configuration for the ToR switches.

   For more information about all the fields and their descriptions, see the section "Creating a vPC Setup" in External Connectivity Network.

   Steps 2 and 3 are required since this example shows the ToR configuration for Topology-1. For Topology-2, -3, and -4, steps 2 and 3 are not required.

5. On the **Switch Overview** page, click **Actions** > **Recalculate and Deploy**.
6. After the configuration is completed on the **Deploy Configuration** page, click **Close**.
7. Create a VXLAN EVPN Multi-Site fabric.

   While creating the VXLAN EVPN Multi-Site fabric, under the **General** tab, choose the **ToR Auto-deploy Flag** check box.

   This action enables automatic deployment of the networks and VRFs in the Data Center VXLAN EVPN fabric to the ToR switches in the VXLAN EVPN Multi-Site fabric when you click **Recalculate and Deploy** in the VXLAN EVPN Multi-Site fabric. For more information, see Deploying Networks on ToR Switches.

   For more information about the remaining tabs and fields, see the section "Creating a VXLAN EVPN Multi-Site and Associating Member Fabrics" in VXLAN EVPN Multi-Site.

8. Open the VXLAN EVPN Multi-Site fabric. Navigate to **Child Fabrics** and click on **Actions** to move the fabric into a VXLAN EVPN Multi-Site fabric.
9. Select the Data Center VXLAN EVPN fabric and click **Actions** > **Interface**.
10. Choose **vPC** and enter all the relevant details and click **Save**.

    For more information about the fields on this page, see the section "Adding Interfaces" in Add Interfaces for LAN Operational Mode.

    After saving all the information, click **Deploy**.

    Follow the same steps to create a vPC on the ToR switch as well.

Deploying Networks on ToR Switches

To deploy networks on ToR switches in the external fabrics, you need to deploy them on the switches in the Data Center VXLAN EVPN through VXLAN EVPN Multi-Site. These switches should be connected to the ToR switches.

1. Choose **Manage > Fabrics**, then double-click on the Data Center VXLAN EVPN fabric.
2. On the **Networks** page, select the networks that you want to deploy or create a new network. For more information about creating a network, see the section "Creating Network for Standalone Fabrics" in Data Center VXLAN EVPN.
3. Select the **Network** from the **Network Attachment** page. Click on **Actions and Edit**. Attach the network and select the appropriate interface/port-channels and then click on **Save**. These port channels connect the leaf switches to the ToR switches. The networks are deployed on these port channels.
4. On the **Fabric Overview** page, click **Actions > Recalculate and Deploy**.

   Now the VLANs are deployed on the leaf switches.
5. Navigate to the VXLAN EVPN Multi-Site fabric.
6. On the **Fabric Overview** page, click **Actions** > **Recalculate and Deploy**.

   The networks created and deployed on the leaf switches in the Data Center VXLAN EVPN fabric are also deployed on the ToR switches in the external fabric. This step allows the same VLANs to be configured on the ToR switches that are deployed on the leaf switches in Step 4.



If VLANs are created on the ToR switches manually using the freeform configs, they are not modified.

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