

ECMP

Equal Cost Multi-Path (ECMP) is a routing strategy that allows a router to forward packets along multiple paths of equal cost to a destination.

- Enables load balancing across multiple network paths.
- Utilizes routing protocols to determine path cost.
- Increases total available bandwidth for traffic flows.

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ECMP routing methods

ECMP is a routing method that

- enables traffic distribution across multiple equal-cost paths,
- supports up to 8 equal cost static or dynamic routes across up to 8 interfaces within each zone, and
- uses traffic zones per virtual router to contain a group of interfaces.

Multiple default routes configuration

This example shows multiple default routes configured 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

Follow these principles for effective ECMP zone configuration:

Firewall mode limitations

Use ECMP zones only in routed firewall mode.

Interface restrictions

Do not use dVTI or Loopback interfaces with ECMP zones.

ECMP zone configuration limits

Follow these limits when configuring ECMP zones:

- Devices can have a maximum of 256 ECMP zones.
- You can associate only 8 interfaces per ECMP zone.
- An interface can be a member of only one ECMP zone.

Interface management limitations

Do not remove interfaces or delete zones actively used for routing:

- You cannot remove an interface that is associated with an 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.

Supported interface types

Use only routed interfaces for ECMP zones. Do not associate these interface types 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.
- VNIs.
- VLAN interfaces.
- Interfaces in a remote access VPN configuration with SSL enabled.

Feature compatibility limitations

Consider these feature limitations when using ECMP zones:

- DHCP Relay is not supported on interfaces in an ECMP zone.
- Dual ISP/WAN Firewall Threat Defense Deployment—Create a single ECMP zone for the primary and secondary data interfaces, enabling static routes with identical metric values.

- The Firewall 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 zones for virtual routers

The ECMP page lets you manage existing ECMP zones linked with virtual routers. When you click **ECMP** on the **Routing** pane, the ECMP page displays the current ECMP zones, including the associated interfaces, for the selected virtual router. On this page, you can add new ECMP zones to the virtual router. You can also **Edit** ( ) and **Delete** ( ) ECMP zones.

You can perform these actions:

- Create an ECMP zone, on page 3
- Configure an equal cost static route, on page 4
- Modify an ECMP zone, on page 5
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Create an ECMP zone

Create an ECMP zone to enable load balancing across multiple equal-cost paths in a virtual router configuration.

ECMP zones are created per virtual router. Only interfaces that belong to the virtual router where the ECMP is being created can be associated with the ECMP zone.

Procedure

Step 1 Navigate to **Devices** > **Device Management**, and edit the Firewall 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 the global virtual router and user-defined virtual routers. For information on creating virtual routers, refer to 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 on the routed device.

Step 7 Under the **Available Interfaces** box, select the interface and click **Add**.

- Only interfaces belonging to the virtual router where you are creating the ECMP can be associated with it. Interfaces must have a logical name to be displayed; edit the interface and save to set a logical name.

- From Version 10.0, ECMP is supported on dynamic VTIs (DVTIs) of hub devices in SD-WAN VPN topologies. When enabled on a DVTI, it is automatically added to a system-generated ECMP zone, so DVTIs do not appear under **Available Interfaces**.

Step 8 Click **OK**.

The ECMP page displays your newly created ECMP zone.

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 a different gateway.

What to do next

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- Modify an ECMP zone, on page 5
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Configure an equal cost static route

Configure equal cost static routes to enable load balancing across multiple interfaces with the same destination and metric value within an ECMP zone.

Smart License	Classic License	Supported Devices	Supported Domains	Access
Any	N/A	Firewall Threat Defense and Firewall 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 that it is associated with an ECMP zone. For more information, refer to 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 the same destination and metric without associating the interfaces with an ECMP zone.

Procedure

Step 1 From the **Devices** > **Device Management** page, edit the Firewall 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 that belongs to the virtual router and is associated with 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**.

To configure equal cost static routing, repeat these 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.

The equal cost static routes are configured for the interfaces associated with the ECMP zone, enabling load balancing across multiple paths.

What to do next

- Modify an ECMP zone, on page 5
- Remove an ECMP zone, on page 6

Modify an ECMP zone

Use this procedure when you need to make changes to an existing ECMP zone configuration on your device.

Follow these steps to modify an ECMP zone:

Procedure

Step 1 Choose **Devices** > **Device Management**, and edit the Firewall Threat Defense device.

Step 2 Click **Routing**.

Step 3 Click **ECMP**.

ECMP zones with their associated interfaces appear.

Step 4 To modify an ECMP zone, click **Edit** (✎) next to the desired ECMP zone. In the **Edit ECMP** dialog box, you can make changes to the ECMP name or associated interfaces.

- ECMP Name: Ensure that the ECMP name you enter is unique.
- Interfaces: Add or remove one or more interfaces as needed.

Note An interface must not belong to more than one ECMP zone, and it should not be linked to an equal-cost static route.

Step 5 Click **OK**.

Step 6 Click **Save**.

The ECMP zone shows your updated settings.

What to do next

- Configure an equal cost static route, on page 4
- Remove an ECMP zone, on page 6

Remove an ECMP zone

ECMP zones group interfaces for equal-cost multipath routing. You may need to remove an ECMP zone when reconfiguring your network topology or when the zone is no longer required.

Procedure

Step 1 Choose **Devices** > **Device Management**, and edit the Firewall Threat Defense device.

Step 2 Click **Routing**.

Step 3 Click **ECMP**.

The ECMP zones with associated interfaces appear.

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

Note You cannot delete the ECMP zone if it has interfaces associated with equal-cost static routes.

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

Step 6 Click **Save** to apply changes.

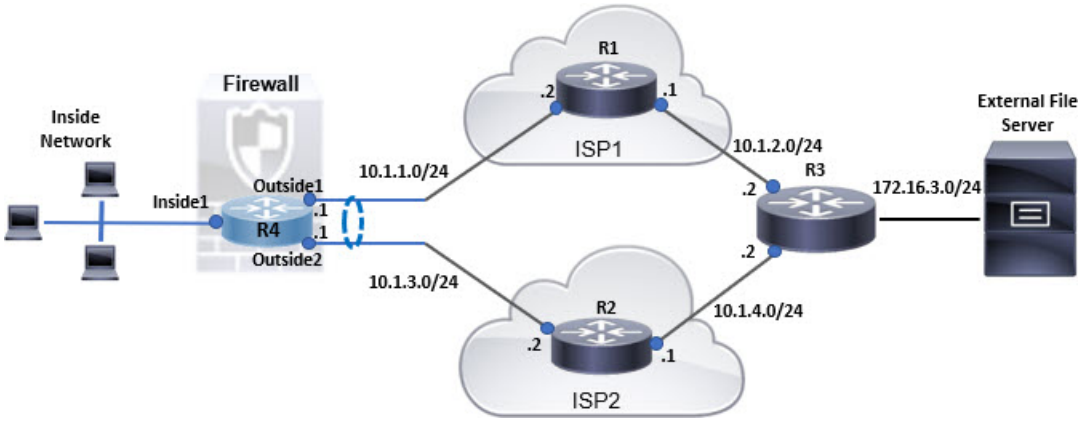
The ECMP zone is removed from the device configuration and is no longer available for routing operations.

Configure ECMP zones on your device

Configure Equal-Cost MultiPath (ECMP) to enable efficient traffic handling through the device with support for asymmetric routing, load balancing, and traffic rerouting when a path becomes unavailable.

This example demonstrates how to use Firewall Management Center to configure ECMP zones on Firewall Threat Defense such that the traffic flowing through the device is handled efficiently. With ECMP configured, Firewall Threat Defense maintains the routing table on a per-zone basis, enabling efficient packet re-routing. Thus, ECMP supports asymmetric routing, load balancing, and traffic rerouting when a path becomes unavailable. In this example, R4 records the two paths to reach the external file server.

Figure 1: Configuration example for ECMP



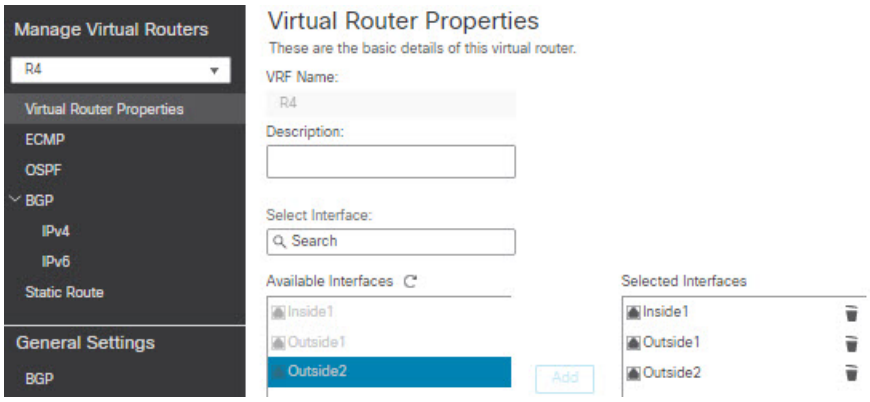
Follow these steps to configure ECMP on your device:

Procedure

Step 1 Create a virtual router.

Set up a new router on *R4* with interfaces: *Inside1*, *Outside1*, and *Outside2*. For more information, refer to Create virtual router.

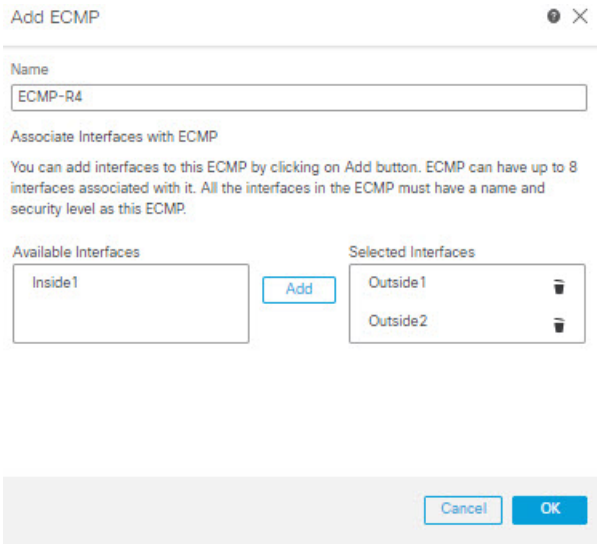
Figure 2: Configuring R4 virtual router



Step 2 Create ECMP zones:

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

Figure 3: Creating ECMP zone

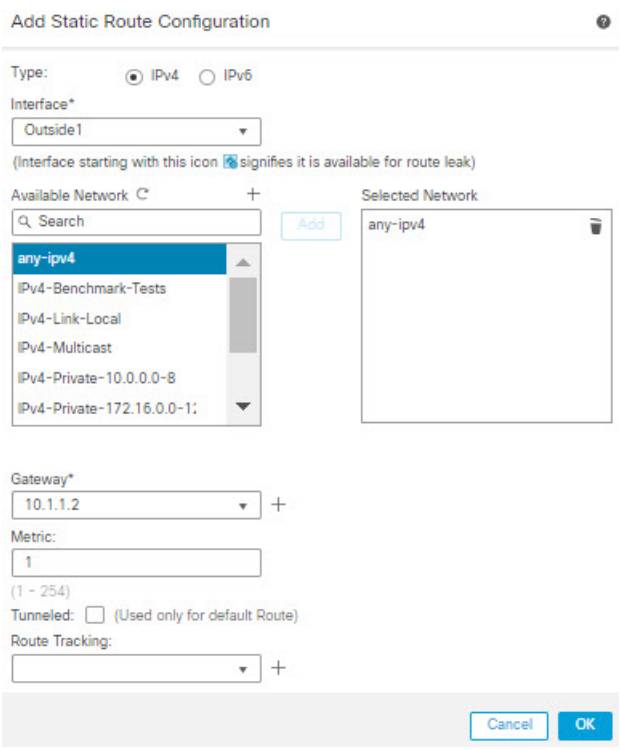


d) Click **OK**.
e) Click **Save**.

Step 3 Create static routes for the zone interfaces:

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

Figure 4: Configuring static route for Outside1



e) Configure the static route for Outside2 by repeating Step 3b through Step 3d.

Ensure that you specify the same metric but different gateways for the static routes:

Figure 5: Configured static routes of ECMP zone interfaces



Step 4 Save and deploy the changes to apply ECMP routing to your device.

Network packets will now utilize efficient routes to reach their destination R3, either through R4>R1>R3 or R4>R2>R3, according to the ECMP algorithm configuration. If the R1>R3 route becomes unavailable, traffic can be rerouted through R2, which helps reduce disruption during path failure. Additionally, return traffic from R3 can arrive on *Outside2* even if the original packet was sent through *Outside1*. When network traffic is heavy, R4 distributes the network load between two specified routes to maintain balanced traffic.

History for ECMP in Secure Firewall Threat Defense

This reference provides the history of Equal-Cost Multi-Path (ECMP) features, focusing on key enhancements introduced in various releases and their implementation specifics.

Feature	Minimum Firewall Management Center	Minimum Firewall Threat Defense	Details
ECMP support as Routing Policy	7.1	Any	Secure Firewall Threat Defense supports ECMP routing through FlexConfig policies. Group interfaces into traffic zones to refine ECMP routing in Secure Firewall Management Center. New/modified screens: **Devices** > **Device Management** > **Routing** > **ECMP**