



ECMP

This chapter describes the procedure to configure Equal Cost Multi-Path (ECMP) routing that routing protocols use to load balance the network traffic.

- [About ECMP, on page 1](#)
- [Guidelines and Limitations for ECMP, on page 1](#)
- [Manage ECMP Page, on page 3](#)
- [Create an ECMP Zone, on page 3](#)
- [Configure an Equal Cost Static Route, on page 4](#)
- [Modify an ECMP Zone, on page 5](#)
- [Remove an ECMP Zone, on page 6](#)
- [Configuration Example for ECMP, on page 6](#)
- [History for ECMP in Secure Firewall Threat Defense, on page 9](#)

About ECMP

The threat defense device supports Equal-Cost Multi-Path (ECMP) routing. You can configure traffic zones per virtual router to contain a group of interfaces. You can have up to 8 equal cost static or dynamic routes across up to 8 interfaces within each zone. For example, you can configure multiple default routes across three interfaces in the zone:

```
route for 0.0.0.0 0.0.0.0 through outside1 to 10.1.1.2
route for 0.0.0.0 0.0.0.0 through outside2 to 10.2.1.2
route for 0.0.0.0 0.0.0.0 through outside3 to 10.3.1.2
```

Guidelines and Limitations for ECMP

Firewall Mode Guidelines

ECMP zones are supported on routed firewall mode only.

Device Guidelines

- Threat Defense 6.5 and higher devices support configuring ECMP traffic zones in management center:
 - Threat Defense devices of version 6.6 and higher supports ECMP per virtual router.

- The threat defense devices 6.5 or earlier does not support virtual routing, you can associate global interfaces with ECMP.
- A device can have a maximum of 256 ECMP zones.

Interface Guidelines

- ECMP zones can be created in global virtual router and user-defined virtual routers.
- Only routed interfaces can be associated with an ECMP zone.
- Only interfaces with logical names can be associated with an ECMP zone.
- Interfaces should belong to the virtual router where ECMP is being created.
- You can associate only 8 interfaces per ECMP zone.
- An interface can be a member of only one ECMP zone.
- You cannot remove an interface that is associated with equal cost static route from the ECMP zone.
- You cannot delete an ECMP zone if its interface has equal cost static routes associated with it.
- For Threat Defense versions prior to 7.1, sVTI interfaces cannot be used in ECMP zone.
- For Threat Defense versions prior to 7.1, ECMP zone-member interfaces are not supported in Site-to-site VPN or in Remote Access IPsec-IKEv2 VPN.
- Following interfaces cannot be associated with an ECMP zone:
 - BVI interface.
 - Member interfaces in an EtherChannel.
 - Failover or state link interface.
 - Management-only or management-access interfaces.
 - Cluster Control Link interface.
 - Redundant interfaces and its members.
 - VNIs.
 - VLAN interfaces.
 - Interfaces in RA VPN configuration with SSL enabled.

Upgrade Guidelines

When you upgrade from management center 7.0 or prior versions, the existing FlexConfig for ECMP is not deployed to the device. Hence, for a successful deployment, you must manually migrate the FlexConfig traffic zones to ECMP in the UI.

You can create ECMP from management center UI for all the 6.5 and higher routed devices.

Additional Guidelines

- DHCP Relay—Do not enable DHCP Relay on an interface associated with an ECMP zone.
- Threat defense does not support ECMP with NAT in IPsec sessions—a standard IPsec virtual private network (VPN) tunnel does not work with NAT points in the delivery path of IPsec packets.

Manage ECMP Page

When you click **ECMP** on the Routing pane, the ECMP page appears corresponding to the virtual router. This page displays the existing ECMP zones with the associated interfaces of the virtual router. In this page, you can Add an ECMP zone to the virtual router. You can also **Edit** (✎) and **Delete** (🗑) ECMP.

You can perform the following:

- [Create an ECMP Zone, on page 3](#)
- [Configure an Equal Cost Static Route, on page 4](#)
- [Modify an ECMP Zone, on page 5](#)
- [Remove an ECMP Zone, on page 6](#)

Create an ECMP Zone

ECMP zones are created per virtual router. Thus, only the interfaces of the virtual router where the ECMP is being created can be associated with the ECMP.

Procedure

-
- Step 1** Choose **Devices > Device Management**, and edit the threat defense device.
- Step 2** Click **Routing**.
- Step 3** From the virtual router drop-down, select the virtual router in which you want to create the ECMP zone. You can create ECMP zones in global virtual router and user-defined virtual routers. For information on creating virtual routers, see [Create a Virtual Router](#).
- Step 4** Click **ECMP**.
- Step 5** Click **Add**.
- Step 6** In the **Add ECMP** box, enter a name for the ECMP zone.

Note The ECMP name must be unique for the routed device.

- Step 7** To associate interfaces, select the interface under the **Available Interfaces** box, and then click **Add**. Remember the following:

- Only interfaces belonging to the virtual router are available for assigning.

- Only interfaces with a logical name are listed under the **Available Interfaces** box. You can edit the interface and provide a logical name in **Interfaces**. Remember to save the changes for the settings to take effect.

Step 8 Click **OK**.
The ECMP page now displays the newly created ECMP.

Step 9 Click **Save** and **Deploy** the configuration.

You can associate the ECMP zone interfaces with equal cost static route by defining them with same destination and metric value, but with different gateway.

What to do next

- [Configure an Equal Cost Static Route, on page 4](#)
- [Modify an ECMP Zone, on page 5](#)
- [Remove an ECMP Zone, on page 6](#)

Configure an Equal Cost Static Route

Smart License	Classic License	Supported Devices	Supported Domains	Access
Any	N/A	threat defense and threat defense virtual	Any	Admin/Network Admin/Security Approver

You can assign interfaces of a virtual router, both global and user-defined, to an ECMP zone for the device.

Before you begin

- To configure an equal cost static route for an interface, ensure to associate it with an ECMP zone. See [Create an ECMP Zone, on page 3](#).
- All routing configuration settings of a non-VRF capable device are also available for a global virtual router.
- You cannot define a static route for interfaces with same destination and metric without associating the interfaces with an ECMP zone.

Procedure

- Step 1** From the **Devices > Device Management** page, edit the threat defense device. Click the **Routing** tab.
- Step 2** From the drop-down list, select the virtual router whose interfaces are associated with an ECMP zone.
- Step 3** To configure the equal cost static route for the interfaces, click **Static Route**.
- Step 4** Either click **Add Route** to add a new route, or click **Edit** (✎) for an existing route.

- Step 5** From the **Interface** drop-down, select the interface belonging to the virtual router and an ECMP zone.
- Step 6** Select the destination network from the **Available Networks** box and click **Add**.
- Step 7** Enter a gateway for the network.
- Step 8** Enter a metric value. It can be a number that ranges between 1 and 254.
- Step 9** To save the settings, click **Save**.
- Step 10** To configure equal cost static routing, repeat the steps to configure the static route for another interface in the same ECMP zone with the same destination network and metric value. Remember to provide a different gateway.

What to do next

- [Modify an ECMP Zone, on page 5](#)
- [Remove an ECMP Zone, on page 6](#)

Modify an ECMP Zone

Procedure

- Step 1** Choose **Devices > Device Management**, and edit the threat defense device.
- Step 2** Click **Routing**.
- Step 3** Click **ECMP**.
ECMP zones with its associated interfaces are displayed in the **ECMP** page.
- Step 4** To modify an ECMP, click **Edit** (✎) against the desired ECMP. In the **Edit ECMP** box, you can do the following:
- **ECMP Name**—Ensure that the changed name is unique for the device.
 - **Interfaces**—You can add or remove interfaces. You cannot include an interface that is already associated with another ECMP. In addition, you cannot remove the interface that is associated with an equal cost static route.
- Step 5** Click **OK**.
- Step 6** To save the changes, click **Save**.

What to do next

- [Configure an Equal Cost Static Route, on page 4](#)
- [Remove an ECMP Zone, on page 6](#)

Remove an ECMP Zone


Procedure

Step 1 Choose **Devices > Device Management**, and edit the threat defense device.

Step 2 Click **Routing**.

Step 3 Click **ECMP**.

ECMP zones with its associated interfaces are displayed in the **ECMP** page.

Step 4 To remove an ECMP zone, click **Delete** () against the ECMP zone.

You cannot delete the ECMP zone if any of its interfaces are associated with an equal cost static route.

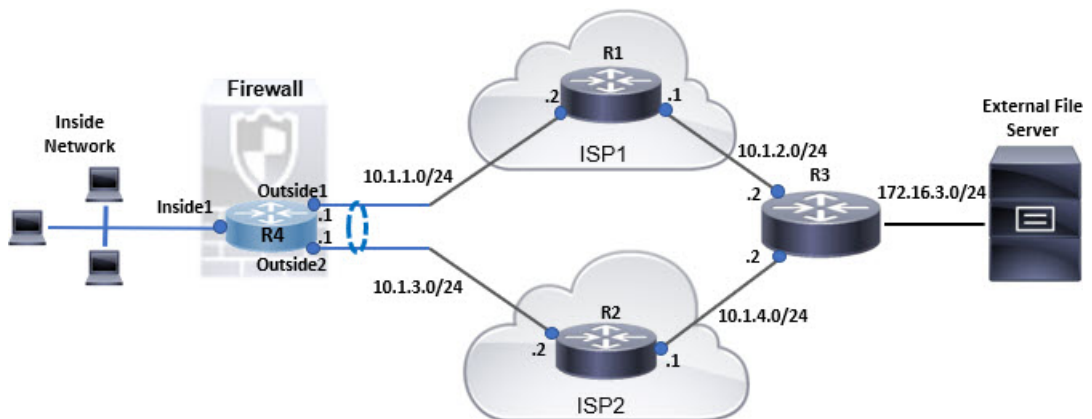
Step 5 Click **Delete** in the confirmation message.

Step 6 To save the changes, click **Save**.

Configuration Example for ECMP

This example demonstrates how to use management center to configure ECMP zones on threat defense such that the traffic flowing through the device is handled efficiently. With ECMP configured, threat defense maintains the routing table per zone basis, and hence it makes it possible to re-route the packets in the best possible routes. Thus, ECMP supports asymmetric routing, load balancing, and handles lost traffic seamlessly. In this example, R4 records the two paths to reach the external file server.

Figure 1: Configuration Example for ECMP



Procedure

Step 1 Create virtual router—R4 with *Inside1*, *Outside1*, and *Outside2* interfaces:

Figure 2: Configuring R4 Virtual Router

Manage Virtual Routers

R4

Virtual Router Properties

ECMP

OSPF

BGP

IPv4

IPv6

Static Route

General Settings

BGP

Virtual Router Properties

These are the basic details of this virtual router.

VRF Name: R4

Description:

Select Interface:

Q Search

Available Interfaces

Inside1

Outside1

Outside2

Add

Selected Interfaces

Inside1

Outside1

Outside2

Step 2

Create ECMP zones:

- In the **Routing** tab, choose R4 user defined virtual router, and then click **ECMP**.
- Click **Add**.
- Enter the ECMP name and from the **Available Interfaces** list, choose *Outside1* and *Outside2*:

Figure 3: Creating ECMP Zone

Add ECMP

Name

ECMP-R4

Associate Interfaces with ECMP

You can add interfaces to this ECMP by clicking on Add button. ECMP can have up to 8 interfaces associated with it. All the interfaces in the ECMP must have a name and security level as this ECMP.

Available Interfaces

Inside1

Add

Selected Interfaces

Outside1

Outside2

Cancel OK

- Click **Ok**, and then **Save**.

Step 3

Create static routes for the zone interfaces:


- In the **Routing** tab, click **Static Route**.
- From the **Interface** drop-down list, select *Outside1*.
- Under **Available Network**, choose *any-ipv4* and click **Add**.
- Specify the next-hop address in the **Gateway** field, 10.1.1.2:

Figure 4: Configuring Static Route for Outside1

Add Static Route Configuration

Type: IPv4 IPv6

Interface*
 Outside1

(Interface starting with this icon  signifies it is available for route leak)

Available Network +

- any-ipv4
- IPv4-Benchmark-Tests
- IPv4-Link-Local
- IPv4-Multicast
- IPv4-Private-10.0.0.0-8
- IPv4-Private-172.16.0.0-1;

Selected Network
 any-ipv4

Gateway*
 10.1.1.2 +

Metric:
 1
 (1 - 254)

Tunneled: (Used only for default Route)



Route Tracking:

Cancel OK

- e) Configure the static route for Outside2, repeating from Step 3b to Step 3d. Ensure to specify same metric, but different gateways for the static routes:

Figure 5: Configured Static Routes of ECMP Zone Interfaces

+ Add Route

Network	Interface	Leaked from Virtual Router	Gateway	Tunneled	Metric	Tracked
IPv4 Routes						
any-ipv4	Outside1		10.1.1.2	false	1	 
any-ipv4	Outside2		10.1.3.2	false	1	 
IPv6 Routes						

Step 4 Save and Deploy.

The network packets to reach its destination, R3, follows R4>R1>R3 or R4>R2>R3, based on the ECMP algorithm. If R1>R3 route is lost, the traffic flows through R2 without any packet drops. Similarly, the response from R3 can be received by *Outside2* though the packet was sent from *Outside1*. In addition, when the network traffic is heavy, R4 distributes them between the two routes and thus balances the load.

History for ECMP in Secure Firewall Threat Defense

Feature	Minimum Management Center	Minimum Threat Defense	Details
ECMP support as Routing Policy	7.1	Any	Secure Firewall Threat Defense was supporting ECMP routing through FlexConfig policies. From this release, you can group interfaces in to traffic zones and configure ECMP routing in Secure Firewall Management Center. New/modified screens: Devices > Device Management > Routing > ECMP

