

Configure Route Control in ACI

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Introduction

This document describes the configuration of Route Control in Application Centric Infrastructure (ACI).

Prerequisites

Requirements

- L3out must be configured: [L3out Configuration Guide](#)
- Bridge Domain configured as layer 3: [Bridge Domain Configuration](#)
- Multi-site configured: [Multisite Configuration](#)

Components Used

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

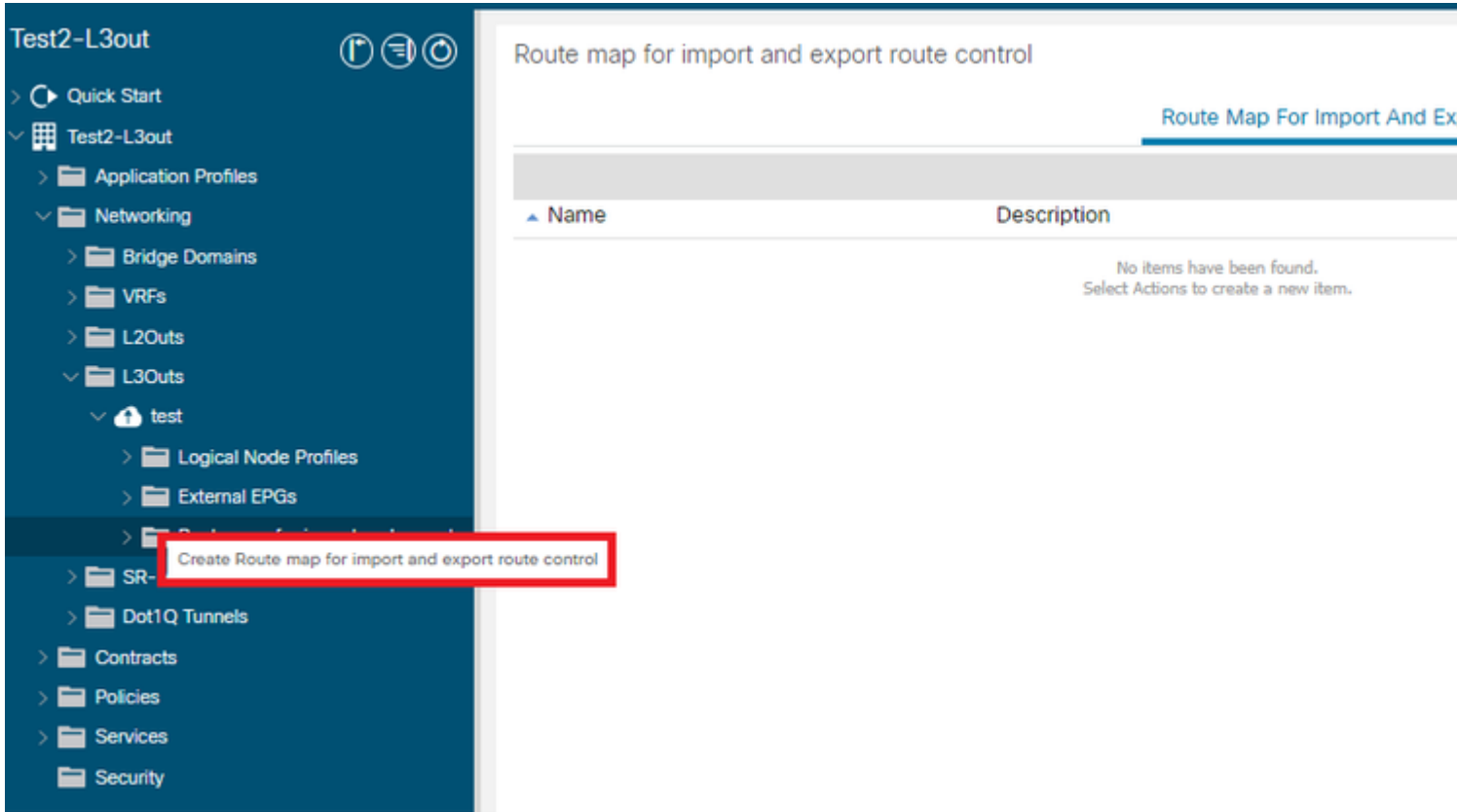
Configuration

All supported routing protocols base the route map for route control configuration on the same premises:

1. Configure a Route Map
2. Establish set and match criteria
3. Apply Route Map accordingly

Navigate to **Tenant > TENANT_NAME > Networking > L3out > L3OUT_NAME > Route Map for Import and Export Route Control**.

Right-click on the folder or use the tools button to **Create Route Map for Import and Export Route Control**.



By default, an import and export route control exists already. If you would like to edit these, just select them from the drop-down menu in the **Name** field.

These default route controls are mainly applied for route re-distribution and VRF leaking. For the special case of the import route control, L3out must be marked as **Import** on **Route Control Enforcement** option.

To create a new one, manually input the desired name in the **Name** field.

Create Route map for import and export route control



Name: ▼

Type: **default-import** Match Routing Policy Only

Description:

Contexts

Order	Name	Action	Description

Cancel Submit

- **Match Prefix AND Routing Policy** – This option matches a configured prefix list and a route policy defined.
- **Match Routing Policy Only** – This option matches the global destination route and only defines a policy to be applied.

Click on the **Plus** button to create a new context that creates the actual route map policy.

Create Route Control Context



Order:

Name:

Action: Deny Permit

Description:

Associated Matched Rules:

Rule Name

Set Rule:

- **Match Rule** – Matches the set of attributes (prefix list, communities for BGP, or regular expressions) to where the rules are to be applied.

Create Match Rule



Name:

Description:

Match Regex Community Terms: 🗑️ +

Name	Regular Expression	Community Type	Description
------	--------------------	----------------	-------------

Match Community Terms: 🗑️ +

Name	Description
------	-------------

Match Prefix: 🗑️ +

IP	Description	Aggregate	Greater than Mask	Less than Mask
----	-------------	-----------	-------------------	----------------

Cancel

Submit

- **Set Rule** – Applies a set of instructions to the attributes specified on the Match Rule:

Create Set Rules for a Route Map



STEP 1 > Select

1. Select

Name:

Description:

- Set Community:
- Set Route Tag:
- Set Dampening:
- Set Weight:
- Set Next Hop:
- Set Preference:
- Set Metric:
- Set Metric Type:
- Additional Communities:
- Set AS Path:
- Next Hop Propagation:
- Multipath:

Previous

Cancel

Finish

From this step, the rules to be applied need to match the protocol routing decision.

OSPF

By default, ACI advertises the OSPF route with an external type 2 and a metric of 20.

You can change these attributes as follows:

Action Rule Profile - RM-SetRules

Properties

Rule Name: RM-SetRules

Description: optional

Set Communities:

Set Route Tag:

Set Dampening:

Set Weight:

Set Next Hop:

Set Preference:

Set Metric:

Set Metric Type:

Next Hop Propagation:

Multipath:

Additional Communities:

Metric: 5

Metric Type: OSPF type1 metric

Community

Set Criteria

Description

No items have been found.

Show Usage

The metric value is summed up to the cost of the interface in the peer router:

<#root>

```
Router# show ip route ospf-1 vrf vrf_test
IP Route Table for VRF "vrf_test"
'*' denotes best ucast next-hop
'**' denotes best mcast next-hop
'[x/y]' denotes [preference/metric]
'%<string>' in via output denotes VRF <string>
```

```
10.10.10.0/24, ubest/mbest: 2/0
*via 10.46.0.1, Vlan481, [110/
```

```
45
```

```
], 00:06:04,
```

```
ospf-1
```

```
, type-1, tag 4294967295
*via 10.46.0.2, Vlan481, [110/
```

```
45
```

```
], 00:06:05,
```

```
ospf-1
```

```
, type-1, tag 4294967295
```

Router#

EIGRP

With this method, for EIGRP the only parameter configurable to alter route selection is the Metric, same that is added to the Diffusal Update Algorithm (DUAL)

```
Leaf# show ip eigrp topology vrf Test:Test_VRF
EIGRP Topology Table for AS(1818)/ID(192.168.10.1) VRF Test:Test_VRF
```

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
r - reply Status, s - sia Status

```
P 10.10.10.0/24, 1 Successors, FD is 51200, tag is 4294967295
via Rconnected(51200/0)
```

```
Leaf# ! After applying route-map
Leaf#
```

```
Leaf# show ip eigrp topology vrf Test:Test_VRF
EIGRP Topology Table for AS(1818)/ID(192.168.10.1) VRF Test:Test_VRF
```

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
r - reply Status, s - sia Status

```
P 10.10.10.0/24, 1 Successors, FD is 51200, tag is 4294967295
via Rconnected(5145600/0)
```

```
Leaf#
```

BGP

Must of the BGP attributes can be configured according to requirement needs:

Set Community	Appends or Replaces Community ID
Set Dampening	Configures time criteria for route suppression in the event of an eBGP route flap.
Set Weight	Enables weight configuration.
Set Preference	Enables Local Preference configuration.
Next Hop Propagation	Propagates the Next Hop address to infra MP-BGP VPN peers.

Action Rule Profile - RM-SetRules

Policy



Properties

Rule Name: RM-SetRules

Description: optional

Set Communities:

Community: 400:1500

e.g., regular:as2-nn2:4:15
e.g., extended:as4-nn2:5:16
e.g., no-export
e.g., no-advertise

Criteria: Append community

Set Route Tag:

Set Dampening:

Half Life (minutes): 15

Reuse Limit: 750

Suppress Limit: 200

Max Suppress Time (minutes): 60

Set Weight:

Weight: 150

Set Next Hop:

Set Preference:

Preference: 150

Set Metric:

Set Metric Type:

Next Hop Propagation:

Multipath:

Set External EPG:

Additional Communities:

Community	Set Criteria	Description
-----------	--------------	-------------

No items have been found.
Select Actions to create a new item.

Show Usage

Close

ACI validation

To validate in the ACI command line interface (CLI), each protocol is assigned to a default name that includes the VRF VNID:

```
<#root>
```

```
Leaf# show vrf Test:Test_VRF detail extended  
VRF-Name: Test:Test_VRF, VRF-ID: 23, State: Up  
VPNID: unknown  
RD: 103:
```

```
2686981
```

Max Routes: 0 Mid-Threshold: 0

Encap: vxlan-

2686981

Table-ID: 0x80000017, AF: IPv6, Fwd-ID: 0x80000017, State: Up

Table-ID: 0x00000017, AF: IPv4, Fwd-ID: 0x00000017, State: Up

Leaf#

To validate route maps applied to each protocol, run:

- **OSPF**

```
Leaf# show ip ospf vrf Test:Test_VRF | egrep route-map
Table-map using route-map exp-ctx-2686981-deny-external-tag
bgp route-map exp-ctx-2686981
eigrp route-map exp-ctx-2686981
static route-map exp-ctx-st-2686981
direct route-map exp-ctx-st-2686981
coop route-map exp-ctx-st-2686981
Leaf#
```

- **EIGRP**

```
Leaf# show ip eigrp vrf Test:Test_VRF | egrep route-map
static route-map exp-ctx-st-2686981
ospf-default route-map exp-ctx-2686981
direct route-map exp-ctx-st-2686981
coop route-map exp-ctx-st-2686981
bgp-64512 route-map exp-ctx-2686981
Tablemap: route-map exp-ctx-2686981-deny-external-tag , filter-configured
Leaf#
```

- **BGP**

```
Leaf# show bgp process vrf Test:Test_VRF | egrep route-map
static, route-map imp-ctx-bgp-st-interleak-2686981
ospf, route-map permit-all
direct, route-map imp-ctx-bgp-direct-interleak-2686981
coop, route-map exp-ctx-coop-bgp-2686981
direct, route-map permit-all
Leaf#
```

With the correct route-map identified, its content can be displayed:

```
<#root>
```

```
Leaf# show route-map exp-ctx-st-2686981
route-map exp-ctx-st-2686981, deny, sequence 1
Match clauses:
tag: 4294967294
Set clauses:
route-map exp-ctx-st-2686981, permit, sequence 8201
Match clauses:
ip address prefix-lists:
IPv4-st63-2686981-exc-ext-out-Test2RM-Context0RM-MatchRule-dst

ipv6 address prefix-lists: IPv6-deny-all
Set clauses:
tag 4294967295
metric 5
metric-type type-1
route-map exp-ctx-st-2686981, permit, sequence 15801
Match clauses:
tag: 4294967292
Set clauses:
tag 0
route-map exp-ctx-st-2686981, permit, sequence 15802
Match clauses:
tag: 4294967291
Set clauses:
tag 4294967295
route-map exp-ctx-st-2686981, permit, sequence 15804
Match clauses:
ip address prefix-lists: IPv4-st63-2686981-exc-int-inferred-export-dst
ipv6 address prefix-lists: IPv6-deny-all
Set clauses:
tag 0

Leaf#
```

Several entries for route maps are created by default, including the default **deny** for all routes that match tag 4294967294. The tag value is set by ACI border leaf switches to avoid route loops. This is the only value on a route-map that cannot be modified unless is changed at the VRF level.

The prefix list created by the Match Rule policy can be displayed:

```
<#root>
```

```
Leaf# show ip prefix-list IPv4-st63-2686981-exc-ext-out-Test2RM-Context0RM-MatchRule-dst
ip prefix-list IPv4-st63-2686981-exc-ext-out-Test2RM-Context0RM-MatchRule-dst: 2 entries
seq 1 permit
10.10.0.0/16 le 32
```

```
seq 2 permit 0.0.0.0/0
Leaf#
```

Multisite MP-BGP

Multisite fabrics allow the configuration of stretched L3outs and are site-specific. Endpoints in a fabric prefer the external routes advertised by local L3outs rather than the remote L3out unless a more specific route exists in the remote fabric. To influence the routing decision, since the routes are injected into MP-BGP vpnv4 address family in the overlay-1 VRF; a special route map called interleak is needed.

The configuration of the route map is virtually the same as a regular route map. AS-Prepend is the recommended value to influence route decisions in the eBGP neighbors:

- Under the route map **Set Rule** policy create a **Set AS Path** policy:

Action Rule Profile - test

The screenshot shows a configuration page for an Action Rule Profile named "test". Under the "Set AS Path" section, there is a table with the following structure:

Criteria	Count	ASN
No items have been found. Select Actions to create a new item.		

At the bottom right of the configuration area, there is a "Show Usage" button.

- Select either AS-Prepend or AS-Prepend last is needed.

Implementation

Once the **Route Map for import and Export Route Control** has been configured. The implementation depends on the needs:

- **For an implementation that affects all routes received and advertised in an L3out:**

Navigate to **Tenant > TENANT_NAME > Networking > L3out > L3OUT_NAME > Route Control Profile**

Route Control Profile:

Name	Direction
Test	Route Export Policy

- **For an implementation that affects specific route classification:**

Navigate to **Tenant > TENANT_NAME > Networking > L3out > L3OUT_NAME > Subnets.**

Enable **Export Route Control Subnet.**

Configure the **Route Control Profile.**

Subnet - 0.0.0.0/0

[Policy](#)

Properties

IP Address: 0.0.0.0/0
address/mask

Route Control:

Export Route Control Subnet

Import Route Control Subnet

Shared Route Control Subnet

Aggregate

Aggregate Export

Aggregate Import

Aggregate Shared Routes

Route Summarization P

EIGRP Route Summarization

Route Control Profile:

Name	Direction
Test	Route Export Policy

Route control is used for filtering external routes advertised out of the fabric, allowed into the fabric, or leaked to

- **For interlake implementation:**

Navigate to **Tenant > TENANT_NAME > Networking > L3out > L3OUT_NAME**.

Configure **Route Profile for Interleak** .

Configure **Route Profile for redistribution** using **Static** source mode:

The screenshot shows a configuration interface with the following elements:

- A dropdown menu for "Route Profile for Interleak:" with the value "interleak1" selected.
- A label "Route Profile for Redistribution:" followed by a table.
- The table has two columns: "Source" and "Route Map".
- The table contains one row with "static" in the "Source" column and "interleak1" in the "Route Map" column.

Source	Route Map
static	interleak1