



Deploying a Service Graph

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Overview of Deploying a Service Graph

The following list provides an overview of the tasks that you must perform to deploy a service graph:

- 1 Create physical and virtual domains.
- 2 Configure the basic management access on the Layer 4 to Layer 7 device
- 3 Import the device package.
See [Importing a Device Package Using the GUI, on page 5](#).
- 4 Create the bridge domains and VRFs.
See [Creating Bridge Domains and VRFs Using the GUI, on page 5](#).
- 5 Create endpoint groups and contracts.
See [Creating Endpoint Groups and Contracts Using the GUI, on page 6](#).
- 6 Configure logical devices and concrete devices.
See [Creating a Logical or Concrete Device Using the GUI, on page 9](#).

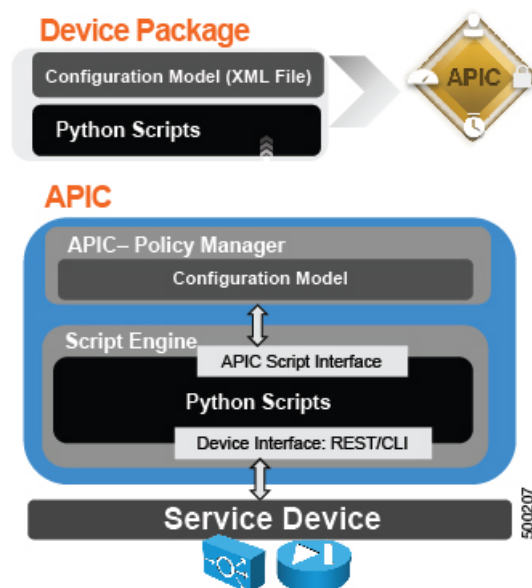
- 7 Create or import a function profile.
See [Creating a Function Profile Using the GUI](#), on page 13 or [Importing a Function Profile Using the GUI](#), on page 14.
- 8 Create a service graph template and either use a function profile or enter the Layer 4 to Layer 7 parameters by hand.
See [Creating a Layer 4 to Layer 7 Service Graph Template Using the GUI](#), on page 14.
- 9 Apply the service graph template.
See [Applying a Service Graph Template to Endpoint Groups Using the GUI](#), on page 15.
- 10 Create the logical device context (optional if you used the GUI wizard).
See [Creating a Device Selection Policy Using the GUI](#), on page 20.

About APIC-to-Layer 4 to Layer 7 Device Communication

The Application Policy Infrastructure Controller (APIC) requires a device package so that it can communicate with the Layer 4 to Layer 7 device. The device package performs the following functions to enable the communication:

- Service functions are added to the APIC through device package
- The device package contains a device model and device scripts (written in Python)
- The device model defines the service function and configuration
- Device scripts translate APIC API callouts to device-specific callouts
- Device scripts can interface with the device using REST or SSH

Figure 1: Device Package and APIC

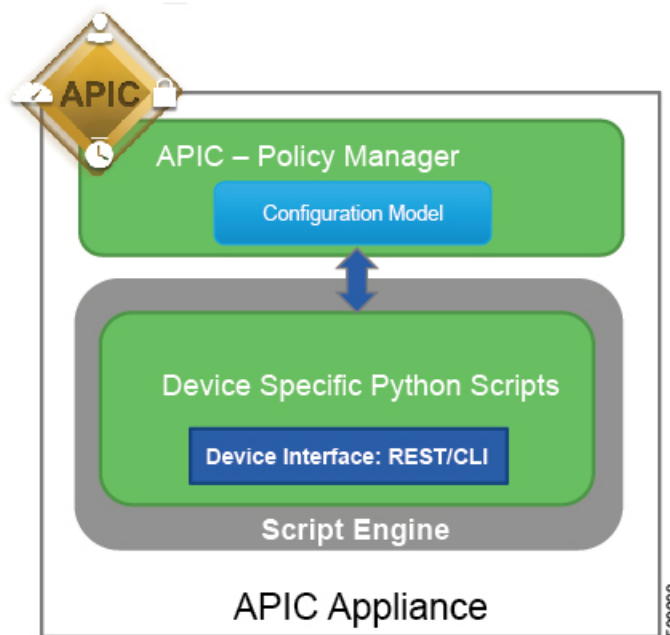


The functions in device script are classified into three categories:

- Device/infrastructure—For device-level configuration and monitoring
- Service events—For configuring functions, such as a server load balancer or SSL, on the device
- Endpoint or network events—For handling endpoint and network attach/detach events

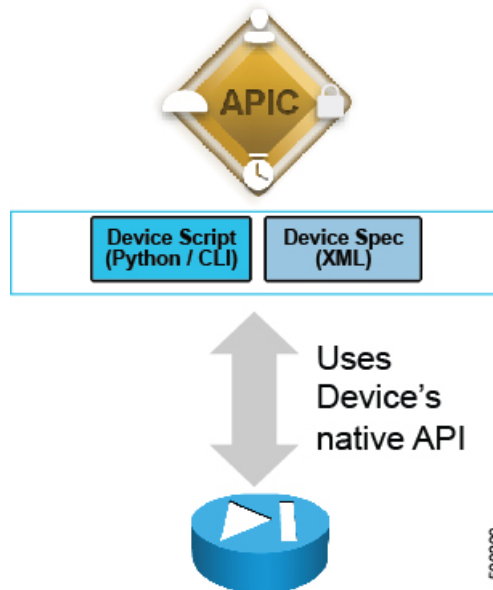
APIC uses the device configuration model provided in the package to pass the appropriate configuration to the device scripts. Device script handlers interface with the device using its REST interface or CLI.

Figure 2: How the Device Scripts Interface with a Service Device



The APIC interfaces with the device by using Python scripts. The APIC calls a device-specific python script function on various events.

Figure 3: The APIC Interfaces with the Device Using Python Scripts



The only configuration needed on the Layer 4 to Layer 7 device is management access. You can enable this access by enabling SSH, enabling HTTP access, and configuring the credentials on the device.

About Layer 4 to Layer 7 Configuration Parameters

Each device package defines Layer 4 to Layer 7 configuration parameters, which configure the functions in a service graph. Parameters are always in key and value pairs. The `device_specification.xml` file within the device package defines the `vnsMDevCfg` object, which is the model configuration. The `vnsMDevCfg` object defines the Layer 4 to Layer 7 parameters.

For more information about configuration parameters, see the *Cisco APIC Layer 4 to Layer 7 Services Deployment Guide*.

You can use a function profile so that you can reuse the same parameter values when deploying a service graph. For more information, see [About Function Profiles](#), on page 12.

Setting Up Management Access to the Layer 4 to Layer 7 Device

The service graph configuration requires the Application Policy Infrastructure Controller (APIC) to communicate with the Layer 4 to Layer 7 device management address. For a physical appliance, the APIC communicates with the IP address of the management port of the appliance. In the case of a virtual appliance, the APIC communicates with the management address of the virtual appliance that is associated with the first vNIC (network adapter 1).

For out-of-band management, no particular configuration is needed on the APIC to establish this communication.

For in-band management, the APIC can talk to a physical or virtual appliance connected to the fabric through the Cisco Application Centric Infrastructure (ACI) fabric itself. You can configure a management endpoint group and create a pool of addresses that are used to apply Network Address Translation (NAT) to the IP address of the APIC to communicate with the appliance. You implement this capability by creating an endpoint group for management and a management address pool in this endpoint group.

The APIC is a clustered set of servers, each with its own IP address. You can configure the service graph from any of the controllers, and the configurations and the device package are replicated. Only one controller will talk to the Layer 4 to Layer 7 device to configure it, and you do not need to know which one it is except for troubleshooting purposes.

Importing a Device Package Using the GUI

Before performing any configuration based on service graphs, you must download and install the appropriate device package in the Application Policy Infrastructure Controller (APIC). A device package specifies to the APIC what devices you have and what the devices can do.

Procedure

- Step 1** Download an appropriate device package. You can find the list of partners at the following URL:
<http://www.cisco.com/c/en/us/solutions/data-center-virtualization/ecosystem.html>
This URL is the Partner Ecosystem page, where you can download the appropriate device package.
- Step 2** Log in to the APIC as the provider administrator.
- Step 3** On the menu bar, choose **L4-L7 Services > Packages**.
- Step 4** In the **Navigation** pane, choose **L4-L7 Service Device Types**.
- Step 5** In the **Work** pane, choose **Actions > Import Device Package**. The **Import Device Package** dialog box appears.
- Step 6** Click **Browse...** and browse to the device package that you want to use.
For information about creating device packages, see the *Cisco APIC Layer 4 to Layer 7 Device Package Development Guide*.
- Step 7** Click **Open**.
- Step 8** Click **Submit**.
-

Creating Bridge Domains and VRFs Using the GUI

The data plane connectivity of the Layer 4 to Layer 7 devices is based on bridge domains. You need to create at least two bridge domains: one for the client side (or outside or consumer side) and one for the server side (inside or provider side).

Procedure

- Step 1** On the menu bar, choose **Tenants > All Tenants**.
- Step 2** In the Work pane, double click the tenant's name.
- Step 3** In the Navigation pane, choose **Tenant *tenant_name* > Networking > Bridge Domains**.
- Step 4** In the Work pane, choose **Actions > Create Bridge Domain**.
- Step 5** In the **Create Bridge Domain** dialog box, fill in the fields as required, except as specified below:
- In the **VRF** drop-down list, choose the VRF with which to associate the bridge domain. Optionally, choose **Create VRF** to create a new VRF. In the **Create VRF** dialog box, fill in the fields as required and then click **Submit**.
 - For **L2 Unknown Unicast**, choose flooding and keep **ARP Flooding** enabled. Depending on the deployment mode, you could also enable hardware-proxy, but the description of this configuration is outside of the scope of this guide.
 - For the **ARP Flooding** check box, put a check in the box if you will use ARP flooding. The most common configuration uses ARP flooding.
- Step 6** Click **Next**.
- Step 7** If you plan to provide the default gateway from the fabric bridge domain (typically the outside bridge domain), perform the following steps:
- For the **Unicast Routing** check box, put a check in the box if you will use unicast routing. If unicast routing is not enabled, the endpoints' IP addresses are not learned. If unicast routing is enabled, the endpoints' IP addresses are learned.
 - In the **Subnets** section, click + to add a subnet, and in the **Create Subnets** dialog box, fill in the fields as required.
Creating the subnets is required for creating a Layer 2 domain with routing.
Configure the default gateway by creating a subnet and entering an IP address.
If you plan to provide routing from the fabric, for example from the outside of the service graph, you must configure the subnet on the bridge domain.
- Step 8** Click **Next**.
- Step 9** Fill in the fields as required.
- Step 10** Click **Finish**.
-

Creating Endpoint Groups and Contracts Using the GUI

The service graph requires a contract and subject to be associated with it. The service graph is deployed between a client-side, outside, consumer endpoint group and a server-side, inside, provider endpoint group. The first endpoint group is associated with the client-side or outside bridge domain and the second endpoint group is associated with the server-side or inside bridge domain.

Procedure

- Step 1** On the menu bar, choose **Tenants > All Tenants**.
- Step 2** In the Work pane, double click the tenant's name.
- Step 3** In the Navigation pane, choose **Tenant *tenant_name* > Application Profiles**.
- Step 4** In the Work pane, choose **Actions > Create Application Profile**.
- Step 5** In the **Create Application Profile** dialog box, fill in the fields as required, except as specified below:
- a) In the **EPGs** section, click + to create an endpoint group and fill in the fields as required.
In the **Provided Contract** and **Consumed Contract** fields, you can choose an existing contract, or you can choose **Create Contract** to create a new contract.
 - b) Click **Update**.
- Step 6** Click **Submit**.
-

Logical Devices and Concrete Devices

Cisco Application Centric Infrastructure (ACI) uses the following terminology:

- Concrete device—A concrete, or physical, device is a service device, such as a single load balancer or a single firewall.
- Logical device—A logical device is a cluster of two devices that operate in active-standby mode.
- Logical device context—The logical device context specifies the criteria for determining which specific device in the inventory to use to render a service graph.

Firewalls and load balancers are seldom deployed as single devices. Instead, they normally are deployed as clusters of active-standby pairs. Cisco ACI provides an abstraction to represent these clusters: the device cluster or logical device. The administrator must help ACI perform the mapping between the service graph and the clusters of firewalls and load balancers. The administrator also needs to tell ACI which pairs of concrete devices constitute a cluster. The GUI simplifies this process, guiding you through the steps to define each cluster of firewalls or load balancers.

The following screenshot shows the configuration dialog box for concrete and logical devices:

Figure 4: Configuring Logical Devices Using the GUI

Please select device package and enter connectivity information.

The screenshot displays a configuration dialog box for logical devices, divided into several sections:

- General:**
 - Managed:
 - Name:
 - Service Type: ADC
 - Device Type: PHYSICAL (selected) | VIRTUAL
 - Physical Domain: select an option
 - Mode: Single Node | HA Cluster
 - Device Package: select a package
 - Model:
- Connectivity:**
 - APIC to Device: Out-Of-Band | In-Band
- Credentials:**
 - Username:
 - Password:
 - Confirm Password:
- Device 1:**
 - Management IP Address:
 - Management Port: enter or select va
 - Device Interfaces:

Name	Path
- Cluster:**
 - Management IP Address:
 - Management Port: enter or select va
 - Cluster Interfaces:

Type	Name	Concrete Interfaces

The fields in this dialog box refer to the management information for the cluster of devices. The virtual address is the management address used when the pair of firewalls or load balancers is operating in active-standby mode.

About Model Choice

When you create a concrete device ($CDev$), you can choose the model for a given device package, matching the model to the type of device that you are configuring. In some cases, you might want to choose the option `Unknown`, which is the generic model type. With this option, you have more control over the definition of the type of device and whether or not the device is context aware.

About Connectivity Options

Under the concrete device definition, you must specify which domain to use. This setting allows Cisco Application Centric Infrastructure (ACI) to locate the device if it is on a virtualized server and provides a pool of VLANs that ACI can use to create the connectivity. Another option available as part of the concrete device configuration is `EPG`. This option appears only if you are configuring in-band management and if this is the endpoint group that provides management access to the virtual appliance. In this case, vNIC1 on the virtual appliance is connected to this endpoint group.

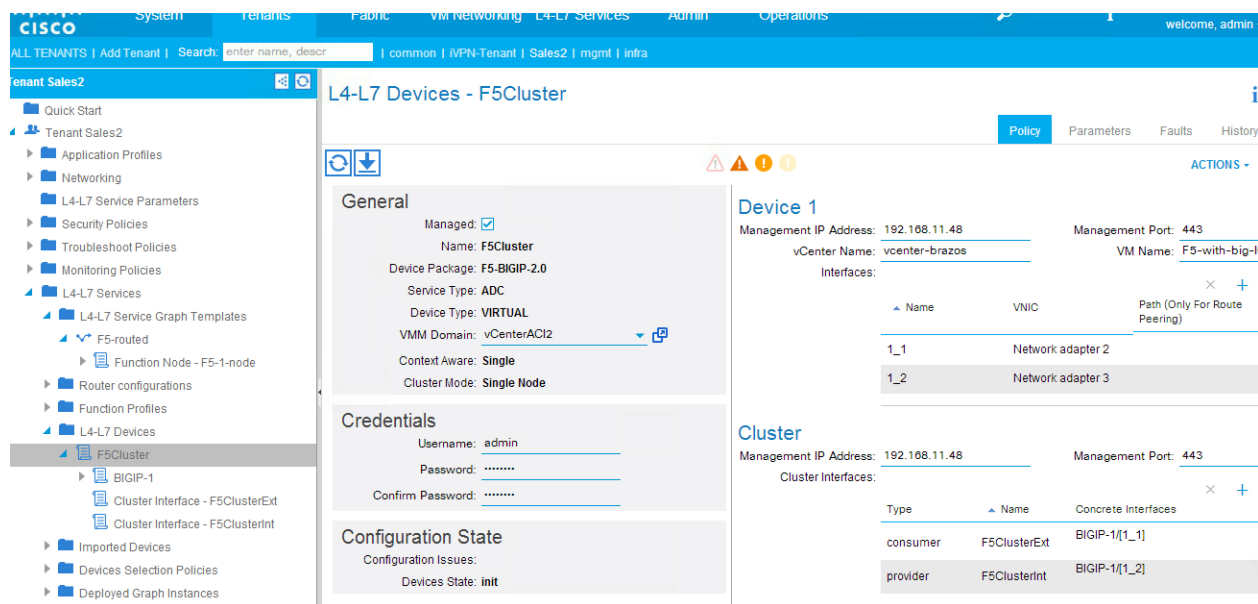
About Interface Numbering

When using the GUI, you must configure logical interfaces. A logical interface defines a naming convention for the building block of the cluster and its mapping to the concrete device and to the metadvice.

For example, the metadvice of an F5 load balancer defines an external and an internal interface. The cluster model in Cisco Application Centric Infrastructure (ACI) defines two interfaces and lets you choose the name (logical interface, or LIF). Each interface maps to a metadvice interface and also to a physical (concrete) device interface. This process allows ACI to render the graph correctly.

The following screenshot shows an example of a mapping of a logical interface to a concrete device interface:

Figure 5: Mapping of a Logical Interface to a Concrete Device Interface



The interfaces have different names on the service device itself than the names that they have as part of the ACI configuration. For example, in the case of F5, the interfaces are numbered 1.1, 1.2, and so on. ACI allows you to reference these interfaces using the character "_" as a replacement for the "/" and "." characters. For example, F5 interfaces are referred to as 1_1, 1_2, and so on.

Creating a Logical or Concrete Device Using the GUI

You can use a virtual or a physical Layer 4 to Layer 7 device in a service graph. You configure a concrete device to provide information to the Application Policy Infrastructure Controller (APIC) about where the device is and how to manage it. You configure a logical device to provide information to the APIC about the HA pair of Layer 4 to Layer 7 devices that Cisco Application Centric Infrastructure (ACI) can use for service graph purposes.

When you connecting to a physical device, you specify the physical interface. When you connect to a virtual machine, you specify the VMM domain, the virtual machine, and the virtual interfaces.

When defining a logical or concrete device, ACI gives you the option to choose which type of device it is by using the information included in the device package. Additionally, you can select an unknown model.

Procedure

- Step 1** On the menu bar, choose **Tenants > All Tenants**.
- Step 2** In the Work pane, double click the tenant's name.
- Step 3** In the Navigation pane, choose **Tenant *tenant_name* > L4-L7 Services > L4-L7 Devices**.
- Step 4** In the Work pane, choose **Actions > Create L4-L7 Devices**.
- Step 5** In the **Create L4-L7 Devices** dialog box, fill in the fields as required, except as specified below:
- a) Put a check in the **Managed** check box.
 - b) In the **Service Type** drop-down list, choose **ADC**, **Firewall**, or **IPS/IDS**.
 - c) In the **Physical Domain** or **VMM Domain** drop-down list, choose the domain to use.
For a concrete device, the domain allows ACI to locate the device if it is on a virtualized server and provides a pool of VLANs that ACI can use to create the connectivity.
 - d) In the **Model** drop-down list, choose the model that matches the type of device that you are configuring.
For a concrete device, in some cases you might want to choose **Unknown** for the model, which is the generic model type. With this option, you have more control over the definition of the type of device and whether or not the device is context aware.
 - e) In the **Connectivity** section, in the **EPG** drop-down list, choose a management endpoint group. This field appears only if you are configuring in-band management and if this is the endpoint group that provides management access to the virtual appliance.
 - f) (Only for physical devices) In the **Device 1** section, fill in the fields as required, except as specified below:
 - 1 In the **Management IP Address** field, enter the IP address used to manage the Layer 4 to Layer 7 device.
 - 2 In the **Physical Interfaces** section, the **Name** must use a syntax that works on the Layer 4 to Layer 7 device.
 - g) (Only for virtual devices) In the **Device 1** section, fill in the fields as required, except as specified below:
 - 1 In the **VM** drop-down list, choose the appropriate virtual machine.
 - h) (Only for physical devices) In the **Cluster** section, for **Cluster Interfaces**, for the **Type**, choose **consumer** for outside or client-side interfaces, and **provider** for inside or server-side interfaces.
- Step 6** Complete the remainder of the dialog screens and click **Finish** on the last screen.
- Step 7** Verify that the device is stable. In the Navigation pane, choose ***tenant_name* > L4-L7 Services > L4-L7 Devices > *device_name***.
- Step 8** In the Work pane, in the **Configuration State** section, the device is stable if the **Device State** is `stable`. If the device does not show as `stable`, verify the faults in the **Operations** tab and verify that the management address of the Layer 4 to Layer 7 device is reachable.
-

Creating a Logical or Concrete Device with an HA Cluster Using the GUI

An HA configuration is set up at two levels: the logical device level, and the Layer 4 to Layer 7 parameters level.

At the logical device level, you tell Cisco Application Centric Infrastructure (ACI) which interfaces are the same interface. For example, the outside is made of 2 outside interfaces of each appliance. You also indicate which ports are failover link ports.

At the Layer 4 to Layer 7 parameters level, you provide the IP address for each interface. You might need to make some IP addresses "floating". You also provide the IP address for the failover links. For a physical ASA HA configuration, the IP address for the cluster interface is the admin context IP address.

Procedure

-
- Step 1** On the menu bar, choose **Tenants > All Tenants**.
 - Step 2** In the Work pane, double click the tenant's name.
 - Step 3** In the Navigation pane **Tenants > All Tenants**, choose **Tenant *tenant_name* > L4-L7 Services > L4-L7 Devices**.
 - Step 4** In the Work pane, choose **Actions > Create L4-L7 Devices**.
 - Step 5** In the **Create L4-L7 Devices** dialog box, fill in the fields as required, except as specified below:
 - a) Put a check in the **Managed** check box.
 - b) In the **Service Type** drop-down list, choose **ADC** or **Firewall**.
 - c) For the **Mode** radio buttons, click **HA Cluster**.
 - d) For the **Device 1** and **Device 2** sections, for **Device Interfaces**, configure the same failover LAN and failover link device interfaces for both devices.
 - e) (Only for physical devices) In the **Device 1** and **Device 2** sections, fill in the fields as required, except as specified below:
 - 1** In the **Management IP Address** field, enter the IP address used to manage the Layer 4 to Layer 7 device.
 - 2** In the **Physical Interfaces** section, the **Name** must use a syntax that works on the Layer 4 to Layer 7 device.
 - f) In the **Cluster** section, for **Cluster Interfaces**, for the **Type**, choose **consumer** for outside or client-side interfaces, and **provider** for inside or server-side interfaces.
 - Step 6** Complete the remainder of the dialog screens and click **Finish** on the last screen.
 - Step 7** Verify that the device is stable. In the Navigation pane, choose ***tenant_name* > L4-L7 Services > L4-L7 Devices > *device_name***.
 - Step 8** In the Work pane, in the **Configuration State** section, the device is stable if the **Device State** is *stable*. If the device does not show as *stable*, verify the faults in the **Operations** tab and verify that the management address of the Layer 4 to Layer 7 device is reachable.
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Verifying the Status of a Logical or Concrete Device

You can verify the status of the device appliance by viewing the logical or concrete device configuration to see if it is stable.

Procedure

- Step 1** On the menu bar, choose **Tenants > All Tenants**.
 - Step 2** In the Work pane, double click the tenant's name.
 - Step 3** In the Navigation pane, choose **Tenant *tenant_name* > L4-L7 Services > L4-L7 Devices > *device_name***.
 - Step 4** In the Work pane, choose the **Policy** tab.
 - Step 5** Choose **Actions > Re-Query For Device Health**.
 - Step 6** In the **Confirmation** dialog box, click **Yes**.
 - Step 7** In the **Configuration State** section, ensure that the **Device State** of the device is `stable`.
If the device is stable, then it has been discovered and has connectivity with Cisco Application Centric Infrastructure (ACI).
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Function Profiles

About Function Profiles

A function profile is a collection of pre-configured Layer 4 to Layer 7 parameters. Entering the Layer 4 to Layer 7 parameters is tedious and error prone due to the often large number of parameters that must be entered manually and individually. The function profile solves this problem since it is reusable. A function profile is specific to one node or function used in the template. The function profile is like an XML DTD with a reduced set of fields or with fields that are pre-populated based on the specific use case.

For example, a function profile for a web service could have the following preset parameters:

- L4 port = 80
- Load Balancing Method: Round Robin

Whenever you use this function profile, these parameters will automatically be set. You can then add more parameters or edit the preset parameters as necessary.

When you apply a service graph template, you can choose a function profile to deploy with the template. Function profiles can be also already part of the device package, in which case you only need to edit the function profiles to complete them when you deploy the service graph template.

When you create a function profile, some of the parameters are mandatory. Most of the mandatory parameters are highlighted in red in the GUI, but you must refer to the vendor's device package documentation to verify which parameters are mandatory.

Creating a Function Profile Using the GUI

A Function Profile provides the default values for your service graph template. The following procedure explains how to create a new function profile.

Procedure

- Step 1** On the menu bar, choose **Tenants > All Tenants**.
- Step 2** In the Work pane, double click the tenant's name.
- Step 3** In the Navigation pane, choose **Tenant *tenant_name* > L4-L7 Services > Function Profiles**.
- Step 4** Right click **Function Profiles** and choose **Create L4-L7 Services Function Profile**.
- Step 5** In the **Create L4-L7 Services Function Profile** dialog box, fill in the fields as required, except as specified below:
 - a) In the **Profile Group** drop-down list, choose **Create Function Profile Group**.

A profile group is a mechanism that allows you to group your profiles together for organizational purposes. For example, you may want to create a profile for your Web, legacy, or e-mail applications. You can create groups and then you can put your profiles into those groups. You may see that you already have an existing group available, but if you do not, then you can create a new one by naming it and providing a description in the **Create L4-L7 Services Function Profile Group** window.
- Step 6** In the **Create L4-L7 Services Function Profile Group** dialog box, fill in the fields as required.
- Step 7** Click **Submit**.

Now you have successfully completed and saved a profile group, which now appears in the **Create L4-L7 Services Function Profile** dialog box.

A profile is created for a particular service function. What you choose from the **Device Function** drop-down list in the **Create L4-L7 Services Function Profile** is the function for which you are writing a profile. From the drop-down list, you will see a list of device packages with service functions available in the Application Policy Infrastructure Controller (APIC) after you have imported the device packages.
- Step 8** Back in the **Create L4-L7 Services Function Profile** dialog box, remove the check from the **Copy Existing Profile Parameters** check box.
- Step 9** In the **Device Function** drop-down list, choose a device package that has a function.

Options are displayed with the various parameters that are part of that function. The purpose of the profile is to provide the default values for the parameters.

Note At this point none of these parameters have any values, but you can add them, which are then used as the default values. The function profiles can be used by the graph templates after you provide these values. These values are applied to the graph template as default values, which means that if you use the graph templates and you do not provide a value for that particular parameter, then the APIC looks up the profile and see if the value is there. If it is there, then the APIC uses that.
- Step 10** Add values in the **Features and Parameters** section at the bottom of the **Create L4-L7 Services Function Profile** window. There are two tabs, **Basic Parameters** and **All Parameters**. The **Basic Parameters** tab includes a list of parameters that are marked as mandatory (required) in the package. The **All Parameters** tab includes a list of the basic parameters as well as some additional / optional ones for advanced configurations. The reason we expose the **Basic Parameters** is because these are part of the basic configuration and the administrator is expected to fill these out. **All Parameters** are optional so unless you want to customize the functionality, these parameters can be left out.
- Step 11** Click **Submit**.

Now you have completed and saved your function profile.

Importing a Function Profile Using the GUI

If you already have a function profile that you saved to your local machine, you can import it into (post it to) the Application Policy Infrastructure Controller (APIC).

Procedure

- Step 1** On the menu bar, choose **Tenants > All Tenants**.
 - Step 2** In the Work pane, double click the tenant's name.
 - Step 3** In the Navigation pane, choose *tenant_name* > **L4-L7 Services > Function Profiles > *function_profile_group_name***.
function_profile_group_name is the function profile group into which you want to import the function profile.
 - Step 4** Right click *function_profile_group_name* and choose **Post ...**.
 - Step 5** In the **Post** dialog box, click **Browse...** and browse to the function profile's XML or JSON file.
 - Step 6** Click **Post**.
 - Step 7** (Optional) Modify or add to the parameters in the imported function profile.
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Service Graph Templates

Creating a Layer 4 to Layer 7 Service Graph Template Using the GUI

A service graph template is a sequence of Layer 4 to Layer 7 functions or devices and their associated configuration, which can be provided by using function profiles. The service graph template must be associated with a contract to be "rendered"—or configured—on the Layer 4 to Layer 7 device and on the fabric.

Before You Begin

- You must have configured a tenant.

Procedure

- Step 1** On the menu bar, choose **Tenants > All Tenants**.
- Step 2** In the Work pane, double click the tenant's name.
- Step 3** In the Navigation pane, choose **Tenant *tenant_name* > L4-L7 Services > L4-L7 Service Graph Templates**.
- Step 4** In the Work pane, choose **Actions > Create a L4-L7 Service Graph Template**.
- Step 5** In the **Create a L4-L7 Service Graph Template** dialog box, in the **Device Clusters** section, choose a device cluster.
- Step 6** Complete the following fields:

Name	Description
Graph Name field	Enter the name of the service graph template.
Graph Type radio buttons	Choose to create a new service graph template or clone an existing service graph template.
Existing Graphs drop-down list	(Only for cloning an existing service graph template) Choose an existing service graph template to clone.

- Step 7** (Only for creating a new service graph template) Drag a device from the **Device Clusters** section and drop it between the consumer endpoint group and provider endpoint group to create a service node.
- Step 8** (Optional) (Only for cloning an existing service graph template) Remove the existing node and drag a different device cluster to the node area to create a service node.
- Step 9** Click **Submit**.
- Step 10** (Optional) In the **Navigation** pane, click the service graph template. The screen presents a graphic topology of the service graph template.

Applying a Service Graph Template to Endpoint Groups Using the GUI

The following procedure explains how to apply a service graph template to endpoint groups:

Before You Begin

You must have created the following things:

- Application endpoint groups
- A service graph template

Procedure

- Step 1** On the menu bar, choose **Tenants > All Tenants**.
- Step 2** In the Work pane, double click the tenant's name.
- Step 3** In the Navigation pane, choose **Tenant *tenant_name* > L4-L7 Services > L4-L7 Service Graph Templates > *template_name***.
- Step 4** In the Work pane, choose **Actions > Apply L4-L7 Service Graph Template**.
You will be associating a Layer 4 to Layer 7 service graph template to your consumer and provider endpoint groups.
- Step 5** In the **Apply L4-L7 Service Graph Template To EPGs** dialog, in the **EPG Information** section, complete the following fields:

Name	Description
Consumer EPG/External Network drop-down list	Choose a consumer endpoint group.
Provider EPG/External Network drop-down list	Choose a provider endpoint group.

- Step 6** In the **Contract Information** section, complete the following fields:

Name	Description
Contract radio buttons	Choose to create a contract or choose an existing contract.
Contract Name field	(Only for creating a contract) Enter the name of the contract.
No Filter (Allow All Traffic) check box	(Only for creating a contract) Put a check in the box to allow all traffic, or remove the check from the box to filter traffic.
Filter Entries	(Only for filtering traffic) Click + and enter the filter information, then click Update .
Existing Contract With Subjects drop-down list	(Only for choosing an existing contract) Choose an existing contract.

- Step 7** Click **Next**.
- Step 8** In the **Device Clusters** section, choose a device cluster.
- Step 9** Complete the following field:

Name	Description
Graph Template drop-down list	Choose a graph template.

Step 10 (Optional) Remove the existing node and drag a different device cluster to the node area to create a service node.

Step 11 In the **unmanaged information** section, complete the following field:

Name	Description
Cluster Interface For Consumer Connector drop-down list	Choose an interface for the consumer connector.
Cluster Interface For Provider Connector drop-down list	Choose an interface for the provider connector.
General check box	Put a check in the box to be able to choose bridge domains.
BD For Consumer Connector drop-down list	(Only if you put a check in the General check box) Choose a bridge domain for the consumer connector. The bridge domain is used for the data path traffic.
BD For Provider Connector drop-down list	(Only if you put a check in the General check box) Choose a bridge domain for the provider connector. The bridge domain is used for the data path traffic.
Route Peering check box	Put a check in the box to enable route peering.

The Application Policy Infrastructure Controller (APIC) uses the chosen bridge domains for data path traffic between function nodes as required by the chosen service graph template. Refer to the online help for the service graph templates to learn more about how this bridge domain is used.

Step 12 (Only for managed devices) Click **Next**.

Step 13 (Only for managed devices) In the **Parameters** screen, in the **Required Parameters** tab, enter the names and values, as appropriate, for all of the required parameters.

Step 14 Click **Finish**.

You now have an active service graph template. The APIC populates the Layer 4 to Layer 7 parameters based on the chosen function profile and colors the mandatory parameters in green if they are configured correctly.

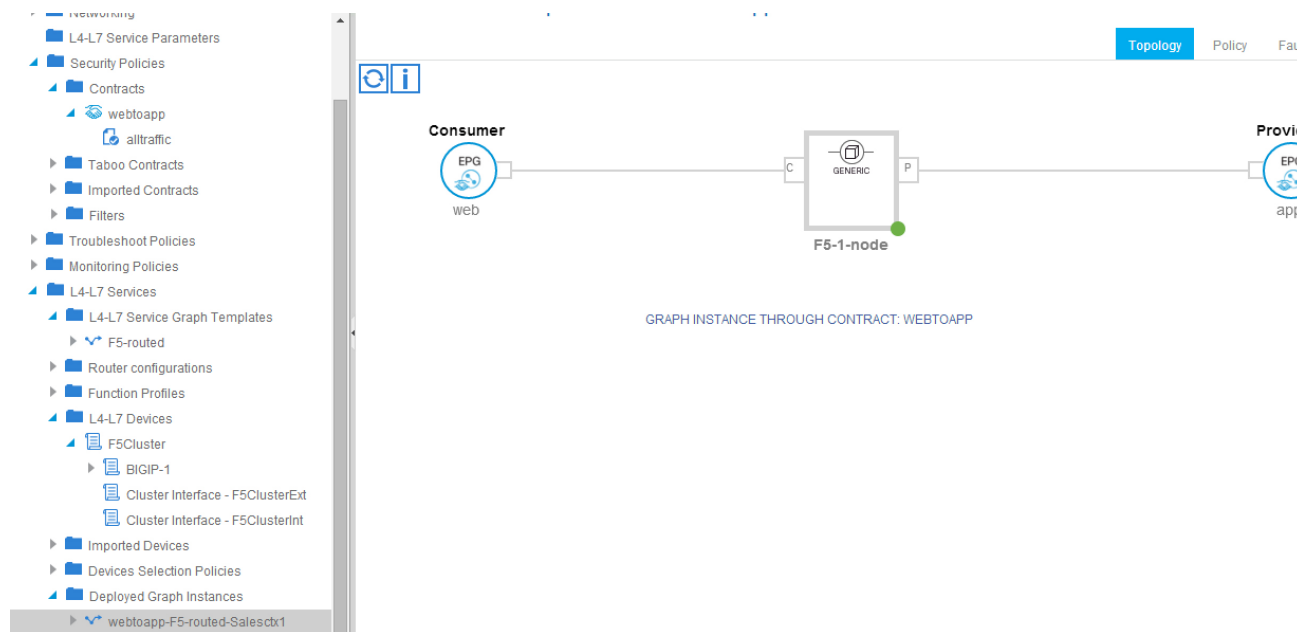
Verifying a Service Graph Deployment Using the GUI

After you apply a service graph template, the service graph is associated with a contract and you can see the list of deployed graphs and rendered concrete devices in the Layer 4 to Layer 7 devices portion of the GUI. When the graph is rendered, you will see configurations appear in the device that is part of the graph. The following procedure verifies that the service graph deployed successfully.

Procedure

- Step 1** On the menu bar, choose **Tenants > All Tenants**.
 - Step 2** In the Work pane, double click the tenant's name.
 - Step 3** In the Navigation pane, choose **Tenant *tenant_name* > L4-L7 Services > Deployed Devices**.
 - Step 4** In the Work pane, look for the device in the table. If the service graph deployment failed, you will not see the device.
 - Step 5** In the Navigation pane, choose **Tenant *tenant_name* > L4-L7 Services > Deployed Graph Instances > *graph_name***.
- The following screenshot shows an example of deployed (rendered) service graphs:

Figure 6: Deployed Service Graphs



If the service graph has been deployed, the graph is listed in the **Deployed Graph Instances** folder.

a) (Optional) View which configurations were not applied and why by choosing **Faults** tab.

Step 6 In the Navigation pane, choose **Tenant *tenant_name* > L4-L7 Services > Deployed Graph Instances > *graph_name* > *function_node_name*** to see which VLANs and which port groups have been allocated by Cisco Application Centric Infrastructure (ACI) to establish the connectivity with the service device.

Figure 7: Allocated VLANs and Port Groups

Meta Folder/Param Key	Name	Value	Overrid To
Device Config	Device		
LocalTraffic	LocalTrafficSSH		egg
Network	Network1		egg
Function Config	Function		

In the case of virtual appliances, ACI creates some port groups called shadow endpoint groups, and ACI moves the vNIC of the appliance to these port groups.

Undoing a Service Graph Configuration Using the GUI

If you no longer need a service graph configuration, then you can delete the service graph template.

Procedure

- Step 1** On the menu bar, choose **Tenants > All Tenants**.
- Step 2** In the Work pane, double click the tenant's name.
- Step 3** In the Navigation pane, choose **Tenant *tenant_name* > L4-L7 Services > L4-L7 Service Graph Templates > *service_graph_template_name***.
- Step 4** Right click the service graph template and choose **Remove Related Objects Of Graph Template**.
- Step 5** Right click the service graph template and choose **Delete**.

Creating a Device Selection Policy Using the GUI

If you did not use the **Apply L4-L7 Service Graph Template To EPGs** wizard to apply the service graph template, you might need to configure a device selection policy (also known as a logical device context). The device selection policy instructs Cisco Application Centric Infrastructure (ACI) about which firewall or load balancer device to use to render a graph.

If you used the **Apply L4-L7 Service Graph Template To EPGs** wizard to apply the service graph template, then a device selection policy was configured automatically and you do not need to configure one manually.



Note When using the NX-OS-style CLI, the device selection policy is configured automatically; there are no equivalent NX-OS-style CLI commands.

Procedure

- Step 1** On the menu bar, choose **Tenants > All Tenants**.
- Step 2** In the Work pane, double click the tenant's name.
- Step 3** In the Navigation pane, choose **Tenant *tenant_name* > L4-L7 Services > Devices Selection Policies**.
- Step 4** In the Work pane, choose **Actions > Create Logical Device Context**.
- Step 5** In the **Create Logical Device Context** dialog box, fill in the fields as required, except as specified below:
- In the **Service Type** drop-down list, choose the contract for the device selection policy. If you do not want to use the contract name as part of the criteria for using a device, choose **any**.
 - In the **Graph Name** drop-down list, choose the graph for the device selection policy. If you do not want to use the graph name as part of the criteria for using a device, choose **any**.
 - In the **Node Name** drop-down list, choose the node for the device selection policy. If you do not want to use the node name as part of the criteria for using a device, choose **any**.
- Step 6** In the **Cluster Interface Contexts** section, click + to add a cluster interface context.
- **Connector Name**—The name of the connector in the service graph template.
 - **Logical Interface**—The logical interface to use for the connector that is specified in the logical interface context.
 - **Bridge Domain**—The bridge domain that is specified in the logical interface context.
 - **Subnets**—The subnet to configure on the logical interfaces when the service graph template is instantiated.
- Step 7** Click **Submit**.
-