

Transport Gateways

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Transport Gateways

Table 1: Feature History

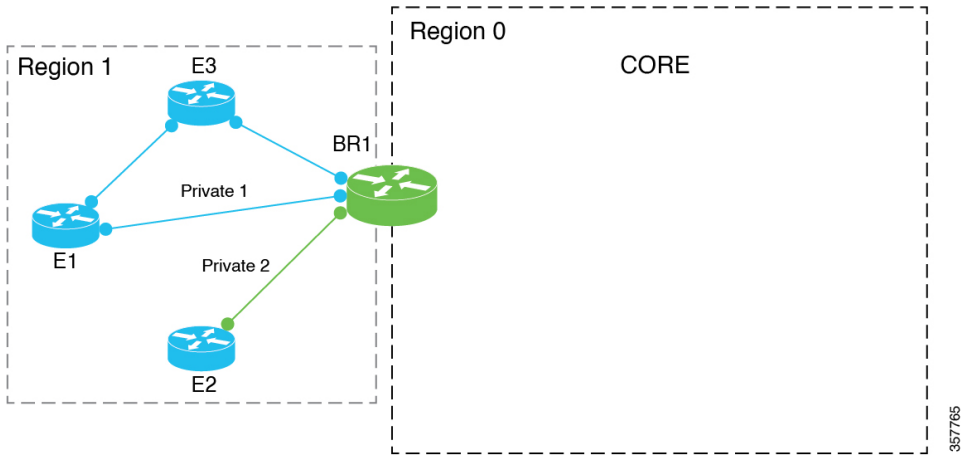
Feature Name	Release Information	Description
Multi-Region Fabric: Transport Gateways	Cisco IOS XE Catalyst SD-WAN Release 17.8.1a Cisco vManage Release 20.8.1	An edge router or border router that has connections to two networks that lack direct connectivity can function as a transport gateway. This is helpful for enabling connectivity between routers that are configured to be within the same access region, but which do not have direct connectivity.

Information About Transport Gateways

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.8.1a, Cisco vManage Release 20.8.1

Various devices assigned to the same access region may operate in networks that lack direct connectivity—so-called disjoint networks. If there is an edge router or a border router that operates in the same access region, and has connections to the two disjoint networks, you can configure that router to function as a transport gateway. As a transport gateway, the router provides connectivity to the edge routers in the disjoint networks.

Figure 1: Border Router Functioning as a Transport Gateway for Edge Routers that Lack Direct Connectivity



The Problem That Transport Gateways Address

Without transport gateway functionality, one method for enabling traffic between devices that lack direct connectivity is to create a control policy that routes traffic between the devices in disjoint networks using an intermediate device that has connectivity to both networks, and configuring specific routes.

There are problems with this approach:

- Complexity: Configuring a control policy to advertise prefixes is complicated.
- Potential traffic black hole: The control policy cannot detect whether a device or a configured route is unavailable. This can lead to packet loss if a route becomes unavailable.

Routing Mechanism

When a router is configured to function as a transport gateway, it does the following for each route between devices within its primary region.

1. Installs each route that it learns from the Cisco SD-WAN Controllers for the access region.
2. Re-originates each route that it learns from the Cisco SD-WAN Controllers, substituting its own TLOCs as the next hop for the routes. This means that it substitutes its TLOCs as the next hop for each route and advertises the route to the Cisco SD-WAN Controllers for its region.

Note Starting from Cisco Catalyst SD-WAN Manager Release 20.16.1, routes that are reoriginated from a site through the transport gateway are filtered out by the Cisco Catalyst SD-WAN Controller. These reoriginated routes are not sent back to the originating site or the sites which share same site ID as the originating site. The reoriginated routes are only distributed to different sites within the Cisco Catalyst SD-WAN network.

This change in routing mechanism is also backported to Cisco Catalyst SD-WAN Manager Release 20.15.2, and Cisco Catalyst SD-WAN Manager Release 20.12.5.

Note that this process does not re-originate primary region routes into the core region, or core region routes into an access region.

The effect of configuring a router as a transport gateway is that it can provide routes for all intra-region traffic. A device in the network uses the transport gateway route only if it lacks a direct route to the destination.

Primary Region Only

If you configure an edge router to act as a transport gateway, the edge router re-originates only routes in a primary access region. For information about primary and secondary regions, see Information About Secondary Regions.

If you configure a border router to act as a transport gateway, it re-originates only routes in the access region, not the core region.

Preference for a Transport Gateway Route

After configuring a transport gateway, there may be multiple paths available between two routers in an access region. When multiple paths are available between two routers, the overlay management protocol (OMP) applies best path selection logic to choose the best path. The best path selection logic is biased toward paths with the smallest number of hops, which may possibly exclude the transport gateway path. OMP best path selection logic includes the following:

- By default, OMP selects a direct path if one is available.
- If no direct path is available, OMP selects a path with more hops, such as through a transport gateway.

You can configure the OMP logic as follows:

- Prefer a transport gateway path over a direct path.
- Consider direct paths and transport gateway paths as equal.

See Configure the Transport Gateway Path Preference Using Cisco SD-WAN Manager, on page 5.

Multiple Transport Gateways

If there are multiple transport gateways active in a region, then a device applies equal-cost multi-path routing (ECMP) across all of the available transport gateways.

Benefits of Transport Gateways

Advantages of Using Transport Gateways

- Enables easier configuration than the control policy method.
- If a route becomes unavailable, the transport gateway withdraws the route to the edge router and stops re-originating the paths to it, preventing networking black holes.

Traffic Protocols

Transport gateway routers can handle IPv4 and IPv6 traffic.

Supported Devices for Transport Gateways

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.8.1a, Cisco vManage Release 20.8.1

- Transport gateway functionality: Cisco IOS XE Catalyst SD-WAN devices only
- Ability to use transport gateway paths: Cisco IOS XE Catalyst SD-WAN devices and Cisco vEdge devices

Restrictions for Transport Gateways

Restrictions from Cisco IOS XE Catalyst SD-WAN Release 17.8.1a and Cisco vManage Release 20.8.1

- Cloud onRamp for SaaS routes

  Does not affect Cloud onRamp for SaaS routes.

- Secondary regions

  Transport gateway functionality is not supported on routers that have a secondary region configured.



Note Attempting to configure transport gateway functionality on such a router results in an error.

- Multiple devices within the same region

  If you enable transport gateway functionality on multiple devices within the same region, providing more than one transport gateway path between edge routers in disjoint networks, the edge routers apply best path selection logic to determine the best path.

  If there are multiple transport gateways and OMP selected transport gateway paths, then it applies ECMP to all available transport gateway paths.

  By default, OMP selects a direct path if one is available, and if not, selects a path with more hops, such as through a transport gateway, if available. However, you can configure the OMP logic differently. See Information About Transport Gateways, on page 1.

- Not advertising a transport gateway route to another transport gateway

  If you enable transport gateway functionality on multiple devices within the same region, the Cisco SD-WAN Controller for the region ensures that a route that is re-originated by one transport gateway is not advertised to another transport gateway. By preventing the advertising of a transport gateway route to another transport gateway, the Cisco SD-WAN Controller helps to prevent any potential routing loops.

- Resource demands

  Due to the resource demands of transport gateway functionality, we recommend enabling this only on a high-performance device with CPU and memory resources to handle the additional load. The specific resource requirements depend on your networking environment.

- Dynamic on-demand tunnels

You cannot configure dynamic on-demand tunnels for a device configured as a transport gateway. This restriction applies in MRF- and non-MRF architectures. For information about dynamic on-demand tunnels, see Dynamic On-Demand Tunnels in the *Cisco Catalyst SD-WAN Systems and Interfaces Configuration Guide, Cisco IOS XE Release 17.x*.

- Edge router and a border router in the same region

  Do not configure both an edge router and a border router in the same region as transport gateways.

- Border router requirement

  For a network using Multi-Region Fabric, Cisco IOS XE Catalyst SD-WAN Release 17.15.x and Cisco Catalyst SD-WAN Control Components Release 20.15.x are the last releases to support configuring non-border-routers as transport gateways. From Cisco IOS XE Catalyst SD-WAN Release 17.16.1a and Cisco Catalyst SD-WAN Control Components Release 20.16.1, in such a network, only configure border routers as transport gateways. Do not configure other types of routers as transport gateways.

Configure Transport Gateways Using Cisco SD-WAN Manager

Enable Transport Gateway Functionality on a Router Using Cisco SD-WAN Manager

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.8.1a, Cisco vManage Release 20.8.1

1. From the Cisco SD-WAN Manager menu, choose **Configuration** > **Templates**.
2. Click **Feature Templates**.
3. Do one of the following:
   - Create a system template for the device.
   - In the table, locate the existing system template for the device. In the row for the template, click **…** and choose **Edit**.
4. In the **Basic Configuration** section, in the **Transport Gateway** field, choose **On**.
5. If you are editing an existing template, click **Update** and then **Configure Device** to push the update to the devices using the template.

Configure the Transport Gateway Path Preference Using Cisco SD-WAN Manager

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.8.1a, Cisco vManage Release 20.8.1

1. From the Cisco SD-WAN Manager menu, choose **Configuration** > **Templates**.
2. Click **Feature Templates**.

3. Do one of the following:
   - Create an OMP template for the device.
   - In the table, locate the existing OMP template for the device. In the row for the template, click **...** and choose **Edit**.
4. In the **Best Path** section, in the **Transport Gateway Path Behavior** field, choose Global mode and choose one of the following options:

Option	Description
Do ECMP Between Direct and Transport Gateway Paths	For devices that can connect through a transport gateway and through direct paths, apply equal-cost multi-path (ECMP) to all available paths.
Prefer Transport Gateway Path	For devices that can connect through a transport gateway, use only the transport gateway paths, even if other paths are available.

5. (Optional) From Cisco IOS XE Catalyst SD-WAN Release 17.12.1a, you can click the **Site Types** field and choose one or more site types to which to apply the transport gateway behavior. For information about how the Site Types parameter operates together with the Transport Gateway Path Behavior parameter, see OMP Best Path Logic and Transport Gateway Path Preference.
6. Click **Save** if creating a new template, or **Update** if editing an existing template.

Configure Transport Gateways Using the CLI

Enable Transport Gateway Functionality on a Router Using a CLI Template

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.8.1a, Cisco vManage Release 20.8.1

Do the following on a device to configure it as a transport gateway:

1. Enter system configuration mode.

   ```
   system
   ```

2. Enable transport gateway functionality.

   ```
   transport-gateway enable
   ```

Note To disable transport gateway functionality, use the **no** form of the command.

Example

```
system
  transport-gateway enable
```

Configure the Transport Gateway Path Preference Using a CLI Template

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.8.1a, Cisco vManage Release 20.8.1

Do the following on a device to configure it to use a transport gateway:

1. Enter sdwan configuration mode.

   ```
   sdwan
   ```

2. Enter system OMP configuration mode.

   ```
   omp
   ```

3. Configure the transport gateway path preference, using one of the following options:

   ```
   best-path transport-gateway {prefer | ecmp-with-direct-path}
   ```

Option	Description
ecmp-with-direct path	For devices that can connect through a transport gateway and through direct paths, apply equal-cost multi-path (ECMP) to all available paths.
prefer	For devices that can connect through a transport gateway, use only the transport gateway paths, even if other paths are available.

4. Beginning with Cisco IOS XE Catalyst SD-WAN Release 17.12.1a, you can specify which types of traffic use a transport gateway route. Other types of traffic do not use a transport gateway.

   ```
   omp best-path transport-gateway-settings site-types site-types
   ```

Option	Description
site-types	Include one or more of the following site types, separated by spaces: **cloud**, **branch**, **br**, **type-1**, **type-2**, **type-3**

Note To use this command, ensure that you use **omp best-path transport-gateway prefer** in the previous step.

Example

The following example configures a device to prefer transport gateway routes.

```
sdwan
omp
  omp best-path transport-gateway prefer
```

Verify a Transport Gateway Configuration Using the CLI

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.8.1a, Cisco vManage Release 20.8.1

Use the **show sdwan running-config system** command on a device to check whether it is configured as a transport gateway. In the output, **transport-gateway enable** indicates that it is configured.

```
Device#show sdwan running-config system
system
system-ip             192.168.1.1
domain-id             1
site-id               11100
region 1
!
role                  border-router
transport-gateway enable
...
```

You can also use the **show sdwan omp summary** command on a device to check whether it is configured as a transport gateway. In the output, **transport-gateway enabled** indicates that transport gateway functionality is enabled.