



Configuring Layer 4 to Layer 7 Resource Pools

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About Layer 4 to Layer 7 Resource Pools

Layer 4 to Layer 7 resource pools bring together related configurations with regard to deploying Layer 4 to Layer 7 service devices. The related configuration is packaged together so that it can be used by orchestration layers such as Cisco Application Centric Infrastructure (Cisco ACI) Windows Azure Pack integration to deploy Layer 4 to Layer 7 service devices.

About External and Public IP Address Pools

For Layer 4 to Layer 7 resource pools created in Cisco APIC Release 3.0(x) and earlier, the public and external IP address pools were one and the same and were simply marked as external. For Layer 4 to Layer 7 resource pools created in Cisco APIC Release 3.1(x) and later, there is a separation and distinction between these two types of address pools. External IP address pools are used for the external interface of the Layer 4 to Layer 7 device, and L3Out SVI IP allocation. For Layer 4 to Layer 7 devices that are connected through a VPC into the fabric, 3 IP addresses are consumed by the L3Out configuration (side A primary IP address, side B primary IP address, and secondary IP address) while port channel and single interface connections consume 2 IP addresses (primary IP address and secondary IP address).

Public IP address pools are used to allocate dynamic NAT IP addresses (1 per tenant VRF), load balancers, virtual IP addresses (1 per tenant EPG), and additional public NAT IP addresses.

By separating the two IP address types, a Cisco APIC administrator is able to achieve the following:

- Export only the IP addresses in the IP pool marked as public - hiding the device-level interface IP addresses
- Incrementally add to the public IP address pool's varying blocks of IP addresses as they are acquired and available to the common tenant L3Out

About External Layer 3 Routed Domains and the Associated VLAN Pools

The external L3Out routed domain is used to provision the L3Out for both the internal and external connectors of the Layer 4 to Layer 7 devices. These L3Outs allow for traffic to originate from outside of the Cisco Application Centric Infrastructure (Cisco ACI) fabric and be able to reach the resources that are inside of the Cisco ACI fabric. The L3Outs also allow for traffic to originate from within the Cisco ACI fabric and be able to reach outside of the Cisco ACI fabric. The VLANs within the VLAN pool that are associated with the Layer 3 routed domain must be unique for a given leaf or VPC leaf switch pair where the Layer 4 to Layer 7 service devices are connected. If the Layer 4 to Layer 7 service devices span across multiple leaf or VPC leaf switch pairs, then the limitation also extends to these leaf and VPC leaf switch pairs.



Note VLAN blocks should not be reconfigured or removed from the VLAN pools once the Layer 4 to Layer 7 resource pool is in use. You can add VLAN blocks to the current VLAN block if required for expansion.

The following VLAN pool sizing considerations apply:

- 1 VLAN is dynamically allocated per external IP address pool
- 1 VLAN is dynamically allocated per tenant virtual forwarding and routing (VRF) that is accessing the Layer 4 to Layer 7 resource pool
- The external routed domain and the associated VLAN pool can be used across Layer 4 to Layer 7 resource pools

About External Routed Networks

For information about configuring external routed networks, see the *Cisco APIC Layer 3 Networking Configuration Guide* document for your release at the following URL:

<https://www.cisco.com/c/en/us/support/cloud-systems-management/application-policy-infrastructure-controller-apic/tsd-products-support-series-home.html>

Creating an IP Address Pool for Layer 4 to Layer 7 Resource Pools Using the GUI

The following procedure creates an IP address pool for Layer 4 to Layer 7 resource pools using either GUI mode.

Procedure

-
- Step 1** On the menu bar, choose **Tenants > Common**.
- Step 2** In the **Navigation** pane, choose **Tenant Common > IP Address Pools**.
- Step 3** In the **Work** pane, choose **Actions > Create IP Address Pool**.
- Step 4** In the **Create IP Address Pool** dialog box, fill in the fields as required.

Do not include the gateway address in the **Address Ranges**. The gateway address will be used as the secondary IP address of the Layer 4 to Layer 7 device external L3Out, which will act as a pervasive gateway.

Example:

- **Name**—**ExtIPPool1**
- **Gateway Address**— **132.121.101.1/24**
- **Address Block**
 - **From**—**132.121.101.2**
 - **To**—**132.121.101.200**

- Step 5** Click **Submit**.
-

Creating a Dynamic VLAN Pool for Layer4 to Layer 7 Resource Pools Using the GUI

The following procedure creates a dynamic VLAN pool for Layer 4 to Layer 7 resource pools using the GUI mode.

Procedure

-
- Step 1** On the menu bar, choose **Fabric > Access Policies**.
- Step 2** In the **Navigation** pane, choose **Pools > VLAN**.
- Step 3** In the **Work** pane, choose **Actions > Create VLAN Pool**.
- Step 4** In the **Create VLAN Pool** dialog box, fill in the fields as required, except as specified below:

- a) For the **Allocation Mode** buttons, click **Dynamic Allocation**.
- b) On the **Encap Blocks** table, click +.
- c) In the **Create Ranges** dialog box, fill in the fields as specified below:
 - In the **Range** fields, enter the desired VLAN range.
 - For the **Allocation Mode** buttons, click **Inherit alloc mode from parent**.
- d) Click **OK**.

Step 5 In the **Create VLAN Pool** dialog box, click **Submit**.

Creating an External Routed Domain for Layer 4 to Layer 7 Resource Pools Using the GUI

The following procedure creates a dynamic VLAN pool for Layer 4 to Layer 7 resource pools using the GUI mode.

Procedure

- Step 1** On the menu bar, choose **Fabric > Access Policies**.
 - Step 2** In the **Navigation** pane, choose **Physical and External Domains > External Routed Domains**.
 - Step 3** In the **Work** pane, choose **Actions > Create Layer 3 Domain**.
 - Step 4** In the **Create Layer 3 Domain** dialog box, fill in the fields as required, except as specified below:
 - a) For the **Associated Attachable Entity Profile** drop-down list, choose the attachable entity profile to which all of the Layer 4 to Layer 7 service devices are connected.
 - b) For the **VLAN Pool** drop-down list, choose the dynamic VLAN pool that you created for Layer 4 to Layer 7 resource pools.
 - c) On the **Security Domains** table, add any required security domains.
 - Step 5** Click **Submit**.
-

Preparing Layer 4 to Layer 7 Devices for Use in Layer 4 to Layer 7 Resource Pools

To configure the physical connectivity of the Layer 4 to Layer 7 devices, see the appropriate configuration guide for each respective device regarding port channel or VPC configuration within the device.



Note For ASA55xx firewall devices that are context aware, the path configuration must be consistent across all the ASA contexts for a given physical ASA55xx. Configuring ASA contexts using different interfaces is not allowed in this configuration.

Validating the APIC Configuration of a Layer 4 to Layer 7 Device for Use in a Layer 4 to Layer 7 Resource Pool

The following procedure validates the Cisco Application Policy Infrastructure Controller (Cisco APIC) configuration of a Layer 4 to Layer 7 services device for use in Layer 4 to Layer 7 resource pools using the GUI mode.

Procedure

-
- Step 1** On the menu bar, choose **Tenants > Common**.
 - Step 2** In the Navigation pane, choose **Tenant *tenant_name* > Services > L4-L7 > Devices > ASA_or_NetScaler_logical_device_name > concrete_device_name**.
 - Step 3** In the **Work** pane, choose the **Policy** tab.
 - Step 4** In the **Interfaces** table, verify that there are at least 2 interfaces, with each one mapping to a validate path (port, port channel, or vPC) in the fabric.
 - Step 5** For each ASA or NetScaler, verify that there is both a **Cluster > consumer** interface and a **Cluster > provider** interface defined. Even if the NetScalers will be used for internal load balancing, having such a configuration allows the tenant to use the NetScaler in both private and public IP address load balancing.
 - Step 6** For HA configurations, verify that there are 2 concrete interfaces for each cluster interface. Doing so will ensure that each port, port channel, or vPC will be configured correctly.
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Configuring the Device Management Network and Routes

You must configure the management routes and remove the default route out of band directly on the Layer 4 to Layer 7 device.

The following example uses the Cisco Application Policy Infrastructure Controller (Cisco APIC) NX-OS-style CLI to configure the management route of an ASA firewall:

```
apic1(config)# route management 10.24.24.0 255.255.255.0 172.0.0.1
```

The following example uses the Cisco APIC NX-OS-style CLI to remove the default route:

```
apic1(config)# no route 0.0.0.0 0.0.0.0 172.0.0.1
```

The following example uses the Citrix NetScaler CLI to configure the management route of a NetScaler Application Delivery Controller (ADC) load balancer:

```
> add route 10.24.24.0 255.255.255.0 172.0.0.1
```

The following example uses the Citrix NetScaler CLI to remove the default route:

```
> rm route 0.0.0.0 0.0.0.0 172.0.0.1
```

Creating a Layer 4 to Layer 7 Resource Pool

Creating a Layer 4 to Layer 7 Resource Pool Using the GUI

The following procedure creates a Layer 4 to Layer 7 resource pool using the GUI mode. Once the resource pool has allocated various components for use by the tenants, you cannot modify to the resource pool. You can perform maintenance tasks such as adding IP address blocks, adding VLAN blocks, and adding logical devices, such as an ASA firewall or Citrix NetScaler load balancer.

Procedure

-
- Step 1** On the menu bar, choose **Tenants > Common**.
- Step 2** In the **Navigation** pane, choose **Tenant Common > Services > L4-L7 > L4-L7 Resource Pools**.
- Step 3** In the **Work** pane, choose **Actions > Create L4-L7 Resource Pool**.
- Step 4** In the **Create L4-L7 Resource Pool** dialog box, fill in the fields as required, except as specified below:
- In the **Private IP Address Subnet** field, enter the subnet that is used for internal device interface IP addresses, internal VIP addresses, and internal L3Out IP addresses.
 - For the **External IP Address Pool** drop-down list, choose the IP address pool that is used for the dynamic allocation of IP addresses used throughout the service graph and devices. You can create a new IP address pool if necessary. For **Connect Type**, choose **L3 External Network**.
 - For the **Public IP Address Pool** table, choose the IP address pool that is used for the dynamic allocation of IP addresses used for NAT IP addressing and VIP addressing. You can create a new IP address pool, if necessary. For **Connect Type**, choose **L3 External Network**.
 - For the **External Routed Domain** drop-down list, choose the external routed domain that you created for use in this Layer 4 to Layer 7 resource pool. You can create a new external routed domain if necessary.
 - In the **External Routed Networks** table, add the external routed networks that the tenants can consume.
The first external routed network will automatically be marked as *Default*. Only the default routed network is currently used.
 - In the **L4-L7 Devices** table, add the Layer 4 to Layer 7 devices that will be part of this Layer 4 to Layer 7 resource pool.
- Step 5** Click **Submit**.
-

Creating a Layer 4 to Layer 7 Resource Pool Using the NX-OS-Style CLI

This section provides example commands for using the NX-OS-style CLI to configure Layer 4 to Layer 7 resource pools.

Procedure

Step 1 Enter the configure mode.

```
apic1# configure
```

Step 2 Enter the configure mode for tenant common.

```
apic1(config)# tenant common
```

Step 3 Specify the Layer 4 to Layer 7 resource pool.

```
apic1(config)# 1417 resource-pool <resource pool name>
```

Step 4 Set the resource pool version.

```
apic1(config-resource-pool)# version normalized
```

Note

The version can be:

- **classic**: For resource pools created before Cisco Application Policy Infrastructure Controller (APIC) release 3.1(1).
- **normalized**: For resource pools created in or after Cisco APIC release 3.1(1).

Step 5 Associate an Layer 4 to Layer 7 devices to a resource pool.

```
apic1(config-resource-pool)# 1417-cluster Dev-ASA-4  
apic1(config-resource-pool)# 1417-cluster Dev-MPX-4
```

Step 6 Associate an IP address pool as an external IP address pool to a resource pool.

```
apic1(config-resource-pool)# address-pool mininetExtPoolL3Ext 13-external
```

Step 7 (For normalized resource pools) Associate an IP address pool as a public IP address pool to a resource pool.

```
apic1(config-resource-pool)# public-address-pool mininetPubPoolL3Ext 13-external
```

Step 8 Associate to an external routed domain.

```
apic1(config-resource-pool)# external-routed-domain L3ServicesDom
```

Step 9 Configure the private IP address subnet for a resource pool.

```
apic1(config-resource-pool)# subnet 192.168.254.1/24
```

Step 10 Associate to an L3Out EPG in tenant common.

```
apic1(config-resource-pool)# l3out vpcDefaultInstP default
```

Configuring a Layer 4 to Layer 7 Resource Pool Using the GUI

Configuring Layer 4 to Layer 7 Devices in a Resource Pool

Adding Layer 4 to Layer 7 Devices to a Layer 4 to Layer 7 Resource Pool



Note A dedicated VLAN will be consumed for each for each L3Out created for the tenant in their private VRF. The dynamic VLAN pool associated with the Layer 3 domain may need additional VLANs added to accommodate the additional devices to the resource pool.

You can add new Layer 4 to Layer 7 devices to the resource pool at any time.

Procedure

- Step 1** On the menu bar, choose **Tenants > Common**.
- Step 2** In the **Navigation** pane, choose **Tenant Common > Services > L4-L7 > L4-L7 Resource Pools**.
The resource pools appear in the **Navigation** pane as a drop-down list under **L4-L7 Resource Pools**.
- Step 3** Click the Layer 4 to Layer 7 resource pool to which you want to add a device.
- Step 4** From the Work pane, click the **L4-L7 Devices** tab.
- Step 5** From the **L4-L7 Devices** table, click the plus icon (+).
The **Create An L4-L7 Device** dialog appears.
- Step 6** Click the **Device** drop-down arrow and choose a Layer 4 to Layer 7 device.
- Step 7** Click **Submit**.

Removing Layer 4 to Layer 7 Devices from a Layer 4 to Layer 7 Resource Pool

The resource pool is unusable by any tenants without available Layer 4 to Layer 7 devices configured. If the L4-L7 Device is not allocated and exported to any tenants, perform the following:

Procedure

- Step 1** On the menu bar, choose **Tenants > Common**.
- Step 2** In the **Navigation** pane, choose **Tenant Common > Services > L4-L7 > L4-L7 Resource Pools**.
The resource pools appear in the **Navigation** pane as a drop-down list under **L4-L7 Resource Pools**.
- Step 3** Click the Layer 4 to Layer 7 resource pool with the device you want to remove.

- Step 4** From the Work pane, click the **L4-L7 Devices** tab.
- Step 5** Click to highlight the Layer 4 to Layer 7 device you want to remove then click the **trashcan** icon.
A confirmation dialog appears.
- Step 6** Click **Yes** to confirm the deletion.

Configuring External IP Address Pools in a Resource Pool

Adding an External IP Address Pool to a Layer 4 to Layer 7 Resource Pool

If the resource pool is in use, do not remove or update the external IP address pool as it is in use by tenants.

Procedure

- Step 1** On the menu bar, choose **Tenants > Common**.
- Step 2** In the **Navigation** pane, choose **Tenant Common > Services > L4-L7 > L4-L7 Resource Pools**.
The resource pools appear in the **Navigation** pane as a drop-down list under **L4-L7 Resource Pools**.
- Step 3** Click the Layer 4 to Layer 7 resource pool to which you want to add an external IP address pool.
- Step 4** From the Work pane, click the **Basic** tab.
- Step 5** From the **External IP Address Pool** table, click the plus icon (+) .
The **External IP Address Pool** fields appear.
- Step 6** Click the **Connect Type** drop-down arrow and choose **L3 External Network** then enter the appropriate values in the remaining **External IP Address Pool** fields.
- Note**
For a description of a field, click the help icon (?) in the top-right corner.
- Step 7** Click **Update**.

Removing an External IP Address Pool from a Layer 4 to Layer 7 Resource Pool



Note

- If the resource pool is in use, do not remove or update the external IP address pool as it is in use by tenants.
- If removing, adding, or updating the external IP address pool to handle IP address pool exhaustion, do not remove and add a larger IP address pool. In these situations, create a new Layer 4 to Layer 7 resource pool with a similar configuration such as Layer 3 domain and an L3Out but with a new external IP address pool.
- The resource pool is unusable by any tenants without an external IP address pool configured.

Procedure

-
- Step 1** On the menu bar, choose **Tenants > Common**.
- Step 2** In the **Navigation** pane, choose **Tenant Common > Services > L4-L7 > L4-L7 Resource Pools**.
The resource pools appear in the **Navigation** pane as a drop-down list under **L4-L7 Resource Pools**.
- Step 3** Click the Layer 4 to Layer 7 resource pool with the external IP address pool you want to remove.
- Step 4** From the Work pane, click the **Basic** tab.
- Step 5** From the **External IP Address Pool** table, click to highlight the external IP address pool you want to remove then click the **trashcan** icon.
A confirmation dialog appears.
- Step 6** Click **Yes** to confirm the deletion.
-

Configuring Public IP Address Pools in a Resource Pool

Adding Public IP Address Pools to a Layer 4 to Layer 7 Resource Pool



Note

- For Layer 4 to Layer 7 resource pools created in Cisco APIC Release 3.0(x) and earlier, the external IP address pool is used as the public IP address pool and should not be modified once in use by any tenants.
 - For Layer 4 to Layer 7 resource pools created in Cisco APIC Release 3.1(x) and later, you can add new public IP address pools to the resource pool at any time.
 - The resource pool is unusable by any tenant without public IP address pools configured.
-

Procedure

-
- Step 1** On the menu bar, choose **Tenants > Common**.
- Step 2** In the **Navigation** pane, choose **Tenant Common > Services > L4-L7 > L4-L7 Resource Pools**.
The resource pools appear in the **Navigation** pane as a drop-down list under **L4-L7 Resource Pools**.
- Step 3** Click the Layer 4 to Layer 7 resource pool to which you want to add a public IP address pool.
- Step 4** From the Work pane, click the **Basic** tab.
- Step 5** From the **Public IP Address Pool** table, click the plus icon (+).
The **Public IP Address Pool** fields appear.
- Step 6** Click the **Connect Type** drop-down arrow and choose **L3 External Network** then enter the appropriate values in the remaining **External IP Address Pool** fields.

Note

For a description of a field, click the help icon (?) in the top-right corner.

Step 7 Click **Update**.

Removing Public IP Address Pools from a Layer 4 to Layer 7 Resource Pool

**Note**

- For Layer 4 to Layer 7 resource pools created in Cisco APIC Release 3.0(x) and earlier, the external IP address pool is used as the public IP address pool and should not be modified once in use by any tenants.
 - For Layer 4 to Layer 7 resource pools created in Cisco APIC Release 3.1(x) and later, removing IP address pools from the resource pool should not be performed if any tenants are currently utilizing the IP address pool.
 - The resource pool is unusable by any tenant if no public IP address pools configured.
-

Procedure

Step 1 On the menu bar, choose **Tenants > Common**.

Step 2 In the **Navigation** pane, choose **Tenant Common > Services > L4-L7 > L4-L7 Resource Pools**.

The resource pools appear in the **Navigation** pane as a drop-down list under **L4-L7 Resource Pools**.

Step 3 Click the Layer 4 to Layer 7 resource pool with the public IP address pool you want to remove.

Step 4 From the Work pane, click the **Basic** tab.

Step 5 From the **Public IP Address Pool** table, click to highlight the public IP address pool you want to remove then click the **trashcan** icon.

A confirmation dialog appears.

Step 6 Click **Yes** to confirm the deletion.

Updating an External Routed Domain for a Layer 4 to Layer 7 Resource Pool

The resource pool is unusable by any tenant if no external routed domain is configured.

Procedure

Step 1 On the menu bar, choose **Tenants > Common**.

Step 2 In the **Navigation** pane, choose **Tenant Common > Services > L4-L7 > L4-L7 Resource Pools**.

The resource pools appear in the **Navigation** pane as a drop-down list under **L4-L7 Resource Pools**.

- Step 3** Click the Layer 4 to Layer 7 resource pool with the external routed domain you want to update.
- Step 4** From the Work pane, click the **External** tab.
- Step 5** Click the **External Routed Domain** drop-down arrow and choose a Layer 3 domain.
- Step 6** Click **Submit**.
-

Updating External Routed Networks for a Layer 4 to Layer 7 Resource Pool

The resource pool is unusable by any tenant if no external routed networks are configured.

Procedure

- Step 1** On the menu bar, choose **Tenants > Common**.
- Step 2** In the **Navigation** pane, choose **Tenant Common > Services > L4-L7 > L4-L7 Resource Pools**.
The resource pools appear in the **Navigation** pane as a drop-down list under **L4-L7 Resource Pools**.
- Step 3** Click the Layer 4 to Layer 7 resource pool with the external routed network you want to update.
- Step 4** From the Work pane, click the **External** tab.
- Step 5** From the **External Routed Networks** table, click the plus icon (+).
The **External Routed Networks** fields appear.
- Step 6** Enter the appropriate value in the **External Routed Networks** fields.
- Note**
For a description of a field, click the help icon (?) in the top-right corner.
- Step 7** Click **Update**.
-