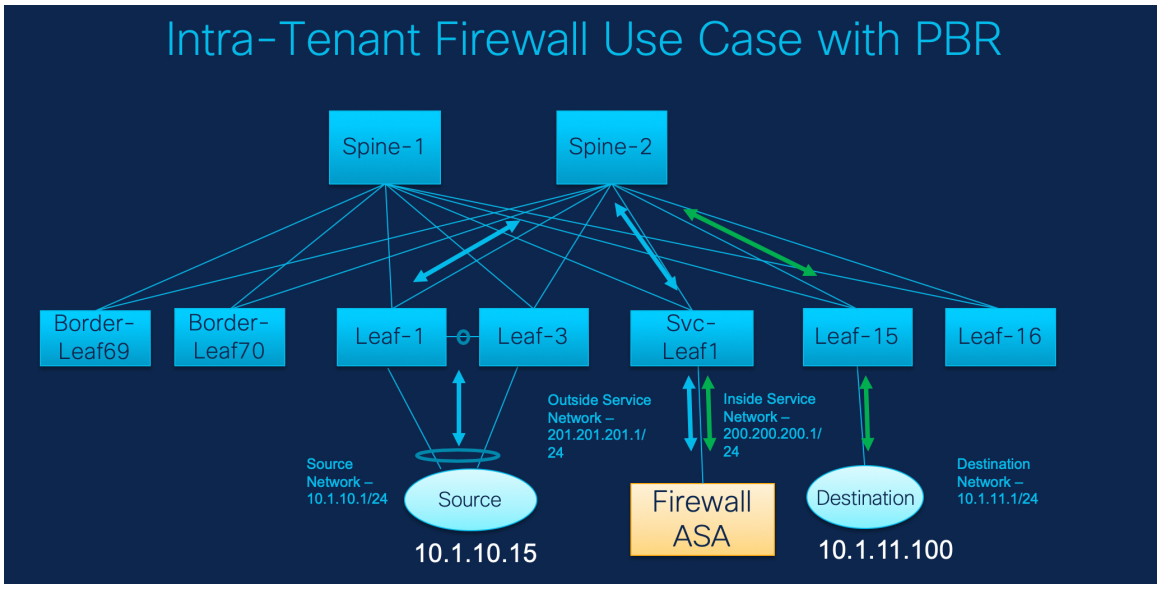


L4-L7 Services Use Cases

- Use Case: Intra-tenant Firewall with Policy-based Routing, on page 1
- Use Case: Inter-tenant Firewall with eBGP Peering, on page 7
- Use Case: One-arm Load Balancer, on page 12
- Use Case: One-arm Firewall, on page 16

Use Case: Intra-tenant Firewall with Policy-based Routing

Refer the figure given below for topology details.



In this topology, Leaf1 and Leaf3 are a vPC pair and they are connected to **Source** (10.1.10.15) with the **Source Network** (10.1.10.1/24). The service leaf is connected to the virtual **Firewall ASA** and Leaf-15 is connected to **Destination** (10.1.11.100). In this use case, the source network refers to 'client' and the destination refers to 'server'.

Any traffic that is traversing from **Source** to **Destination** must go to the outside service network, and the firewall performs its function by allowing or denying traffic. This traffic is then routed to the inside service network and on to the Destination network. Since the topology is stateful, the traffic coming back from the destination to the source follows the same path.

Now, let us see how to perform service redirection in NDFC.

Note

- This use-case does not cover how to provision the **Site_A** VXLAN fabric. For information about this topic, refer to the Cisco Nexus Dashboard Fabric Controller for LAN Configuration Guide
- This use-case does not cover configurations on the service node (firewall or load balancer).

You can navigate to Services tab by one of the following below mentioned paths:

LAN > **Services**

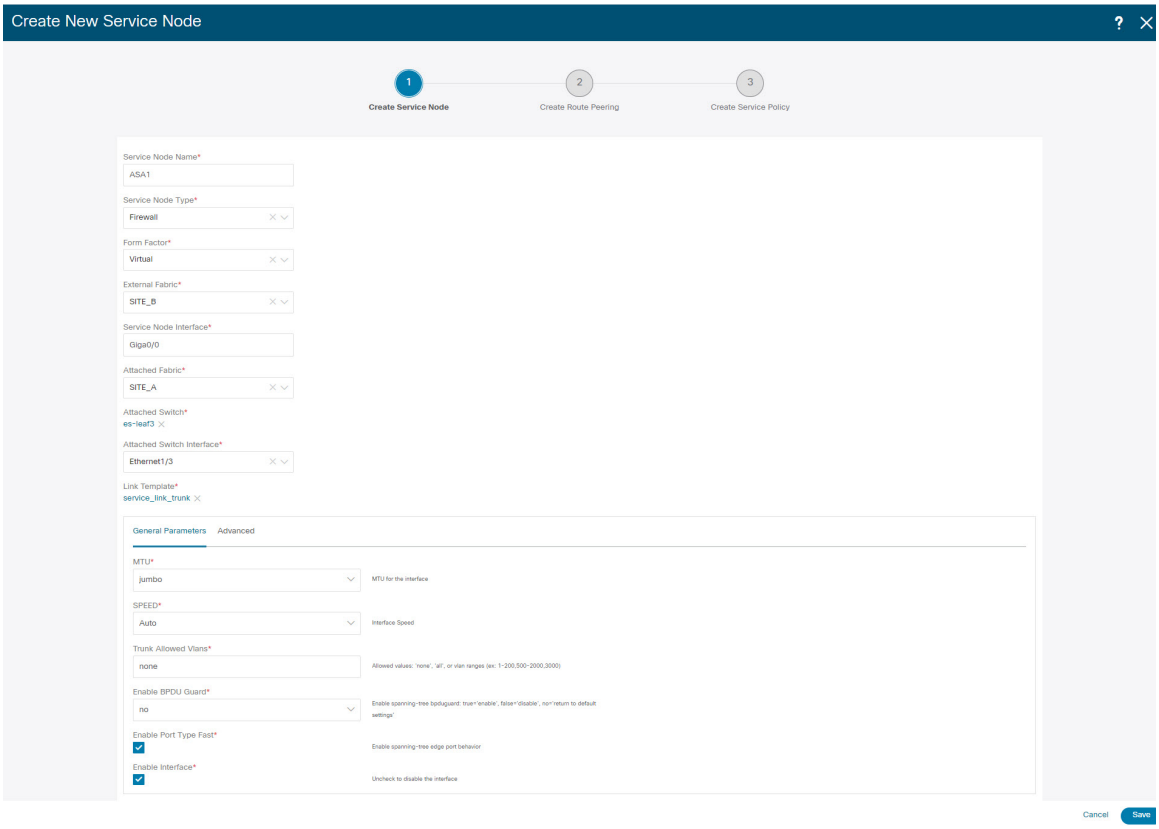
LAN > **Fabrics** > **Fabric Overview** > **Services**

LAN > **Switches** > **Switches Overview** > **Services**

1. Create Service Node

Procedure

Step 1 Navigate **LAN** > **Fabrics** > **Fabric Overview** > **Services**.



Step 2 On **Services** tab, choose **Actions** > **Add**.

Step 3 Enter the Service Node Name and specify **Firewall** in the **Service Node Type** dropdown box.

The **Service Node Name** must be unique.

Step 4 From the **Form Factor** drop-down list, select **Virtual**.

Step 5 Choose appropriate external fabric from drop-down list, select the external fabric in which the service node (for example, ASA firewall) is located.

Note
Ensure that the service nodes need to belong to the external fabric. This is a prerequisite before creating a service node.

Step 6 Enter the interface name of the service node that connects to the service leaf.

Step 7 Select the attached switch that is the service leaf, and the respective interface on the service leaf.

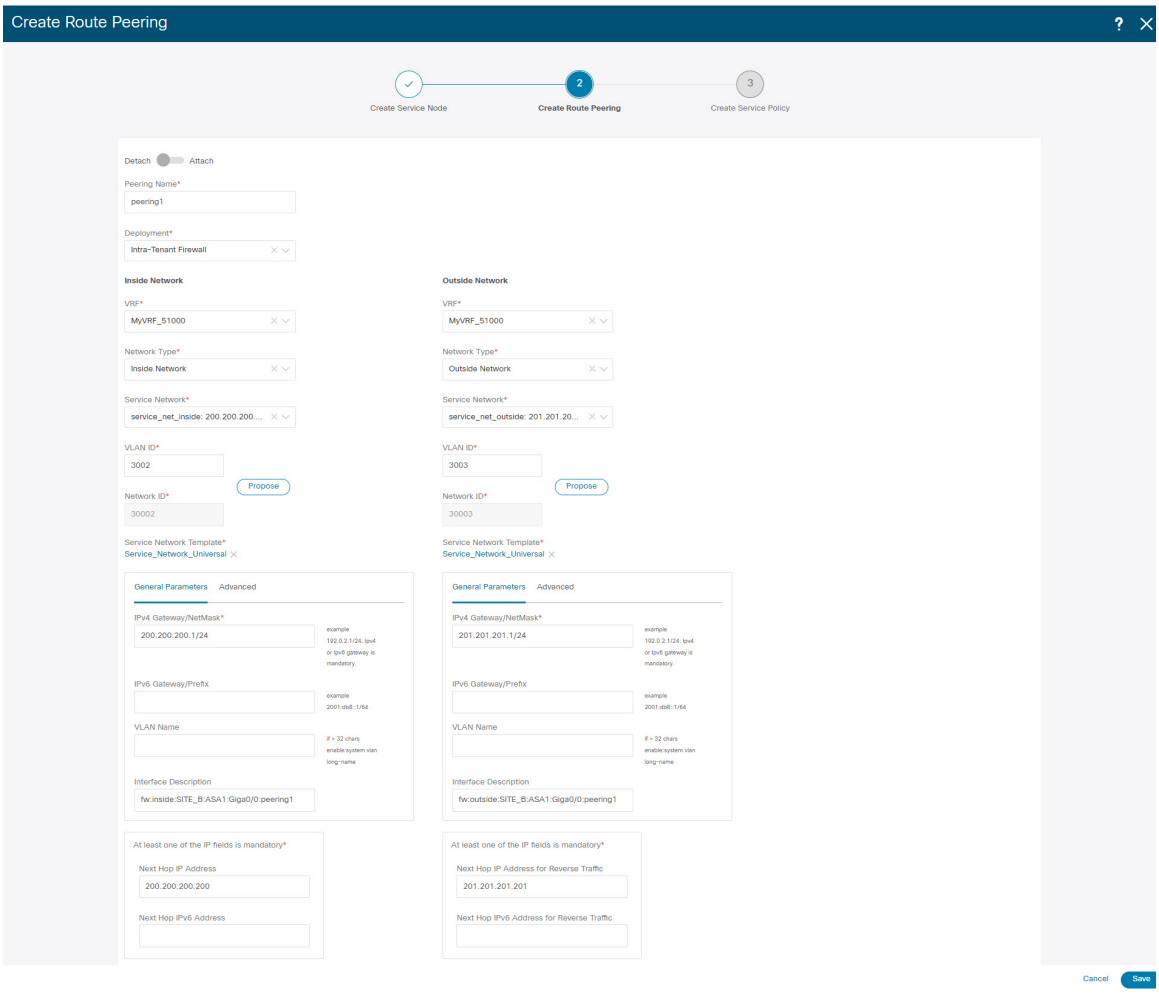
Step 8 Choose **service_link_trunk** template. NDFC supports trunk, port channel, and vPC link templates. The available link templates in the **Link Template** drop-down list are filtered based on the selected **Attached Switch Interface** type.

Step 9 Specify the **General Parameters** and **Advanced** parameters, if required. Some parameters are pre-filled with the default values.

Step 10 Click **Save** to save the created service node.

2. Create Route Peering

Let us now configure the peering between a service leaf and a service node.



Procedure

Step 1 Enter the peering name and select **Intra-Tenant Firewall** from the **Deployment** drop-down list.

Step 2 Under **Inside Network**, from the **VRF** drop-down list, select a VRF that exists and select **Inside Network** under **Network Type**.

Enter the name of the **Service Network** and specify the **Vlan ID**. You can also click **Propose** to allow NDFC to fetch the next available VLAN ID from the specified service network VLAN ID range in the fabric settings. The default **Service Network Template** is **Service_Network_Universal**.

Under the **General Parameters** tab, specify the gateway address for the service network. Specify the **Next Hop IP Address**. This next hop address has to be within the 'inside service network' subnet. Under the **Advanced** tab, the default **Routing Tag** value is 12345.

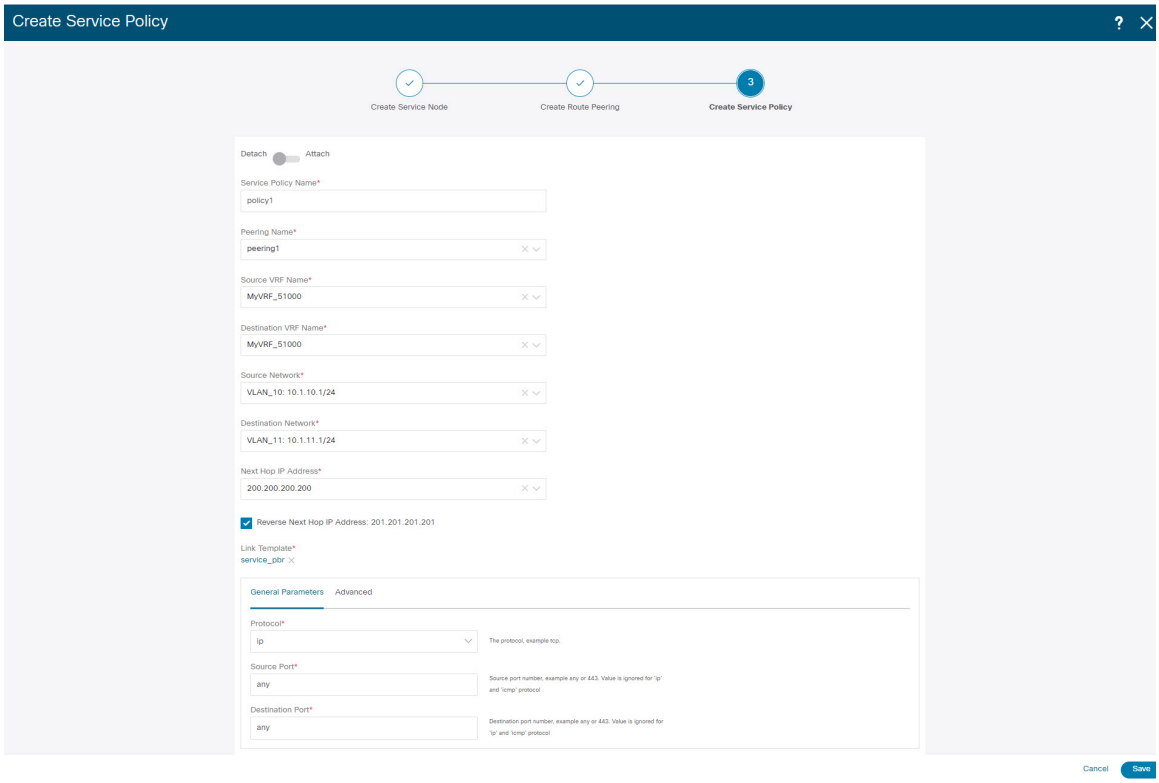
Step 3 Specify the required parameters under **Outside Network** and specify the **Next Hop IP Address for Reverse Traffic**. This next hop address for reverse traffic needs to be within the 'outside service network' subnet.

Step 4 Click **Save** to save the created route peering.

3. Create Service Policy

Procedure

Step 1 Specify a name for the policy and select the route peering from the **Peering Name** drop-down list.



Step 2 Select the source and destination VRFs from **Source VRF Name** and **Destination VRF Name** drop-down lists. The source and destination VRFs for an intra-tenant firewall deployment have to be the same.

Step 3 Select the source and destination networks from **Source Network** and **Destination Network** drop-down lists, or specify the source or destination network that is within the network subnets defined in **Fabric Overview** > **Services** window.

Step 4 The next hop and reverse next hop fields are populated based on the values entered while creating the route peering. Select the check box next to **Reverse Next Hop IP Address** field to enable policy enforcement on reverse traffic.

Step 5 Under the **General Parameters** tab in the policy template, select **ip** from **Protocol** dropdown list, and specify **any** in **Source Port** and **Destination Port** fields.

Note
For **ip** and **icmp** protocols, **any** source and destination port is used for ACL generation. You can also select a different protocol and specify the corresponding source and destination ports. NDFC converts well-known port numbers to match the format required by the switch. For example, you can convert port 80 to ‘www’.

Step 6 Under **Advanced** tab, by default **permit** is selected for **Route Map Action** and **none** is selected for **Next Hop Option**. You can change these values, and customize the ACL name and route map match sequence number, if required. For more information, refer *Templates* section in the Layer 4-Layer 7 Service chapter.

Step 7 Click **Save** to save the created service policy.

This completes procedures to perform and specify the flows for redirection.

5. Deploy Service Policy

1. On **Services** tab, on the **Service Policy** window choose the required peering.
2. Choose **Actions** > **Deploy**.

   The **Deploy Service Policy** window appears.
3. Click **Deploy** to confirm deployment.

4. Deploy Route Peering

1. On **Services** tab, on the **Route Peering** window choose the required peering.
2. Choose **Actions** > **Deploy**.

   The **Deploy Route Peering** window appears.
3. Click **Deploy** to confirm deployment.

6. View Stats

Now that the respective redirection policies are deployed, the corresponding traffic will be redirected to the firewall.

To visualize this scenario in NDFC, click the service policy, a slide-in pane appears.

You can view the cumulative statistics for a policy in a specified time range.

Statistics are displayed for:

- Forwarding traffic on the source switch
- Reversed traffic on the destination switch
- Traffic in both directions on the service switch

7. View Traffic Flow in Fabric Builder

The service node in the external fabric is attached to the service leaf, and this external fabric shown as a cloud icon in NDFC topology.

Procedure

Step 1 Click the service leaf, a slide-in pane appears and click **Show more flows**. You can see the flows that are redirected.

Step 2 Click **Details** in the **Service Flows** window to display attachment details.

8. Visualize Redirected Flows to Destination in the Topology window

Procedure

Step 1 Click **Topology** and click on leafs to visualize the redirected flows to destination.

Step 2 Select **Redirected Flows** from the drop-down list.

Step 3 Select a policy from the drop-down list or initiate a search by entering a policy name, source network, and destination network in the search field. The search field is autopopulated based on your input.

The switches, on which the source and destination network is attached and the flows are redirected and highlighted.

Step 4 The service node is shown as connected by a dotted line to the leaf switch on the topology window. Hover over the dotted line to get more information about the interface.

The traffic from **Source** traverses to the service leaf where the firewall is configured.

Based on firewall rules, traffic is allowed to reach the destination, Leaf 15.

Use Case: Inter-tenant Firewall with eBGP Peering

Refer to figure given below for topology details.

In this topology, es-leaf1 and es-leaf2 are vPC border leaf switches.

Now, let us see how to perform service redirection in NDFC.

This use-case consists of the following steps:

Note

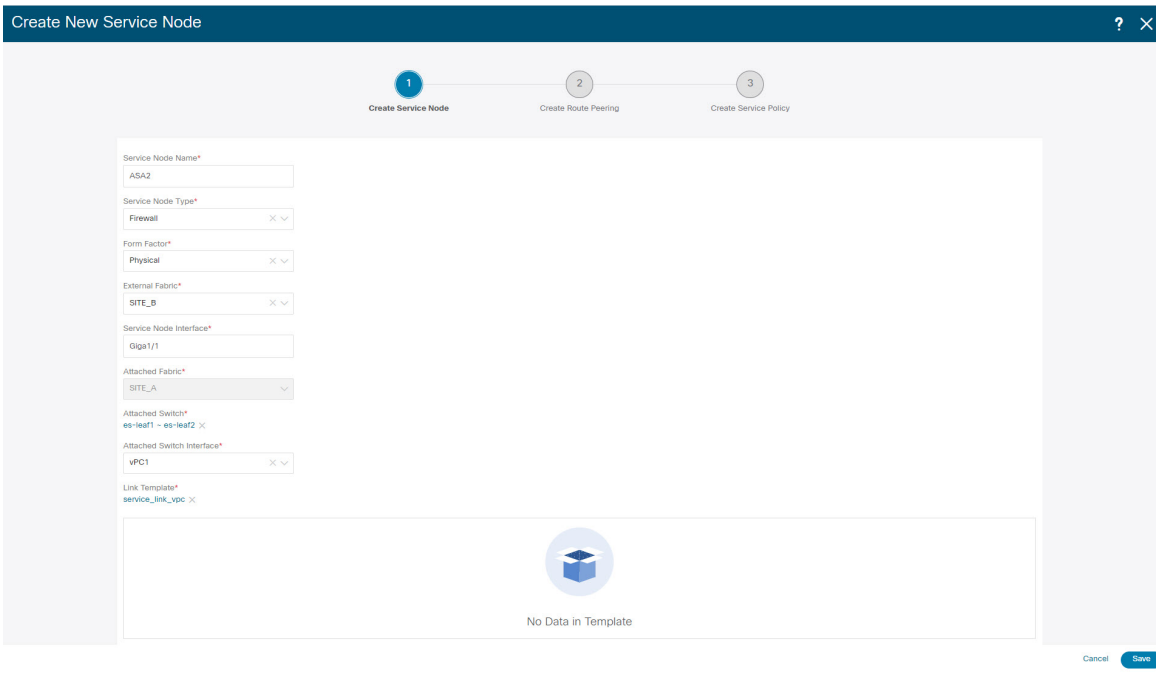
- As some steps are similar to the steps given in the Intra-tenant Firewall deployment use- case, reference links added to the steps in that use-case.
- Service policies are not applicable on Inter-tenant firewall deployments.

1. Create Service Node

Procedure

Step 1 Navigate to **LAN** > **Fabrics** > **Fabric Overview** > **Services**.

Step 2 On **Services** tab, choose **Actions** > **Add**.



Step 3 Enter **service node** name, choose **Firewall** in the Service Node Type dropdown box. The **Service Node Name** must be unique.

Step 4 From the **Form Factor** drop-down list, choose **Virtual**.

Step 5 From the **External Fabric** drop-down list, choose the external fabric in which the service node (for example, ASA firewall) is located.

Note

Ensure that service nodes need to belong to the external fabric. This is a prerequisite before creating a service node.

Step 6 Enter the interface name of the service node that connects to the service leaf.

Step 7 Select the attached switch that is the service leaf, and the respective interface on the service leaf.

Step 8 Select the **service_link_trunk** template. NDFC supports trunk, port channel, and vPC link templates. The available link templates in the **Link Template** drop-down list are filtered based on the selected **Attached Switch Interface** type.

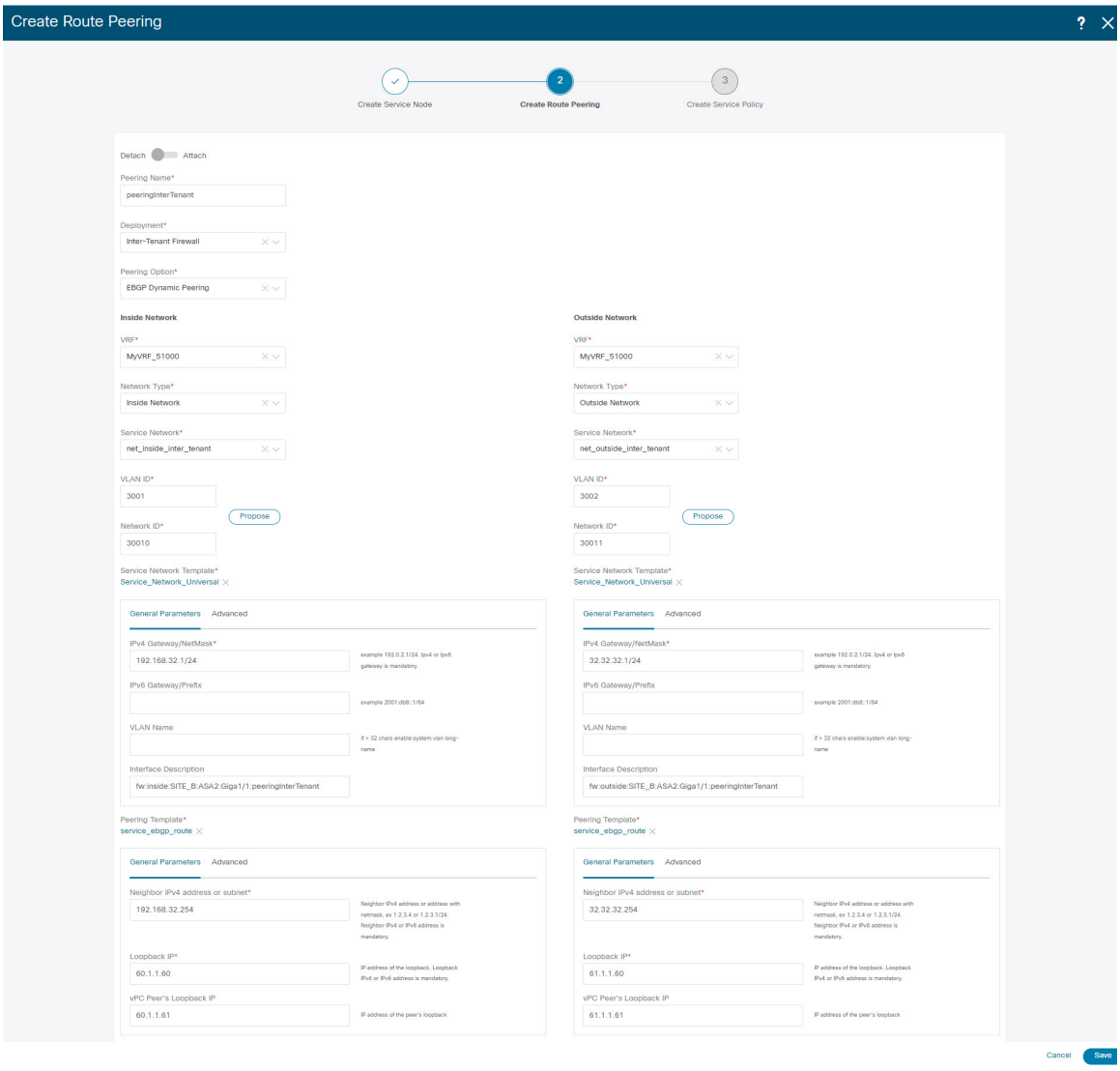
Step 9 If required, specify **General Parameters**, and **Advanced**. Some parameters are pre-filled with default values.

Step 10 Click **Save** to save the created service node.

Note
For more sample screenshots, refer 1. Create Service Node, on page 2 section in the Intra-tenant firewall with policy-based routing use case.

2. Create Route Peering

Let us now configure the peering between a service leaf and a service node.



Procedure

Step 1 Enter the peering name and select **Inter-Tenant Firewall** from the **Deployment** drop-down list. From the **Peering Option** drop-down list, select **eBGP Dynamic Peering**.

Step 2 Under **Inside Network**from the **VRF** drop-down list, select a VRF that exists and select **Inside Network** under **Network Type**.

Enter the name of **Service Network**, specify **Vlan ID**. You can click **Propose** to allow NDFC to fetch the next available VLAN ID from specified service network VLAN ID range in the fabric settings. The default **Service Network Template** is **Service_Network_Universal**.

Under **General Parameters** tab, specify the gateway address for the service network. Specify **Next Hop IP Address**. This next hop address has to be within the ‘inside service network’ subnet. Under the **Advanced** tab, the default **Routing Tag** value is 12345.

Step 3 The default Peering Template for eBGP dynamic peering is **service_ebgp_route**.

Under **General Parameters** tab, specify **Neighbor IPv4** address, **Loopback IP** address, and **vPC Peer's Loopback IP** address. The border switches are a vPC pair.

Step 4 Under the **Advanced** tab, specify the **Local ASN** and select the **Advertise Host Routes** checkbox. This local ASN value is used to override the system ASN on the switch and is required to avoid routing loops.

If the **Advertise Host Routes** checkbox is selected, the /32 and /128 routes are shown. If this checkbox is not selected, the prefix routes will be shown.

By default, the **Enable Interface** checkbox is selected.

Step 5 Specify the required parameters under **Outside Network** and specify the **Next Hop IP Address for Reverse Traffic**. This next hop address for reverse traffic needs to be within the 'outside service network' subnet.

Step 6 The default Peering Template for eBGP dynamic peering is **service_ebgp_route**.

Under the **General Parameters** tab, **Neighbor IPv4** address, **Loopback IP** address, and **vPC Peer's Loopback IP** address. The leaf switches are a vPC pair.

Step 7 Under the **Advanced** tab, specify the **Local ASN** and select the **Advertise Host Routes** checkbox. This local ASN value is used to override the system ASN on the switch and is required to avoid routing loops.

If the **Advertise Host Routes** checkbox is selected, the /32 and /128 routes are advertised. If this checkbox is not selected, the prefix routes will be advertised.

By default, the **Enable Interface** checkbox is selected.

Step 8 Click **Save** to save the created route peering.

3. Deploy Route Peering

Refer to 4. Deploy Route Peering, on page 6 in the Intra-Tenant Firewall deployment use-case. Ensure that the **InterTenantFW** is displayed under **Deployment**.

The BGP configuration on the vPC border leaf for this use-case is given below.

```
router bgp 12345
 router-id 10.2.0.1
 address-family l2vpn evpn
  advertise-pip
 neighbor 10.2.0.4
  remote-as 12345
  update-source loopback0
  address-family l2vpn evpn
   send-community
    send-community extended
 vrf myvrf_50001
  address-family ipv4 unicast
   advertise l2vpn evpn
   redistribute direct route-map fabric-rmap-redist-subnet
   maximum-paths ibgp 2
  address-family ipv6 unicast
   advertise l2vpn evpn
   redistribute direct route-map fabric-rmap-redist-subnet
   maximum-paths ibgp 2
  neighbor 192.168.32.254
```

```
   remote-as 9876
  local-as 65501 no-prepend replace-as // Note: This configuration corresponds to the Local
 ASN template parameter value of the service_ebgp_route template of the inside network with
 VRF myvrf_50001. The no-prepend replace-as keyword is generated along with the local-as
command.
  update-source loopback2
  ebgp-multihop 5
  address-family ipv4 unicast
   send-community
   send-community extended
   route-map extcon-rmap-filter-allow-host out
vrf myvrf_50002
 address-family ipv4 unicast
  advertise l2vpn evpn
  redistribute direct route-map fabric-rmap-redist-subnet
  maximum-paths ibgp 2
 address-family ipv6 unicast
  advertise l2vpn evpn
  redistribute direct route-map fabric-rmap-redist-subnet
  maximum-paths ibgp 2
 neighbor 32.32.32.254
  remote-as 9876
  local-as 65502 no-prepend replace-as // Note: This configuration corresponds to the Local
 ASN template parameter value of the service_ebgp_route template of the outside network
with VRF myvrf_50002. The no-prepend replace-as keyword is generated along with the local-as
 command.
  update-source loopback3
  ebgp-multihop 5
  address-family ipv4 unicast
   send-community
   send-community extended
   route-map extcon-rmap-filter-allow-host out
```

The loopback interface configuration on the vPC switch es-leaf1 for this use-case is given below. The loopback interfaces in the configuration correspond to the 'Loopback IP' parameter of the **service_ebgp_route** template. Two loopback interfaces are created automatically on each vPC switch for two separate VRF instances using **Loopback IP** parameter values that are specified in the **service_ebgp_route** template.

```
interface loopback2
 vrf member myvrf_50001
 ip address 60.1.1.60/32 tag 12345
interface loopback3
 vrf member myvrf_50002
 ip address 61.1.1.60/32 tag 12345
```

The loopback interface config on vPC peer switch es-leaf2:

```
interface loopback2
 vrf member myvrf_50001
 ip address 60.1.1.61/32 tag 12345
interface loopback3
 vrf member myvrf_50002
 ip address 61.1.1.61/32 tag 12345
```

Use Case: One-arm Load Balancer

Refer figure given below for topology details.

In this topology, es-leaf1 and es-leaf2 are vPC leafs.

Now, let us see how to perform service redirection in NDFC.

You can navigate to **Services** tab by one of the following below mentioned paths:

LAN > **Services**

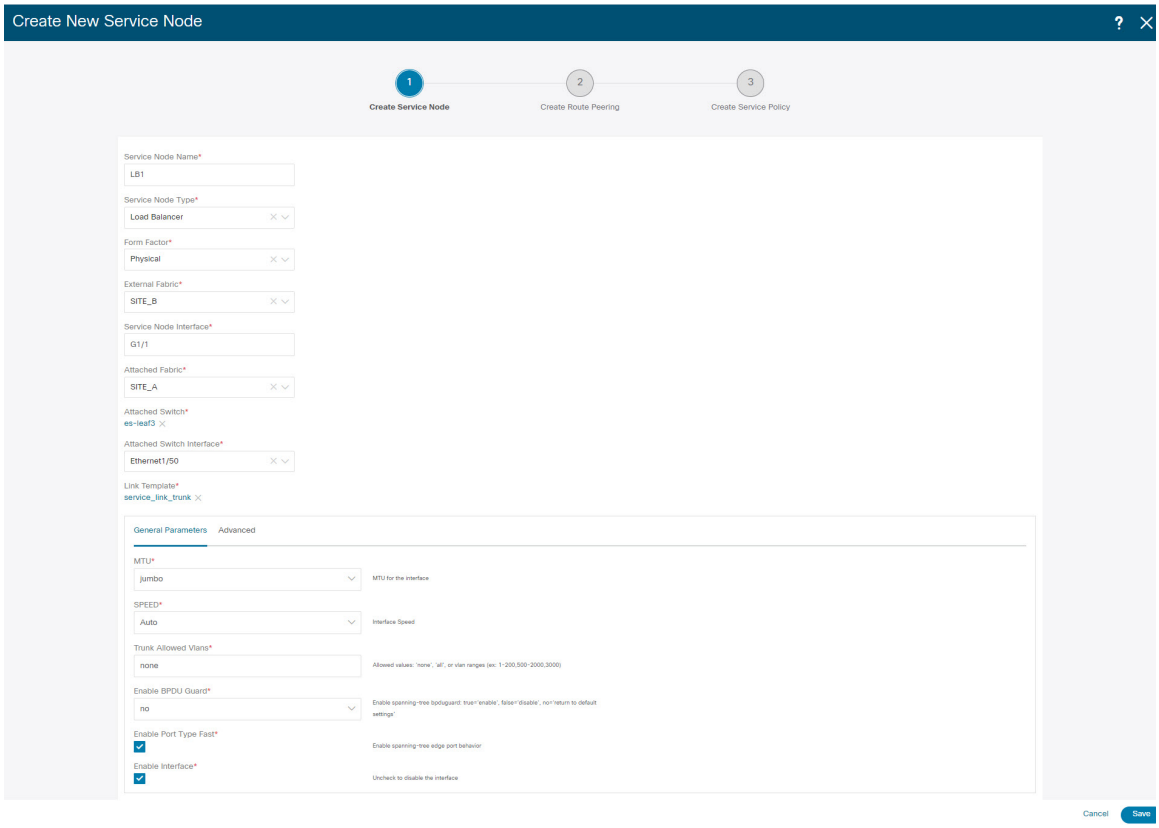
This use-case consists of the following steps:

Note As some steps are similar to the steps given in the Intra-tenant Firewall deployment use-case, reference links provided to the steps in that use-case.

1. Create Service Node

Procedure

Step 1 Navigate to **LAN** > **Fabrics** > **Fabric Overview** > **Services**



Step 2 Click the **Add** icon in the **Service Nodes** window.

Step 3 Enter the node name and specify **Load Balancer** in the **Type** dropdown box. The **Service Node Name** must be unique.

Step 4 From the **Form Factor** drop-down list, select **Virtual**.

Step 5 In the **Switch Attachment** section, from the **External Fabric** drop-down list, select the external fabric in which the service node (for example, ASA firewall) is located. Note that the service nodes need to belong to the external fabric. This is a prerequisite before creating a service node.

Step 6 Enter the interface name of the service node that connects to the service leaf.

Step 7 Select the attached switch that is the service leaf, and the respective interface on the service leaf.

Step 8 Select the **service_link_trunk** template. NDFC supports trunk, port channel, and vPC link templates. The available link templates in the **Link Template** drop-down list are filtered based on the selected **Attached Switch Interface** type.

Step 9 Specify **General Parameters** and **Advanced** parameters, if required. Some parameters are pre-filled with the default values.

Step 10 Click **Save** to save the created service node.

Note
For more sample screenshots, refer 1. Create Service Node, on page 2 in the Intra-tenant firewall with policy-based routing use case.

2. Create Route Peering

Let us now configure peering between a service leaf and a service node. In this use-case, we configure static route peering.

Procedure

Step 1 Enter the peering name and select **One-Arm Mode** from the **Deployment** drop-down list. Also, from the **Peering Option** dropdown list, select **Static Peering**.

Step 2 Under **First Arm**, specify the required values. From the **VRF** dropdown list, select a VRF that exists and select **First Arm** under **Network Type**.

Step 3 Enter the name of **Service Network** and specify **Vlan ID**. Click **Propose** to allow NDFC to fetch the next available VLAN ID from the specified service network VLAN ID range in the fabric settings. The default **Service Network Template** is **Service_Network_Universal**.

Under the **General Parameters** tab, specify the gateway address for the service network. Specify the **Next Hop IP Address**. This next hop address has to be within the first arm's subnet. Under the **Advanced** tab, the default **Routing Tag** value is 12345.

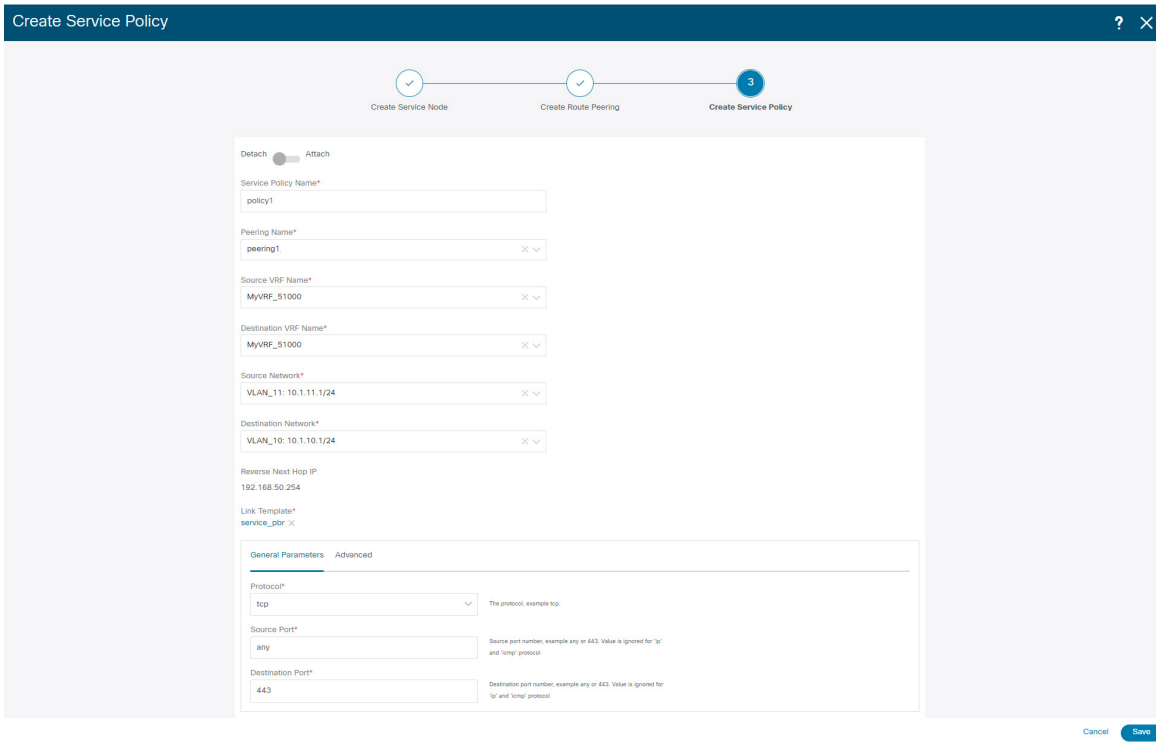
Step 4 The default **Peering Template** is **service_static_route**. Add routes, as required, in the **Static Routes** field.

Step 5 Specify **Next Hop IP Address** for Reverse Traffic.

Step 6 Click **Save** to save the created route peering.

3. Create Service Policy

Refer to 3. Create Service Policy, on page 5 in the Intra-Tenant Firewall deployment use-case.



4. Deploy Route Peering

Refer to 4. Deploy Route Peering, on page 6 in the Intra-tenant Firewall deployment use-case. Note that **OneArmADC** is displayed under **Deployment**.

5. Deploy Service Policy

Refer to 5. Deploy Service Policy, on page 6 in the Intra-tenant Firewall deployment use-case. However, as there are two servers in this load balancer use-case, two service policies to be defined with each server network.

6. View Stats

Refer to 6. View Stats, on page 6 in the Intra-Tenant Firewall deployment use-case.

7. View Traffic Flow in Fabric Builder

Refer to 7. View Traffic Flow in Fabric Builder, on page 6 in the Intra-Tenant Firewall deployment use-case.

8. Visualize Redirected Flows to Destination in the Topology window

Refer to 8. Visualize Redirected Flows to Destination in the Topology window, on page 7 in the Intra-Tenant Firewall deployment use-case.

The VRF configuration on the service leaf is as given below.

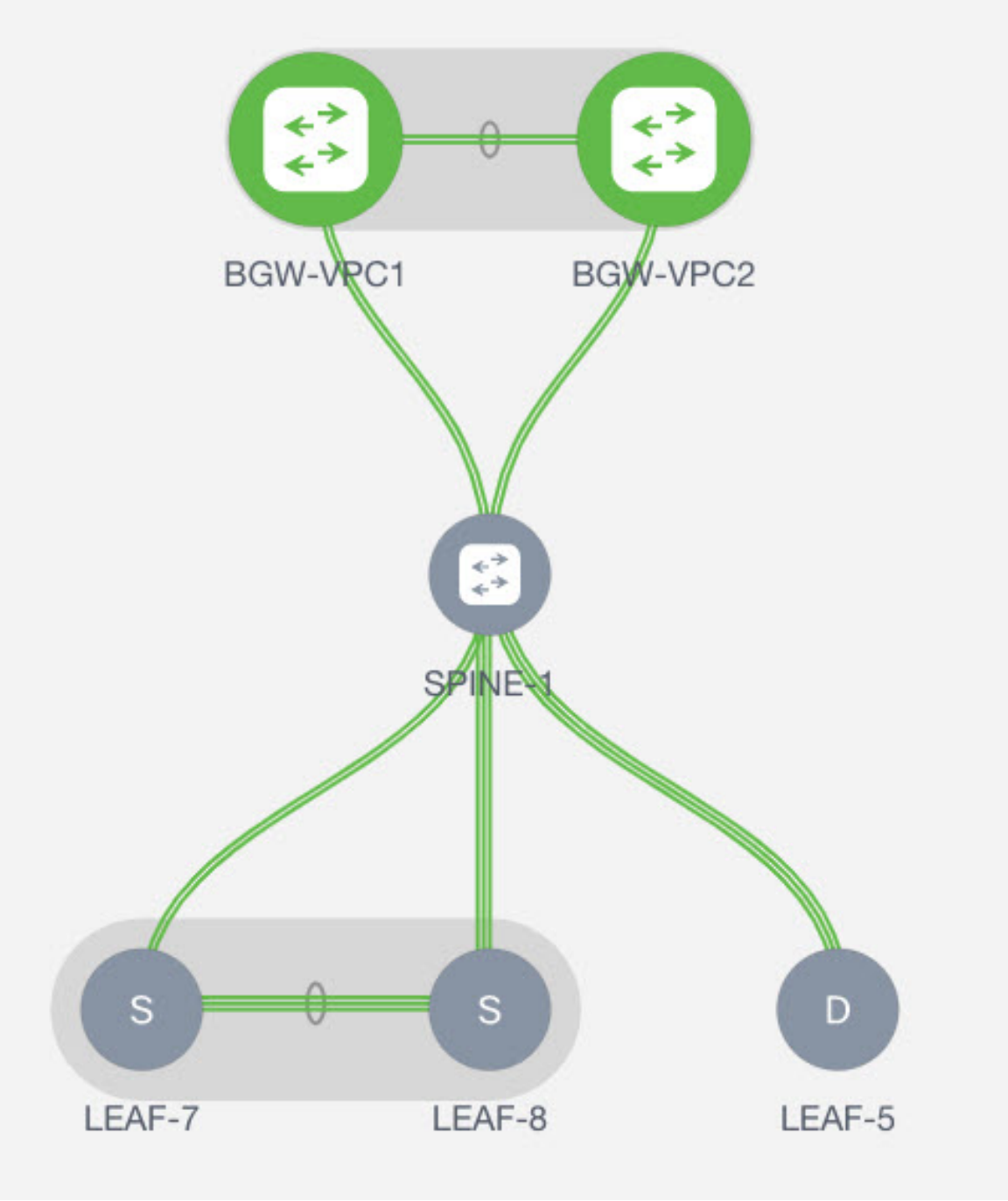
```
interface Vlan2000
 vrf member myvrf_50001
 ip policy route-map rm_myvrf_50001

interface Vlan2306
 vrf member myvrf_50001
vrf context myvrf_50001
vni 50001
 ip route 55.55.55.55/32 192.168.50.254 // Note: This is the static route
 rd auto
 address-family ipv4 unicast
  route-target both auto
  route-target both auto evpn
 address-family ipv6 unicast
  route-target both auto
  route-target both auto evpn
router bgp 12345
 vrf myvrf_50001
  address-family ipv4 unicast
   advertise l2vpn evpn
   redistribute direct route-map fabric-rmap-redist-subnet
   redistribute static route-map fabric-rmap-redist-static
   maximum-paths ibgp 2
  address-family ipv6 unicast
   advertise l2vpn evpn
   redistribute direct route-map fabric-rmap-redist-subnet
   redistribute static route-map fabric-rmap-redist-static
   maximum-paths ibgp 2
```

Use Case: One-arm Firewall

Starting from Cisco NDFC Release 12.1.1e, a new deployment One-arm firewall is added.

Refer to the figure for topology details. In this topology, BGW-VPC1 and BGW-VPC2 are vPC Border Gateway which is added as service switches. LEAF-7 and LEAF-8 are vPC leaf switches for which Source (S) network of the redirected flow is attached. LEAF-5 is attached to Destination (D) network of the redirected flow.



Now, let us see how to perform service redirection in NDFC.

You can navigate to **Services** tab by one of the following mentioned paths:

LAN > **Services**

For selected Easy fabric, **LAN** > **Fabrics** > **Fabric Overview** > **Services**

For selected (leaf, border, and border gateway) switches, **LAN** > **Switches** > **Switches Overview** > **Services**

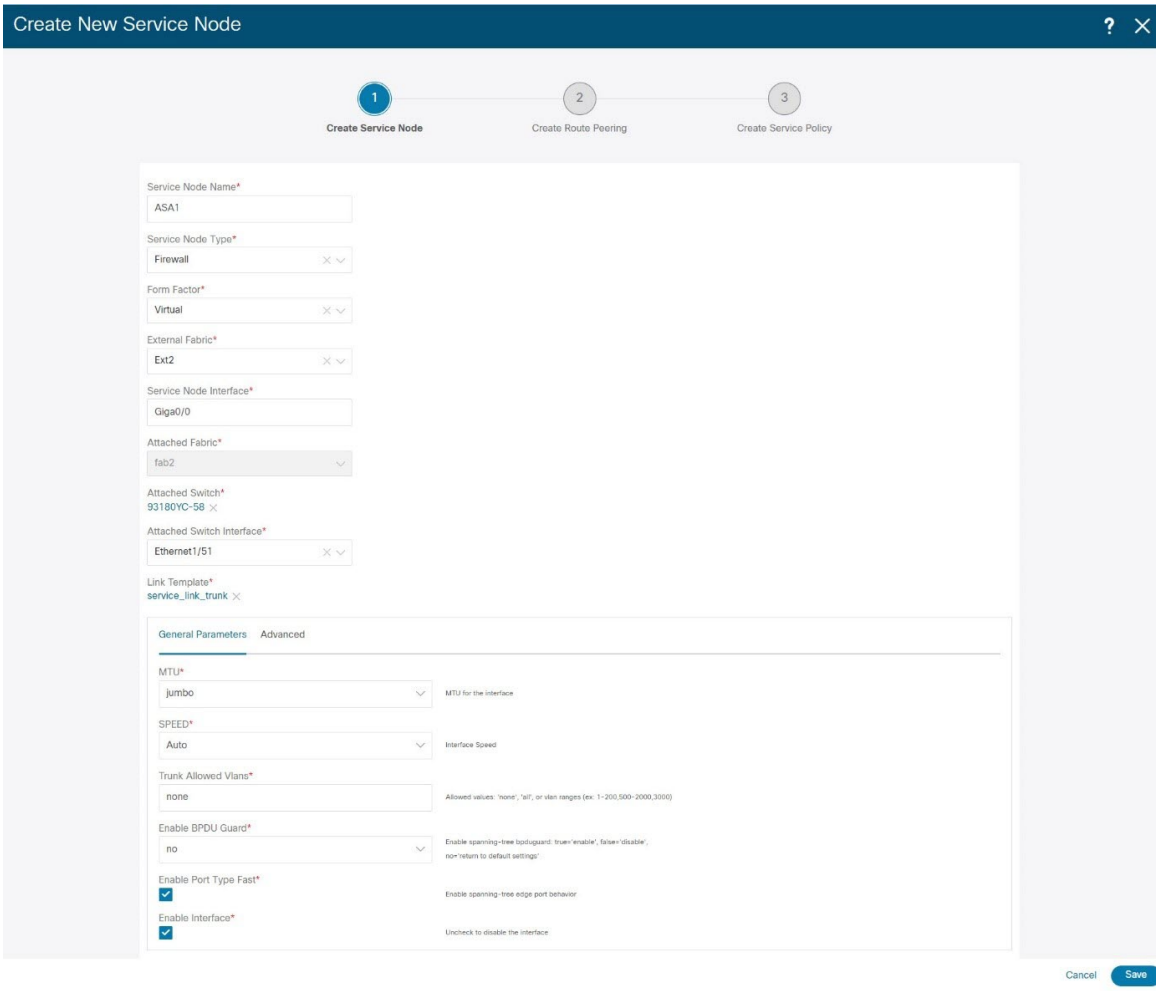
This use-case consists of the following steps:

Note As some steps are similar to the steps given in the Intra-tenant Firewall deployment use case, reference links added to the steps in that use-case.

1. Create Service Node

Procedure

Step 1 Navigate to **LAN** > **Fabrics** > **Fabric Overview** > **Services**



Step 2 Click the **Add** icon in the **Service Nodes** window.

Step 3 Enter the node name and specify **Firewall** in the **Type** dropdown box. The **Service Node Name** must be unique.

Step 4 From the **Form Factor** drop-down list, select **Virtual**.

Step 5 In the **Switch Attachment** section, from the **External Fabric** drop-down list, select the external fabric in which the service node (for example, ASA firewall) is located. Note that the service nodes need to belong to the external fabric. This is a prerequisite before creating a service node.

Step 6 Enter the interface name of the service node that will be connected to the service leaf.

Step 7 Select the attached switch that is the service leaf, and the respective interface on the service leaf.

Step 8 Select the **service_link_trunk** template. NDFC supports trunk, port channel, and vPC link templates. The available link templates in the **Link Template** drop-down list are filtered based on the selected **Attached Switch Interface** type.

Step 9 Specify the **General Parameters** and **Advanced** parameters, if required. Some parameters are pre-filled with the default values.

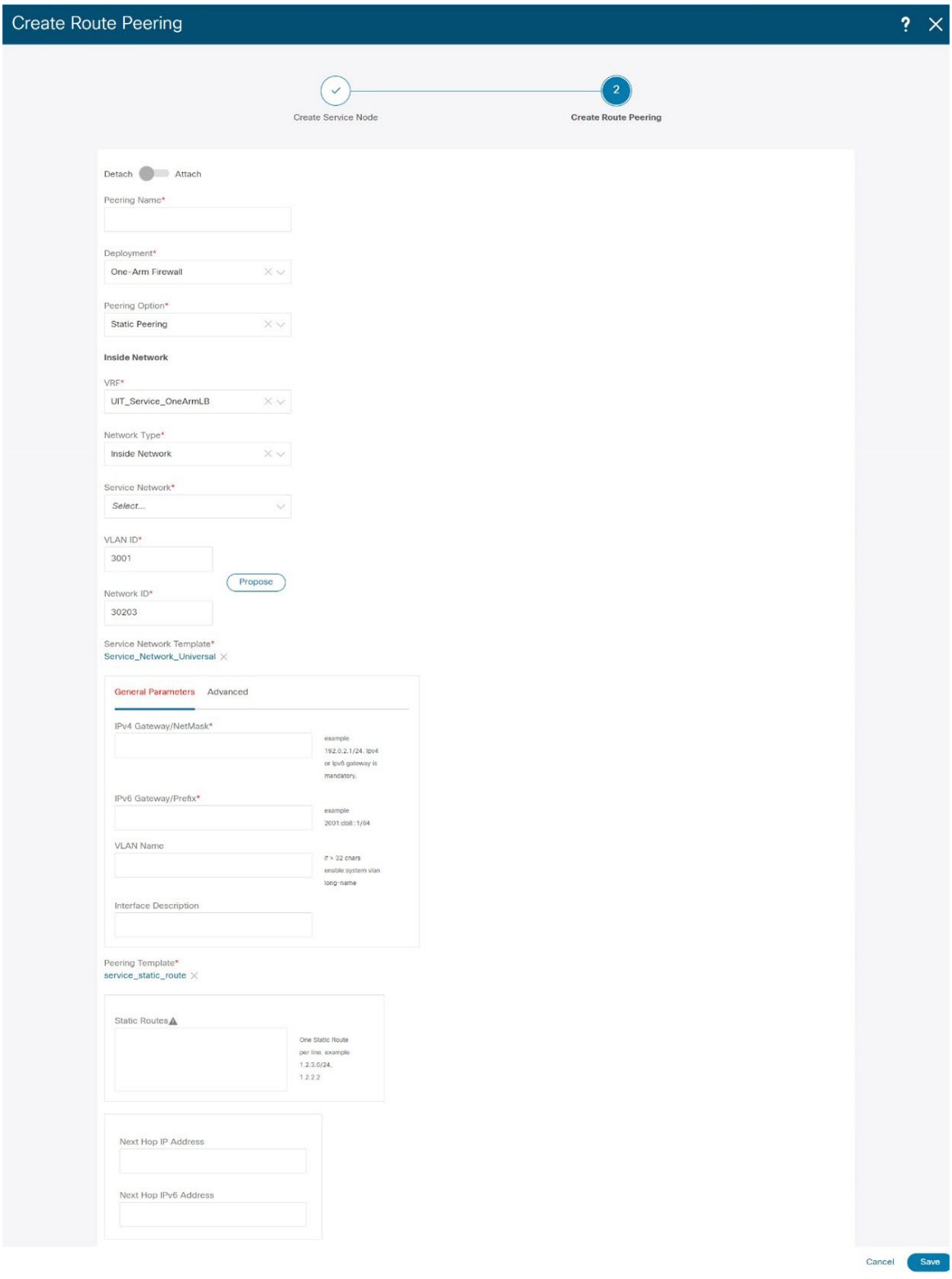
Step 10 Click **Save** to save the created service node.

Note
For more sample screenshots, refer 1. Create Service Node, on page 2 in the Intra-tenant firewall with policy-based routing use case.

2. Create Route Peering

Let us now configure peering between a service leaf and a service node. In this use-case, we configure static route peering.

2. Create Route Peering



Procedure

Step 1 Enter the peering name and select **One-Arm Firewall** from the **Deployment** drop-down list. Also, from the **Peering Option** dropdown list, choose **Static Peering**.

Note
You can also choose **eBGP Peering** option.

Step 2 In **Inside Network**, specify the required values. From the **VRF** dropdown list, select a VRF that exists and select **Inside Network** under Network Type.

Step 3 Enter the name of **Service Network**, specify **Vlan ID**, and **Network ID**. You can click **Propose** to allow NDFC to fetch the next available Vlan ID from the specified service network Vlan ID range and the next available Network ID from the specified Layer 2 VXLAN VNI range defined in the fabric settings. The default **Service Network Template** is **Service_Network_Universal**.

Under the **General Parameters** tab, specify the gateway address for the service network. Specify the **Next Hop IP Address**. This next hop address has to be within the inside network's subnet. Under the **Advanced** tab, the default **Routing Tag** value is 12345.

Step 4 The default **Peering Template** for static peering is **service_static_route**. Add routes, as required, in the **Static Routes** field.

Step 5 Click **Save** to save the created route peering.

3. Create Service Policy

Refer to 3. Create Service Policy, on page 5 in the Intra-Tenant Firewall deployment use-case.

4. Deploy Route Peering

Refer to 4. Deploy Route Peering, on page 6 in the Intra-tenant Firewall deployment use-case.

5. Deploy Service Policy

Refer to 5. Deploy Service Policy, on page 6 in the Intra-tenant Firewall deployment use-case.

6. View Stats

Now that the respective redirection policies are deployed, the corresponding traffic will be redirected to the firewall.

To visualize this scenario in NDFC, click the service policy, a slide-in pane appears.

You can view the cumulative statistics for a policy in a specified time range.

Statistics are displayed for:

- Forwarding traffic on the source switch

- Reversed traffic on the destination switch
- Traffic in both directions on the service switch

8. Visualize Redirected Flows to Destination in the Topology window

Refer to 8. Visualize Redirected Flows to Destination in the Topology window, on page 7 in the Intra-Tenant Firewall deployment use-case.