



## **Cisco ACI L3Out Configuration Examples**

**First Published:** 2020-04-27

### **Americas Headquarters**

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
<http://www.cisco.com>  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 527-0883

THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.

THE SOFTWARE LICENSE AND LIMITED WARRANTY FOR THE ACCOMPANYING PRODUCT ARE SET FORTH IN THE INFORMATION PACKET THAT SHIPPED WITH THE PRODUCT AND ARE INCORPORATED HEREIN BY THIS REFERENCE. IF YOU ARE UNABLE TO LOCATE THE SOFTWARE LICENSE OR LIMITED WARRANTY, CONTACT YOUR CISCO REPRESENTATIVE FOR A COPY.

The Cisco implementation of TCP header compression is an adaptation of a program developed by the University of California, Berkeley (UCB) as part of UCB's public domain version of the UNIX operating system. All rights reserved. Copyright © 1981, Regents of the University of California.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE OF THESE SUPPLIERS ARE PROVIDED "AS IS" WITH ALL FAULTS. CISCO AND THE ABOVE-NAMED SUPPLIERS DISCLAIM ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

All printed copies and duplicate soft copies of this document are considered uncontrolled. See the current online version for the latest version.

Cisco has more than 200 offices worldwide. Addresses and phone numbers are listed on the Cisco website at [www.cisco.com/go/offices](http://www.cisco.com/go/offices).

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: <https://www.cisco.com/c/en/us/about/legal/trademarks.html>. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1721R)

© 2020 Cisco Systems, Inc. All rights reserved.



## CONTENTS

---

### PREFACE

<b>Preface</b>	<b>v</b>
Audience	v
Related Content	v
Documentation Feedback	v
Obtaining Documentation and Submitting a Service Request	vi

---

### CHAPTER 1

<b>MP-BGP Setup</b>	<b>1</b>
Set Up the MP-BGP Route Reflector	1

---

### CHAPTER 2

<b>Example 1 - An OSPF L3Out With Two External Routers</b>	<b>5</b>
Example Topology	6
Prerequisites	8
Create L3Out Using the Create L3Out Wizard	9
Review - Create L3Out Using the Create L3Out Wizard	13
Configure Advertise the BD Subnet with a Route Map	14
Verify the Contract	16
Change the OSPF Interface Level Parameters (Optional)	17

---

### APPENDIX A

<b>Completed Configurations in XML for REST API</b>	<b>19</b>
Uploading Example Files in Cisco APIC GUI	19
Completed Configuration Examples	19
MP-BGP Setup	20
Example 1 - An OSPF L3Out With Two External Routers	20





## Preface

---

This preface includes the following sections:

- [Audience](#), on page v
- [Related Content](#), on page v
- [Documentation Feedback](#), on page v
- [Obtaining Documentation and Submitting a Service Request](#) , on page vi

## Audience

This guide is intended primarily for data center administrators with responsibilities and expertise in switch and network administration with responsibilities and expertise in one or more of the following areas:

- Cisco ACI connectivity to external networks using routing protocols
- Cisco ACI connectivity to external networks using static protocols

## Related Content

For additional details about Cisco ACI L3Out, the following documents are available at these URLs:

- [Cisco APIC Layer 3 Networking Configuration Guide](#)
- [Cisco ACI Fabric L3Out Guide](#)

All Cisco ACI documentation is available at the following link: [Cisco Application Centric Infrastructure \(ACI\) Documentation](#)

## Documentation Feedback

To provide technical feedback on this document, or to report an error or omission, please send your comments to [apic-docfeedback@cisco.com](mailto:apic-docfeedback@cisco.com). We appreciate your feedback.

# Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation*, at:

<https://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>.

Subscribe to *What's New in Cisco Product Documentation*, which lists all new and revised Cisco technical documentation as an RSS feed and delivers content directly to your desktop using a reader application. The RSS feeds are a free service.



## CHAPTER 1

# MP-BGP Setup

---

This chapter contains the following content:

- [Set Up the MP-BGP Route Reflector, on page 1](#)

## Set Up the MP-BGP Route Reflector

This section shows an example of Infra MP-BGP configuration within each pod. This set up is a prerequisite to use any Cisco ACI L3Out configurations. All the examples in this document assume the Infra MP-BGP is configured.

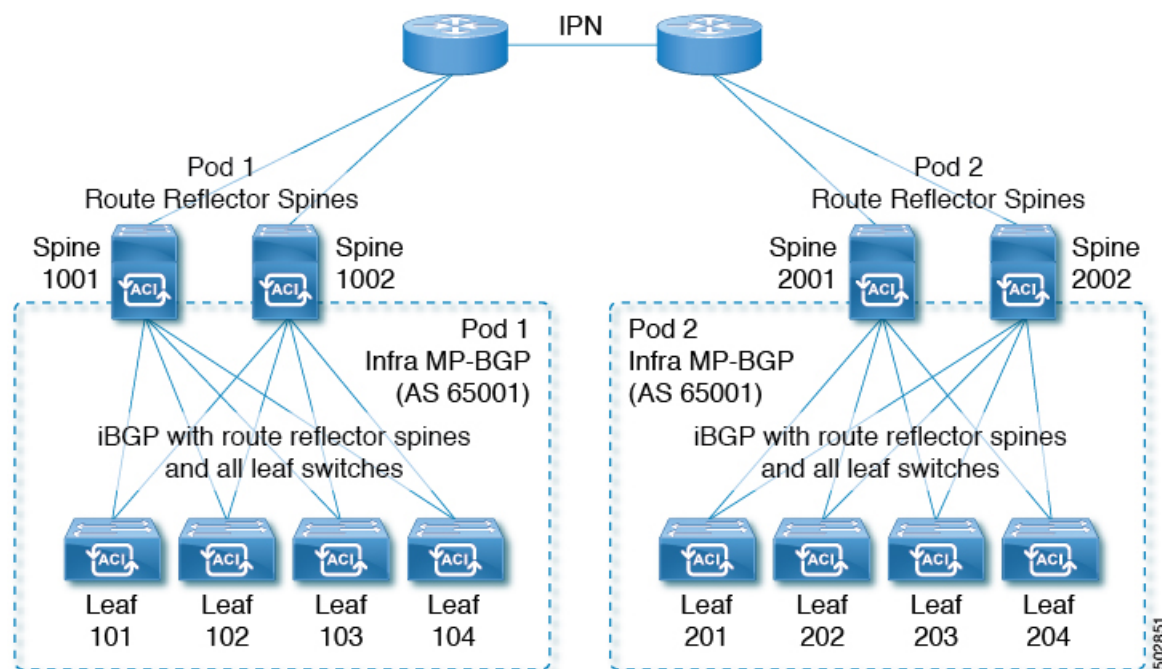


---

**Note** See the [Cisco ACI Multi-Pod White Paper](#) for more details about Infra MP-BGP between each pod (called external MP-BGP between spine switches).

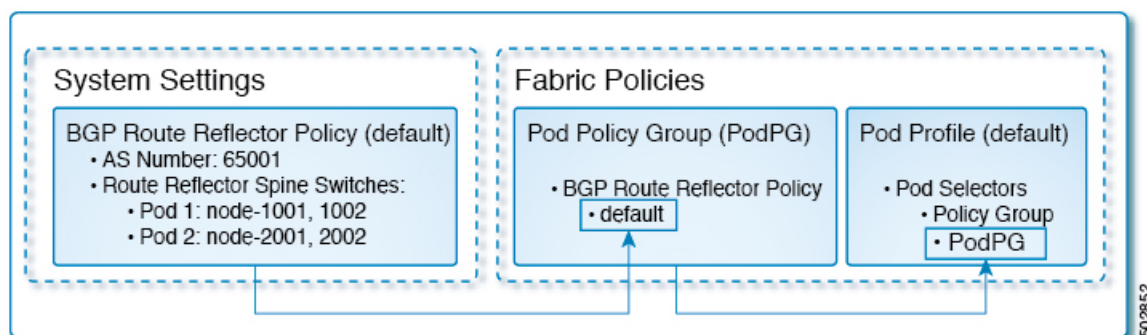
---

Figure 1: Example Topology of Infra MP-BGP in Multi-Pod Setup



The preceding topology diagram displays an example where Cisco ACI is configured with infra MP-BGP AS number 65001 along with two route reflector spine switches in each pod. Infra MP-BGP sessions are established within each pod between the spine switches and the leaf switches. Leaf switches in each pod do not peer with route reflector spine switches in other pods. The following diagram explains how to configure the MP-BGP route reflector in this example.

Figure 2: Diagram of the MP-BGP Route Reflector Configuration



First, configure the AS number 65001 as Cisco ACI infra MP-BGP which is used for all the pods. Next, specify the spine switches to be the route reflector in each pod as follows:

- Pod 1 node: 1001, 1002
- Pod 2: node 2001, 2002.



**Note** In this example, all spine switches are configured as route reflectors. However, if you have more than two spine switches per pod, not all spine switches are required to be configured as route reflectors. It is recommended to have two route reflector spine switches per pod.

For Policy Group name, in this example we use PodPG. In your example, you can use any name that you choose. However, for the BGP Route Reflector policy, we choose the default policy, and you must use the default policy. Next, assign the default policy to the pod policy group and the PodPG to the pod profile as displayed in the preceding Figure.

Further details are displayed in the following related screenshots:

**Figure 3: BGP Route Reflector Policy Example in Cisco APIC GUI**

**ACI BGP AS Number**

- AS number on all ACI nodes for MP-BGP
- When L3OUT is using BGP, this AS number is used as well

**Node ID of Route Reflector Spines**

- All leaf switches form an iBGP peer with Route Reflector Spines

Pod ID	Node ID	Node Name
1	1001	f1-p1-spine1
1	1002	f1-p1-spine2
2	2001	f1-p2-spine1
2	2002	f1-p2-spine2

Figure 4: Pod Profile and Policy Group for BGP Route Reflector in Cisco APIC GUI

The screenshot shows the Cisco APIC GUI configuration for a Pod Profile and Policy Group. The left sidebar has tabs for System, Tenants, and Fabric. Under Fabric, there are sub-tabs for Inventory and Fabric Policies. The Policies section is expanded, showing a tree with Pods, Policy Groups, Profiles, and Pod Profile default. The main configuration area is divided into two sections: Pod Policy Group and Pod Profile.

**Pod Policy Group Configuration:**

- Name: PodPG
- Description: optional
- Date Time Policy: select a value
- Resolved Date Time Policy: default
- ISIS Policy: select a value
- Resolved ISIS Policy: default
- COOP Group Policy: select a value
- Resolved COOP Group Policy: default
- BGP Route Reflector Policy: default
- Resolved BGP Route Reflector Policy: default
- Management Access Policy: select a value
- Resolved Management Access Policy: default
- SNMP Policy: select a value
- Resolved SNMP Policy: default
- MACsec Policy: select a value
- Resolved MACsec Policy: default

**Pod Profile Configuration:**

- Name: default
- Description: optional
- Type: ALL
- Fabric Policy Group: PodPG

**Pod Policy Group**

- Select BGP Route Reflector
- BGP Route Reflector under **System Setting** is "default" Pod Policy.

**Pod Profile**

- Specify the Pod Policy Group (PodPG)

For more details, see the information about MP-BGP route reflectors at the following URLs:

- *Cisco APIC Layer 3 Networking Configuration Guide*

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

- *Cisco ACI Fabric L3Out Guide*

<https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/guide-c07-743150.html>



## CHAPTER 2

# Example 1 - An OSPF L3Out With Two External Routers

---

This chapter includes the following sections:



### Note

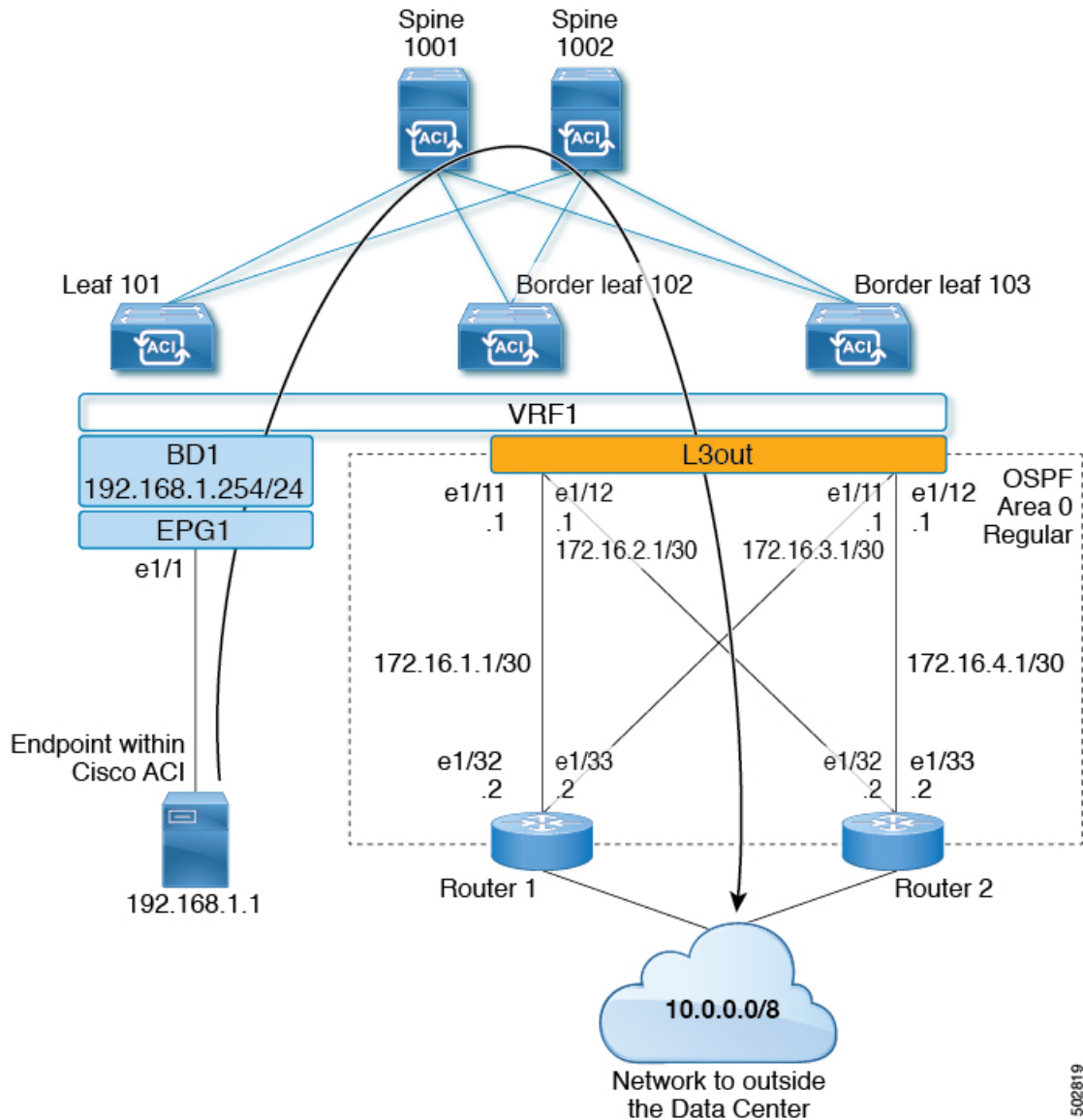
This example uses Cisco APIC release 4.2(x) and the associated GUI screens.

---

- [Example Topology, on page 6](#)
- [Prerequisites , on page 8](#)
- [Create L3Out Using the \*\*Create L3Out\*\* Wizard, on page 9](#)
- [Review - Create L3Out Using the \*\*Create L3Out\*\* Wizard, on page 13](#)
- [Configure Advertise the BD Subnet with a Route Map, on page 14](#)
- [Verify the Contract, on page 16](#)
- [Change the OSPF Interface Level Parameters \(Optional\), on page 17](#)

# Example Topology

Figure 5: Example Topology for an OSPF L3Out with Two External Routers

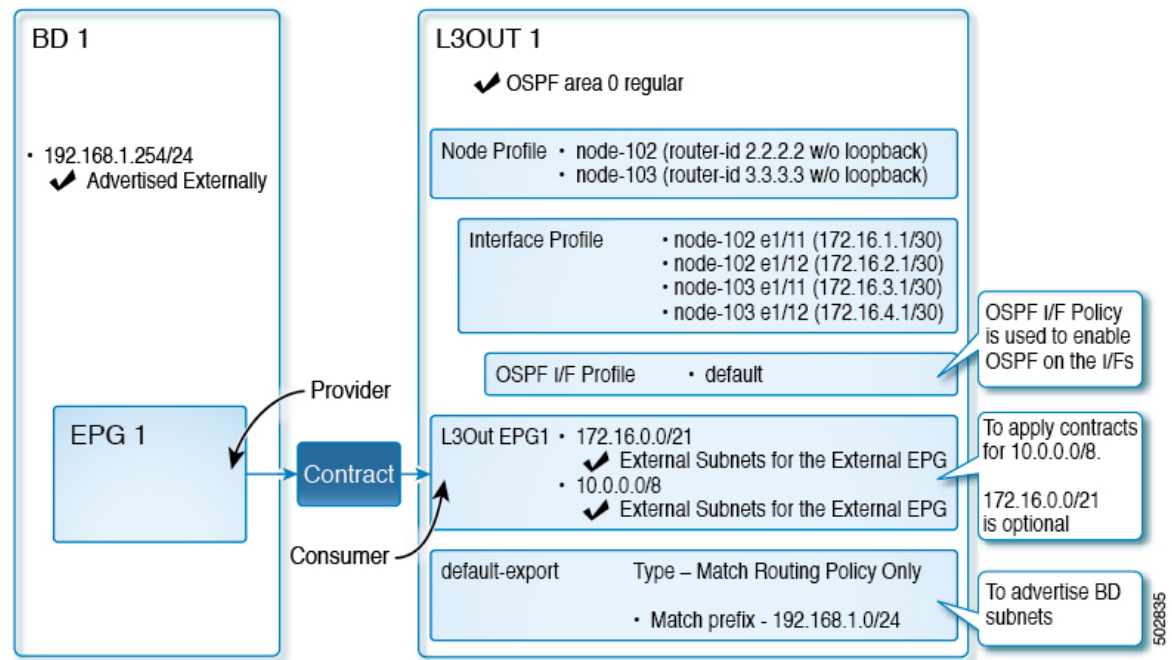


This basic L3Out example shows you how to:

- Configure an L3Out with the following specifications
  - with Area 0 OSPF
  - with two external routers
  - with routed interfaces
  - on two border leaf switches

- Advertise a BD subnet using default route-map (default-export)
- Allow communication with a contract between EPG1 and external route (10.0.0.0/8)

Figure 6: OSPF Configuration Diagram

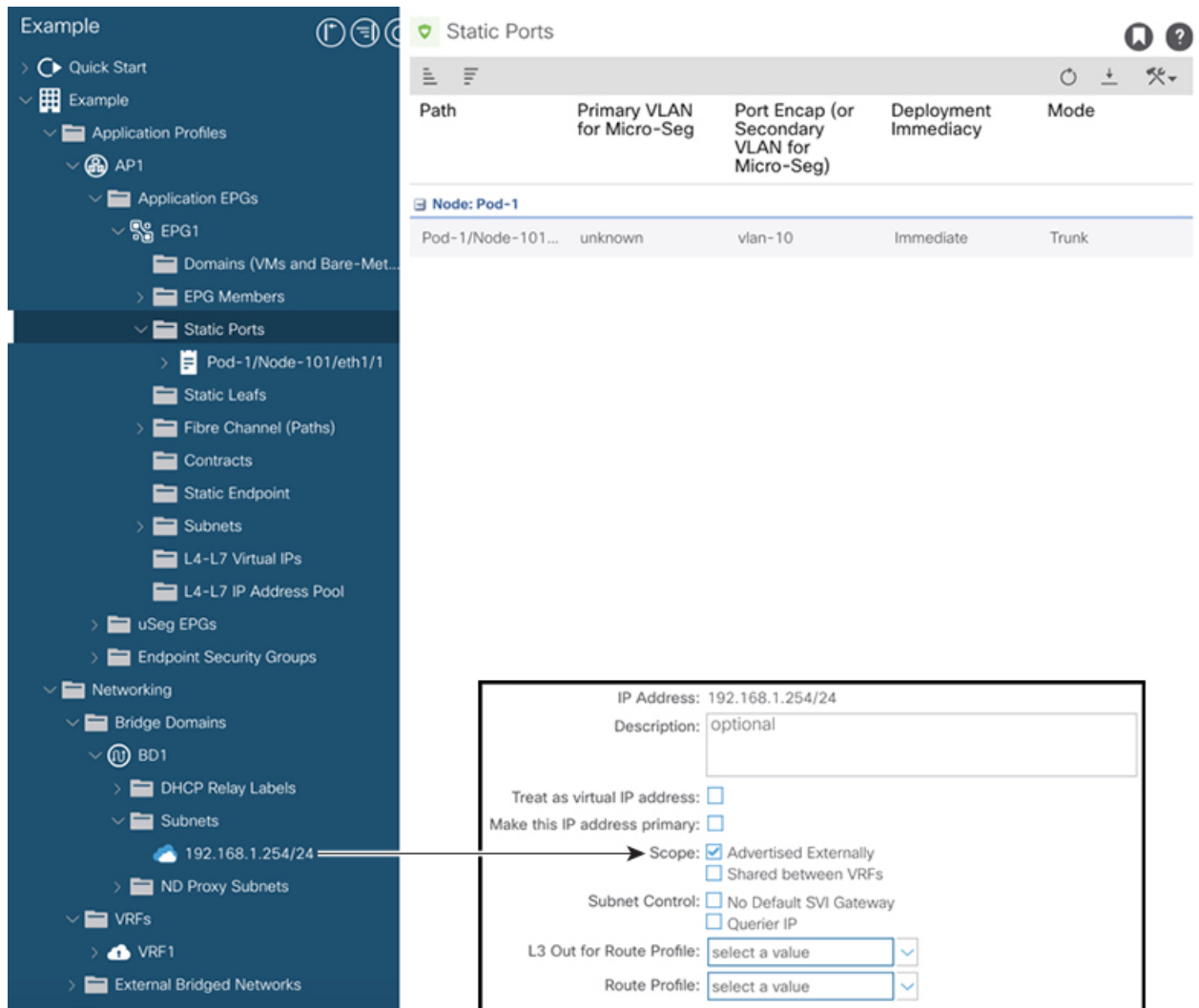


The preceding diagram illustrates the configuration for the example topology in [Figure 5: Example Topology for an OSPF L3Out with Two External Routers](#), on page 6. The configuration flow for this example is as follows:

1. L3Out: This creates
  - L3Out itself (OSPF parameters)
  - Node, Interface, OSPF I/F Profiles
  - L3Out EPG with **External Subnets for the External EPG** scope
2. Advertise a BD subnet: This uses
  - **default-export** route-map
  - BD subnet with **Advertise Externally** scope
3. Allow EPG - L3Out communication: This uses a contract between EPG1 and L3Out EPG1

# Prerequisites

Figure 7: Example Screen of Objects Created as Prerequisites



- This configuration example focuses only on the L3Out configuration part. The other configurations such as for VRF, BD, EPG, Application Profiles, and Access Policies (Layer 3 Domain etc.) are not covered. The preceding screenshot displays the prerequisite tenant configurations that are as follows:
  - VRF1
  - BD1 with the subnet 192.168.1.254/24
  - EPG1 with a static port towards endpoints

See [Completed Configurations in XML for REST API, on page 19](#) for a complete configuration example that includes VRF, BD, EPG, Application Profiles, and Access Policies on top of the L3Out configuration.

# Create L3Out Using the Create L3Out Wizard

This task creates the OSPF L3Out described in Example Topology. Following this task, Cisco ACI will be configured with two border leaf switches and OSPF neighborship with two external routers as shown in [Figure 5: Example Topology for an OSPF L3Out with Two External Routers](#), on page 6.

**Step 1** In the GUI **Navigation** pane, under the Tenant Example, navigate to **Networking > L3Outs**.

**Step 2** Right-click and choose **Create L3Out**.

**Step 3** In the **Create L3Out** screen, **Identity** tab, perform the following actions:

**Create L3Out**

1. Identity 2. Nodes And Interfaces 3. Protocols 4. External EPG

Protocol

Leaf Router

**Identity**

A Layer 3 Outside (L3Out) network configuration defines how the ACI fabric connects to external layer 3 networks. The L3Out supports connecting to external networks using static routing and dynamic routing protocols (BGP, OSPF, and EIGRP).

**Prerequisites:**

- Configure an L3 Domain and Fabric Access Policies for interfaces used in the L3Out (AAEP, VLAN pool, Interface selectors).
- Configure a BGP Route Reflector Policy for the fabric infra MP-BGP.

Name:

VRF:

L3 Domain:

Use for GOLF: ☐

☐ BGP ☐ EIGRP ☒ OSPF

OSPF Area ID:

OSPF Area Control: ☒ Send redistributed LSAs into NSSA area  
☒ Originate summary LSA  
☐ Suppress forwarding address in translated LSA

OSPF Area Type:

OSPF Area Cost:

Previous Cancel Next

- In the **Name** field, enter the name for an L3Out. (EXAMPLE\_L3Out1)
- In the **VRF** field and the **L3 Domain** field, choose the appropriate values. (VRF1, EXAMPLE\_L3DOM)
- In the **OSPF** field, check the checkbox.
- In the **OSPF Area ID** field, choose the value **0** or the text **backbone**.
- In the **OSPF Area Type** field, choose **Regular area**.
- Keep the rest of the fields with their default values.

**Step 4**

Click **Next** to display the **Nodes and Interfaces** screen, and perform the following actions:

Create L3Out

1. Identity 2. Nodes And Interfaces 3. Protocols 4. External EPG

Nodes and Interfaces

The L3Out configuration consists of node profiles and interface profiles. An L3Out can span across multiple nodes in the fabric. All nodes used by the L3Out can be included in a single node profile and is required for nodes that are part of a VPC pair. Interface profiles can include multiple interfaces. When configuring dual stack interfaces a separate interface profile is required for the IPv4 and IPv6 configuration, that is automatically taken care of by this wizard.

Use Defaults: ☒

Interface Types

Layer 3: **Routed** Routed Sub SVI Floating SVI

Layer 2: **Port** Direct Port Channel

Nodes

Node ID: leaf2 (Node-102) Router ID: 2.2.2.2 Loopback Address:   Hide Interfaces

Interface: eth1/11 IP Address: 172.16.1.1/30 MTU (bytes): inherit

Interface: eth1/12 IP Address: 172.16.2.1/30 MTU (bytes): inherit

Node ID: leaf3 (Node-103) Router ID: 3.3.3.3 Loopback Address:   Hide Interfaces

Interface: eth1/11 IP Address: 172.16.3.1/30 MTU (bytes): inherit

Interface: eth1/12 IP Address: 172.16.4.1/30 MTU (bytes): inherit

Previous Cancel Next

Click + icon to add another node

Click + icon to add another interface

- In the **Interface Types** area, in the **Layer 3** field and in the **Layer 2** field, ensure that your selections match the choices in the preceding screenshot (Routed and Port).
- In the **Nodes** area, in the **Node ID** field, from the drop-down list, choose the appropriate node ID. (leaf2 (Node 102))
- In the **Router ID** field, enter the appropriate router ID. (2.2.2.2)

The **Loopback Address** field auto populates based on the router ID value you enter. You do not require the loopback address, so delete the value and leave the field blank.

- In the **Interface** field, choose the interface ID. (eth1/11)
- In the **IP Address** field, enter the associated IP address. (172.16.1.1/30)
- In the **MTU** field, keep the default value. (inherit)
- Click the + icon next to the **MTU** field to add an additional interface for node leaf2. (Node-102)
- In the **Interface** field, choose the interface ID. (eth1/12)
- In the **IP Address** field, enter the associated IP address. (172.16.2.1/30)
- In the **MTU** field, keep the default value. (inherit)

**Step 5**

To add another node, click the + icon next to the **Loopback Address** field, and perform the following actions:

**Note** When you click the + icon, the new **Nodes** area is displayed below the area that you had populated earlier.

- a) In the **Nodes** area, in the **Node ID** field, from the drop-down list, choose the node ID. (leaf3 (Node-103))
- b) In the **Router ID** field, enter the router ID. (3.3.3.3)

The **Loopback Address** field auto populates based on the router ID value you enter. You do not require the loopback address, so delete the value and leave the field blank.

- c) In the **Interface** field, choose the interface ID. (eth1/11)
- d) In the **IP Address** field, enter the IP address. (172.16.3.1/30)
- e) In the **MTU** field, keep the default value. (inherit)
- f) Click the + icon next to the **MTU** field to add an additional interface for node leaf3. (Node-103)
- g) In the **Interface** field, choose the interface ID. (eth1/12)
- h) In the **IP Address** field, enter the associated IP address. (172.16.4.1/30)
- i) In the **MTU** field, keep the default value. (inherit), and click **Next**.

We have specified the node, interface, and IP address for each interface.

### Step 6

Click **Next** to view the **Protocols** screen.

This screen allows you to specify the OSPF interface level policy to configure hello-interval, network-type, etc.

Create L3Out

? ✕

1. Identity 2. Nodes And Interfaces 3. Protocols 4. External EPG

Protocol Associations

OSPF

Node ID: 102		Hide Policy <input type="checkbox"/>
Interface	Policy	
1/11, 1/12	<div style="border: 1px solid #ccc; padding: 2px;">select a value</div>	

Node ID: 103		Hide Policy <input type="checkbox"/>
Interface	Policy	
1/11, 1/12	<div style="border: 1px solid #ccc; padding: 2px;">select a value</div>	

Previous
Cancel
Next

In this example, nothing is selected. Therefore, the default policy is used. The default OSPF interface profile uses **Unspecified** as network-type which defaults to broadcast network type. To optimize this with point-to-point network-type for sub-interface, see **Change the OSPF Interface Level Parameters (Optional)**.

### Step 7

Click **Next**.

The **External EPG** screen is displayed with L3Out EPG details. This configuration is to classify the traffic into the EPG to apply to the contract.

**Step 8** In the **External EPG** screen, perform the following actions:

## Create L3Out

External EPG

The L3Out Network or External EPG is used for traffic classification, contract associations, and route control policies. Classification is matching external networks to this EPG for applying contracts. Route control policies are used for filtering dynamic routes exchanged between the ACI fabric and external devices, and leaked into other VRFs in the fabric.

Name: L3Out\_EPG1

Provided Contract: select a value

Consumed Contract: common/default

Default EPG for all external networks: ☐

Subnets

IP Address	Scope	Name	Aggregate	Route Control Profile	Route Summarization Policy
10.0.0.0/8	External Subnets for the External EPG				
172.16.0.0/21	External Subnets for the External EPG				

Previous Cancel Finish

a) In the **External EPG** area, **Name** field, enter a name for the external EPG. (L3Out\_EPG1)

b) In the **Provided Contract** field, do not choose a value.

In this example, there is no provided contract for L3Out\_EPG1 because a normal EPG (EPG1) is the provider.

c) In the **Consumed Contract** field, choose **default** from the drop-down list.

**Step 9**

In the **Default EPG for all external networks** field, uncheck the checkbox, and perform the following actions:

a) Click the + icon in the **Subnets** area, to display the **Create Subnet** dialog box.

b) In the **IP Address** field, enter the subnet. (10.0.0.0/8)

c) In the **External EPG Classification** field, check the checkbox for **External Subnets for the External EPG**. Click **OK**.

**Step 10**

Click the + icon in the **Subnets** area once more to display the **Create Subnet** dialog box, and perform the following actions:

**Note** Although this is an optional configuration, it is a best practice to specify the L3Out interface subnets in case endpoints have to communicate with those IPs.

a) In the **IP Address** field, enter the subnet. (172.16.0.0/21)

This subnet covers all the interfaces in the L3Out. This can be each individual subnet for each routed interface instead.

b) In the **External EPG Classification** field, check the checkbox for **External Subnets for the External EPG**. Click **OK**.

c) Click **Finish**.

The L3Out OSPF is now deployed.

# Review - Create L3Out Using the Create L3Out Wizard

Review how the configuration using the wizard is presented in the Cisco APIC GUI, and verify that the configurations are accurate.

**Step 1** Navigate to your **Tenant\_name** > **Networking** > **L3Outs** > **EXAMPLE\_L3Out1**, in the **Work** pane, scroll to view the details as follows:

At this location in the GUI, verify the main L3Out parameters such as VRF, domain, and OSPF parameters that are configured in the **Identity** screen in the **Create L3Out** wizard.

The screenshot displays the Cisco APIC GUI configuration for **EXAMPLE\_L3Out1**. The left pane shows the navigation tree with the following structure:

- Example
  - Quick Start
  - Example
    - Application Profiles
    - Networking
      - Bridge Domains
      - VRFs
      - External Bridged Networks
      - L3Outs
        - EXAMPLE\_L3Out1 (selected)
          - Logical Node Profiles
            - EXAMPLE\_L3Out1\_nodeProfile
          - Logical Interface Profiles
            - EXAMPLE\_L3Out1\_interfaceProfile
          - OSPF Interface Profile
          - Configured Nodes
          - External EPGs
            - L3Out\_EPG1
          - Route map for import and export route control
          - Dot1Q Tunnels
          - Contracts
          - Policies
          - Services

The right pane shows the configuration details for **EXAMPLE\_L3Out1**:

- VRF:** VRF1
- Resolved VRF:** Example/VRF1
- L3 Domain:** EXAMPLE\_L3\_DOM
- Route Profile for Interleak:** select a value
- Enable BGP/EIGRP/OSPF:** BGP ☐ OSPF ☒ EIGRP ☐
- OSPF Area ID:** 0
- OSPF Area Control:** ☒ ☐
- Send redistributed LSAs into NSSA area:** ☒
- Originate summary LSA:** ☒
- Suppress forwarding address in translated LSA:** ☐
- OSPF Area Type:** NSSA area (selected), Regular area, Stub area
- OSPF Area Cost:** 1
- Nodes:**

Node ID	Router ID	Loopback Address
topology/pod-1/node-102	2.2.2.2	
topology/pod-1/node-103	3.3.3.3	
- Routed Interfaces:**

Path	IP Address	Secondary IP Address	MAC Address	MTU (bytes)
Pod-1/Node-102/eth1/11	172.16.1.1/30		00:22:BD:F8:19:FF	inherit
Pod-1/Node-102/eth1/12	172.16.2.1/30		00:22:BD:F8:19:FF	inherit
Pod-1/Node-103/eth1/11	172.16.3.1/30		00:22:BD:F8:19:FF	inherit
Pod-1/Node-103/eth1/12	172.16.4.1/30		00:22:BD:F8:19:FF	inherit

**Step 2** Verify that OSPF is enabled with the specified parameters such as Area ID and Area Type.

**Step 3** Under **Logical Node Profiles**, *EXAMPLE\_L3Out1\_nodeProfile* is created to specify border leaf switches with their router IDs.

**Step 4** Under **Logical Interface Profile**, *EXAMPLE\_L3Out1\_interfaceProfile* is created.

Verify the interface parameters such as interface ID, IP addresses, in this example, as routed interfaces. The default MAC addresses gets auto populated. OSPF interface profile is also created under this for OSPF interface level parameters.

The review is complete.

## Configure Advertise the BD Subnet with a Route Map

In this example, a route map, **default-export**, is used with the IP prefix list to advertise the BD subnet.

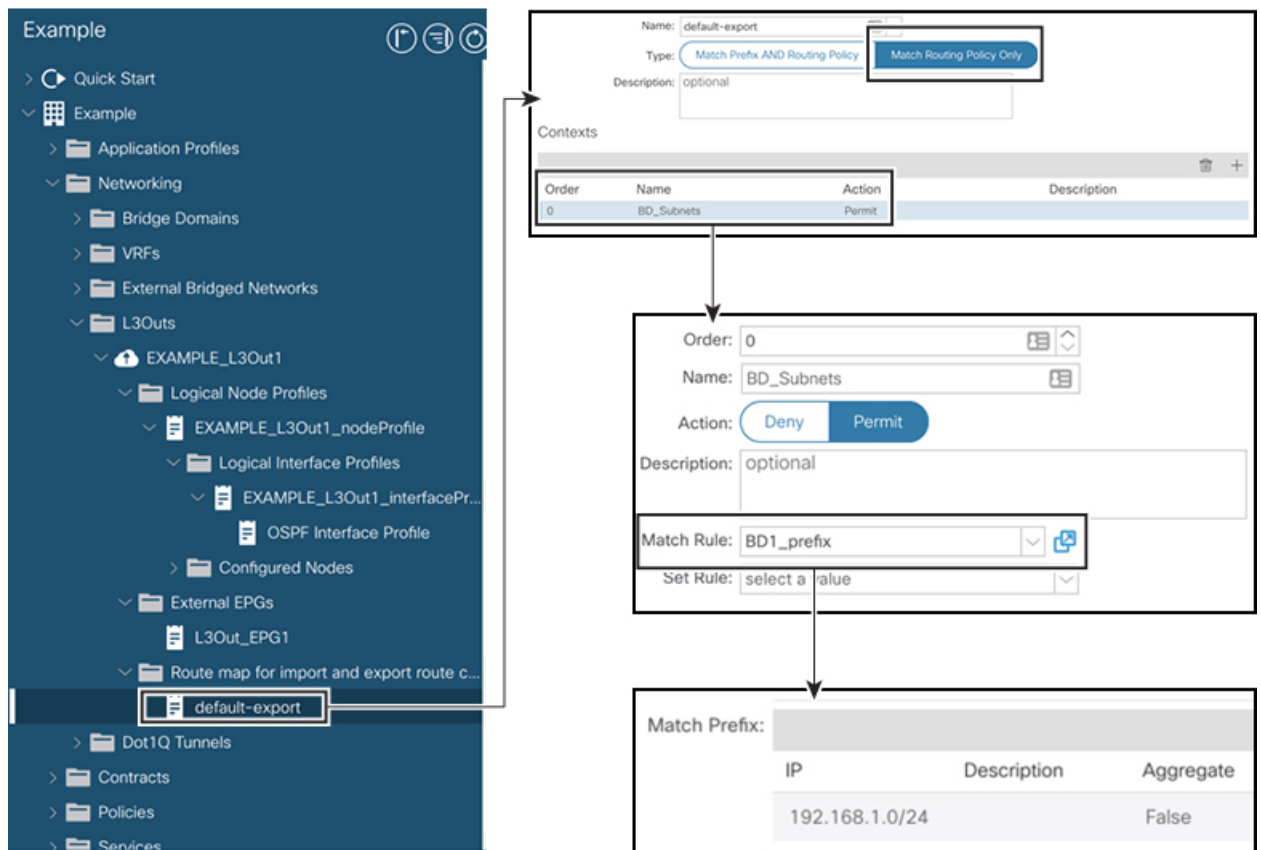


**Note** This **default-export** route map will be applied to the L3Out (EXAMPLE\_L3Out1) without being associated to anything specific.

**Step 1** To enable a BD subnet to be advertised, navigate to **Tenant > Networks > Bridge Domains > BD1 > Subnets > 192.168.1.254/24**, and select **Advertised Externally** scope.

The screenshot displays the Cisco ACI configuration interface. On the left, a navigation pane shows the hierarchy: Tenant > Networks > Bridge Domains > BD1 > Subnets > 192.168.1.254/24. The right pane shows the configuration for this subnet. The 'Policy' tab is active, displaying various settings. Under the 'Scope' section, the 'Advertised Externally' checkbox is checked, while 'Private to VRF' and 'Shared between VRFs' are unchecked. Other settings like 'Treat as virtual IP address', 'Make this IP address primary', 'Subnet Control', 'L3 Out for Route Profile', and 'Route Profile' are also visible with their respective options.

**Step 2** To create a route map under your L3Out (EXAMPLE\_L3Out1), navigate to **Route map for import and export route control**.



**Step 3** Right-click and choose **Create Route map for import and export route control**.

**Step 4** In the **Create Route map for import and export route control** dialog box, in the **Name** field, choose **default-export**.

**Step 5** In the **Type** field, choose **Matching Route Policy Only**.

**Note** **Match Routing Policy Only:** By choosing this **Type** with default-export route map, all route advertisement configuration is performed by this route map. BD associations and export route control subnets configured under the external EPG will not apply. You should configure all match rules within this route-map for all routes that will be advertised from this L3Out.

**Match Prefix and Routing Policy:** By choosing this **Type** with default-export route map, route advertisement is matched by any match rules configured in this route map **in addition to** any BD to L3Out associations and export route control subnets defined under the External EPG.

When using a route profile, it is recommended to use **Match Routing Policy Only** for a simpler configuration that is easier to maintain.

**Step 6** In the **Contexts** area, click the + icon, to display the **Create Route Control Context** dialog box, and perform the following actions:

a) In the **Order** field, configure the order. (0)

In this example, we have only one order.

b) In the **Name** field, enter a name for the context. (BD\_Subnets)

c) In the **Action** field, choose **Permit**.

This enables the route map to permit the prefix we will configure.

In this example, we require the match rule that requires the IP prefix list, **BD1\_prefix**. This IP prefix list points to the BD subnet advertised.

**Step 7** In the **Match Rule** field, create the IP prefix-list by performing the following actions;

- Choose **Create Match Rule for a Route-Map**.
- In the **Name** field, enter a name *BD1\_prefix*.
- In the **Match Prefix** area, click the + icon, and enter the BD subnet (192.168.1.0/24).

## Verify the Contract

In this task, you verify the contract to enable communication between an endpoint (192.168.1.1) and external prefixes (10.0.0.0/8, and optionally 172.16.0.0/21). In this example, the EPG for the endpoint is EPG1 and the external EPG for external prefixes is L3Out\_EPG1.

The required configuration should already be present from the **Create L3Out** wizard.

**Step 1** Under your L3Out, navigate to **External EPGs > L3Out\_EPG1**.

The screenshot shows the Cisco ACI GUI navigation tree on the left. The path is: Example > L3Outs > EXAMPLE\_L3Out1 > External EPGs > L3Out\_EPG1. The L3Out\_EPG1 is highlighted with a red box. Arrows point from this box to two configuration windows on the right.

The top window is titled "External EPG Instance Profile - L3Out\_EPG1" and shows the "General" tab. It displays a table of subnets:

IP Address	Scope	Name	Aggregate	Route Control Profile	Route Summarization Policy
10.0.0.0/8	External Subnets for the External EPG				
172.16.0.0/21	External Subnets for the External EPG				

The bottom window is also titled "External EPG Instance Profile - L3Out\_EPG1" and shows the "Contracts" tab. It displays a table of consumed contracts:

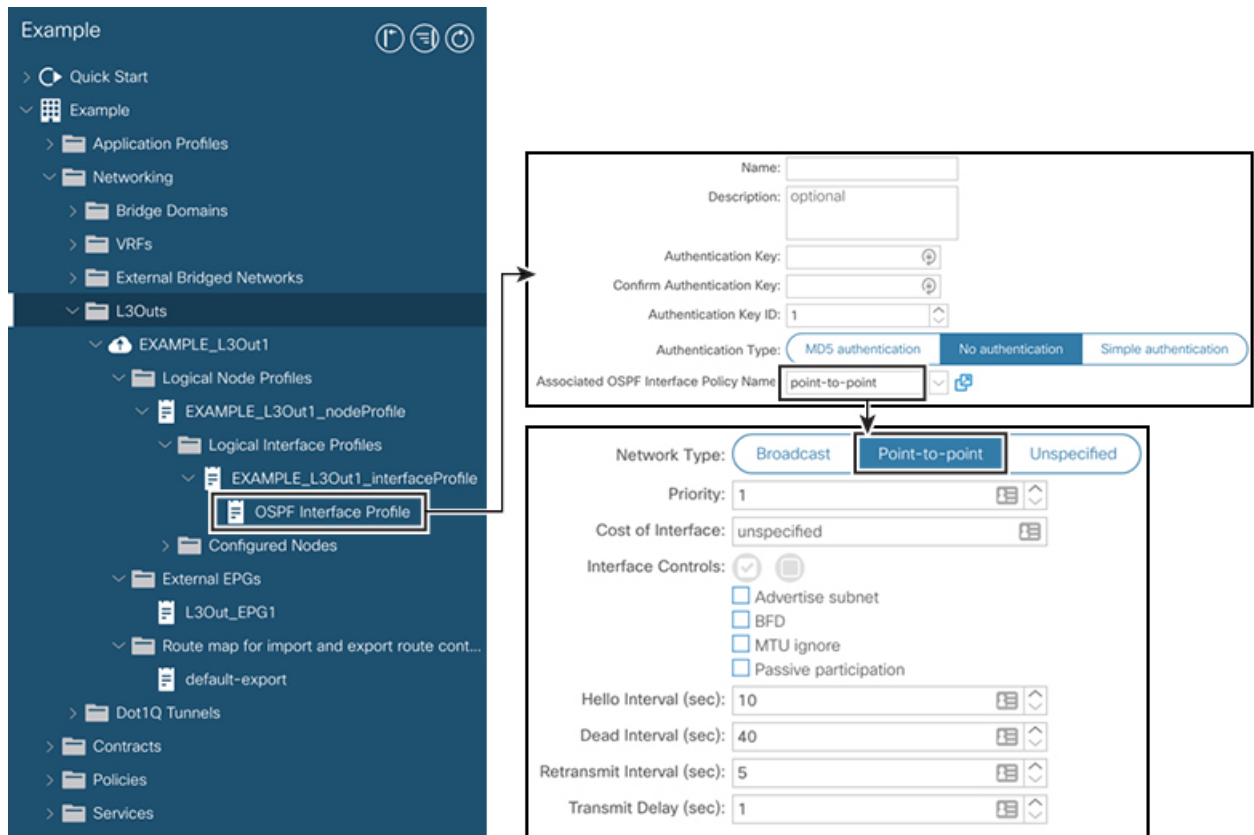
Name	Tenant	Type	QoS Class	State
default	common	Contract	Unspecified	formed

- Step 2** In the **Work** pane, in the **External EPG Instance Profile** area, under **Policy > General** sub-tab, look at the Properties and verify that the two subnets are displayed with **External Subnets for the External EPG**.
- Step 3** Next, click the **Contracts** sub-tab and verify the contract you specified earlier is consumed correctly. In case you want to add more contracts, you can perform the actions from this location in GUI.
- Step 4** Navigate to **Application Profile > Application EPGs > EPG1 > Contracts**, and verify that EPG1 is providing the appropriate contract.

## Change the OSPF Interface Level Parameters (Optional)

If you wish to change the OSPF interface-level parameters, such as **Hello Interval**, **OSPF network type**, then you can configure it in the OSPF Interface Profile. The node level OSPF parameters are already configured.

- Step 1** Under your L3Out, navigate to **Logical Interface Profile > EXAMPLE\_L3Out1\_interfaceProfile > OSPF Interface Profile**.



- Step 2** In the **Work** pane, in the **Properties** area, choose the OSPF Interface Policy you wish to use.

This modifies your OSPF interface level parameters.

**Change the OSPF Interface Level Parameters (Optional)**



## APPENDIX **A**

# Completed Configurations in XML for REST API

This appendix contains the following sections:

- [Uploading Example Files in Cisco APIC GUI, on page 19](#)
- [Completed Configuration Examples, on page 19](#)

## Uploading Example Files in Cisco APIC GUI

The following steps show how to upload the XML example files.



### Note

Although the following steps use **Tenant** as an example to trigger POST, the examples in this document can be uploaded from any other location in the Cisco APIC GUI such as VRF, Access Policies etc. Whichever location you use, you must modify the parent DN to **uni/**.

- 
- Step 1** Log in to your Cisco APIC GUI, and navigate to **Tenants**.
  - Step 2** In the **Tenants** tab, click an existing tenant name such as **infra** or **common**.
  - Step 3** In the left **Navigation** pane, below **Quick Start**, right-click the **Tenant name**, and click **Post**.
  - Step 4** In the **parent DN** field, change the value to **uni/** by removing all additional content.
  - Step 5** In the **File Name** field, browse to the .xml file on your desktop that you wish to upload, choose it, and click **Post**.  
The contents of the XML file is uploaded in Cisco APIC, and the configured objects are displayed in Cisco APIC GUI.
  - Step 6** To upload additional example files, repeat the above set of steps.
- 

## Completed Configuration Examples

Download the following XML example files and upload them in your Cisco APIC GUI. This enables you to obtain the completed configurations for each example along with some of the prerequisites.

## MP-BGP Setup

### Infra MP-BGP

Contents: BGP Route reflector policy along with Pod Policy Group and Pod Profile

URL: [https://www.cisco.com/c/dam/en/us/td/docs/switches/datacenter/aci/apic/example-files/L3Out\\_Example\\_infra\\_MP-BGP.xml](https://www.cisco.com/c/dam/en/us/td/docs/switches/datacenter/aci/apic/example-files/L3Out_Example_infra_MP-BGP.xml)

## Example 1 - An OSPF L3Out With Two External Routers

### Access Policy

Contents: L3 Domain, interface profiles, etc.

URL: [https://www.cisco.com/c/dam/en/us/td/docs/switches/datacenter/aci/apic/example-files/L3Out\\_Example1\\_AccessPolicies.xml](https://www.cisco.com/c/dam/en/us/td/docs/switches/datacenter/aci/apic/example-files/L3Out_Example1_AccessPolicies.xml)

### Tenant

Contents: L3Out, VRF, BD, EPG, etc.

URL: [https://www.cisco.com/c/dam/en/us/td/docs/switches/datacenter/aci/apic/example-files/L3Out\\_Example1\\_TenantPolicies.xml](https://www.cisco.com/c/dam/en/us/td/docs/switches/datacenter/aci/apic/example-files/L3Out_Example1_TenantPolicies.xml)