

Route Aggregation on Border Routers and Transport Gateways

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Route Aggregation on Border Routers and Transport Gateways

Table 1: Feature History

Feature Name	Release Information	Description
Route Aggregation on Border Routers and Transport Gateways	Cisco Catalyst SD-WAN Control Components Release 20.11.1 Cisco IOS XE Catalyst SD-WAN Release 17.11.1a	This feature enables you to configure route aggregation on border routers and transport gateways in a Multi-Region Fabric network environment. For a border router, you can specify whether the route aggregation operates only for the core region, the router's access region, or both.

Information About Route Aggregation on Border Routers and Transport Gateways

Minimum releases: Cisco Catalyst SD-WAN Control Components Release 20.11.x, Cisco IOS XE Catalyst SD-WAN Release 17.11.1a

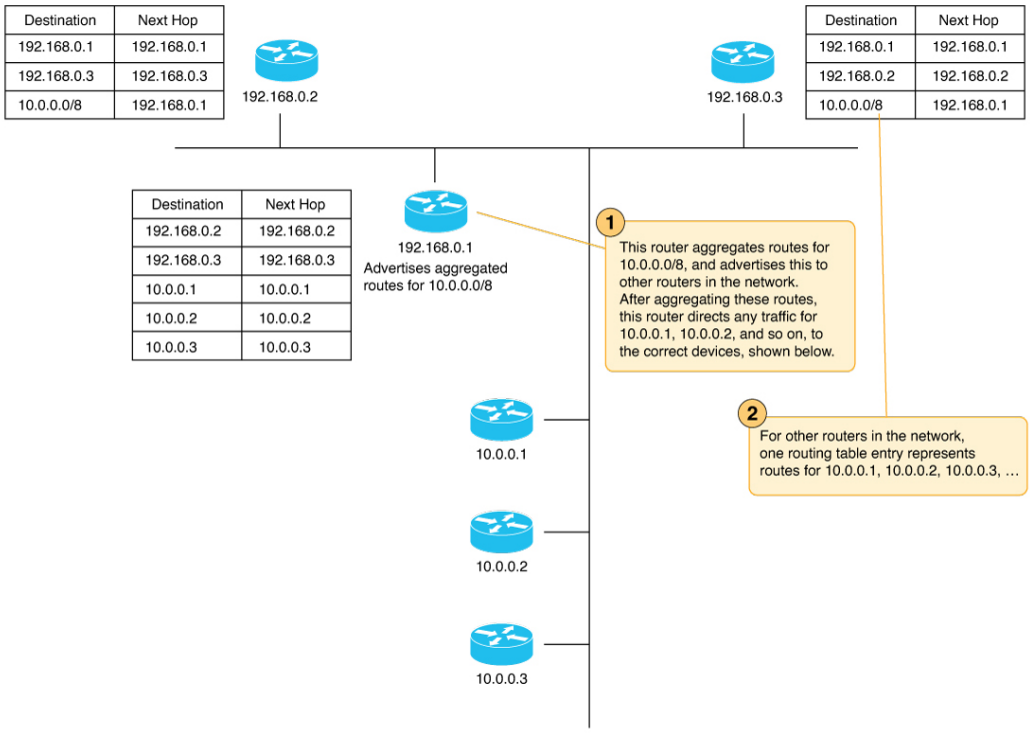
Route aggregation is a method for reducing the number of entries that routers in a network must maintain in routing tables, for better scaling. In some enterprise settings, the number of routes available to a device might reach the thousands. Storing this number of entries in the routing tables of devices in the network may require excessive resources on each device, and can reduce network performance.

To reduce the demand on router resources, and improve network performance, you can configure a router in the network to manage a range of IP addresses using a networking method called route aggregation, which works as follows:

- Configure a router to advertise to the network a single prefix that represents a range of IP addresses. Provide the prefix in classless inter-domain routing (CIDR) notation. For example, 10.0.0.0/8 includes all addresses from 10.0.0.1 to 10.255.255.254.
- Other routers in the network only require a single routing table entry for this prefix, which aggregates a range of IP addresses.
- When a router in the network receives traffic for a route represented by an IP address in the aggregated range, the router directs the traffic to the device handling that range of addresses.

In this manner, route aggregation can significantly reduce the size of routing tables on devices in the network.

Figure 1: Route Aggregation



Note the following behaviors regarding route aggregation:

- An aggregating device advertises the aggregate prefix only if a component route within the prefix range is available.
- By default, an aggregating router advertises each individual route and the summary prefix. You can use an aggregate-only option to advertise only the summary prefix and not each individual route.

Route Aggregation with Multi-Region Fabric and Transport Gateways

Releases earlier than Cisco IOS XE Catalyst SD-WAN Release 17.11.1a support configuring aggregation for OMP routes. This includes configuring aggregation for edge routers in access regions of a network using Multi-Region Fabric. Cisco IOS XE Catalyst SD-WAN Release 17.11.1a adds support for using route route aggregation with border routers (with the option to advertise routes to either the access region or core region) and transport gateways.

When you configure route aggregation on a border router or transport gateway, the aggregation includes even routes that the device reoriginates. For example, if you configure a border router to aggregate routes defined by the prefix 10.0.0.0/8, the aggregation applies to the route 10.0.0.20, even if that is a route that the border router is reoriginating.

For more information about route aggregation, see the Configure OMP section of the *Cisco Catalyst SD-WAN Routing Configuration Guide, Cisco IOS XE Release 17.x*.

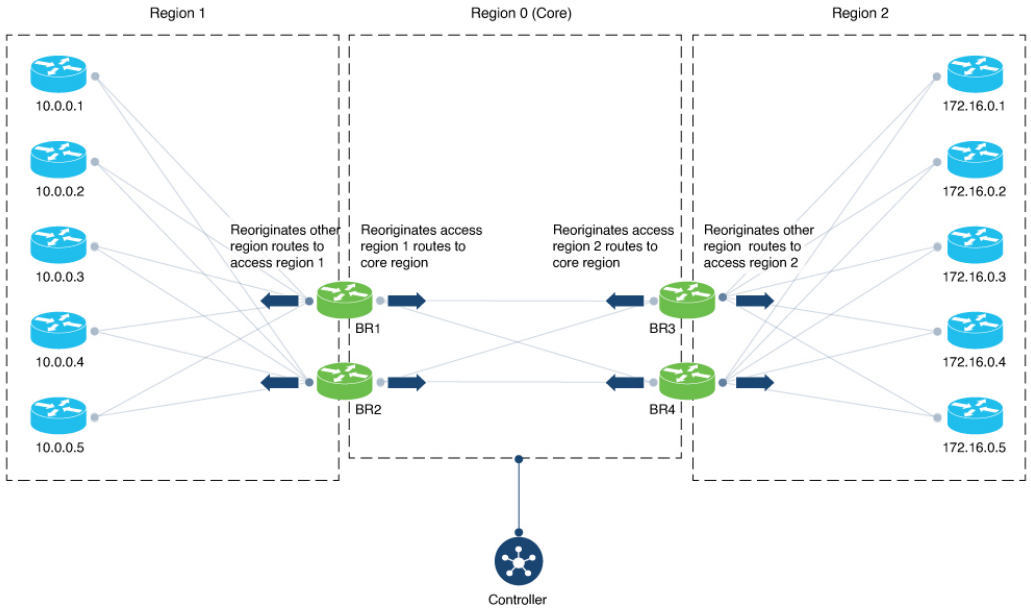
Reorigination of Routes by a Border Router

By the nature of the Multi-Region Fabric network topology, a border router functions as a gateway to routers in the access region that it serves to reach other Multi-Region Fabric regions. To do this, the border router reoriginates routes of devices in its access region to the core region, and similarly reoriginates routes from the core region to the access region. As the number of routers in the access or core region grows, the number of routes that the border router reoriginates grows too.

Each route that a border router reoriginates to the core region creates an additional resource demand on all of the border routers in the core region. The following simplified illustration shows a few important points:

- As the number of routes in an access region grows, the number of routes that the border router for that region readvertises grows.
- Each border router for a region reoriginates the same set of routes as other border routers in the region, so the number of readvertised routes multiplies with each new border router.
- As the number of readvertised routes grows, the resource demands grow for the Cisco SD-WAN Controllers serving the core region.

Figure 2: Reorigination of Routes in a Multi-Region Fabric Network



IPv6 Support

Route aggregation supports IPv4 and IPv6 addresses.

Benefits of Route Aggregation on Border Routers and Transport Gateways

Configuring a border router to perform route aggregation reduces the need to readvertise all routes individually in the core region. Reoriginating fewer individual routes alleviates resource demands on border routers and Cisco SD-WAN Controllers.

Similarly, you can configure route aggregation for an edge router operating as a transport gateway. The benefits do not apply specifically to the core region, but as with all route aggregation, the result is to reduce demands on router resources by minimizing the size of routing tables.

Supported Platforms for Route Aggregation on Border Routers and Transport Gateways

Minimum releases: Cisco Catalyst SD-WAN Control Components Release 20.11.x, Cisco IOS XE Catalyst SD-WAN Release 17.11.1a

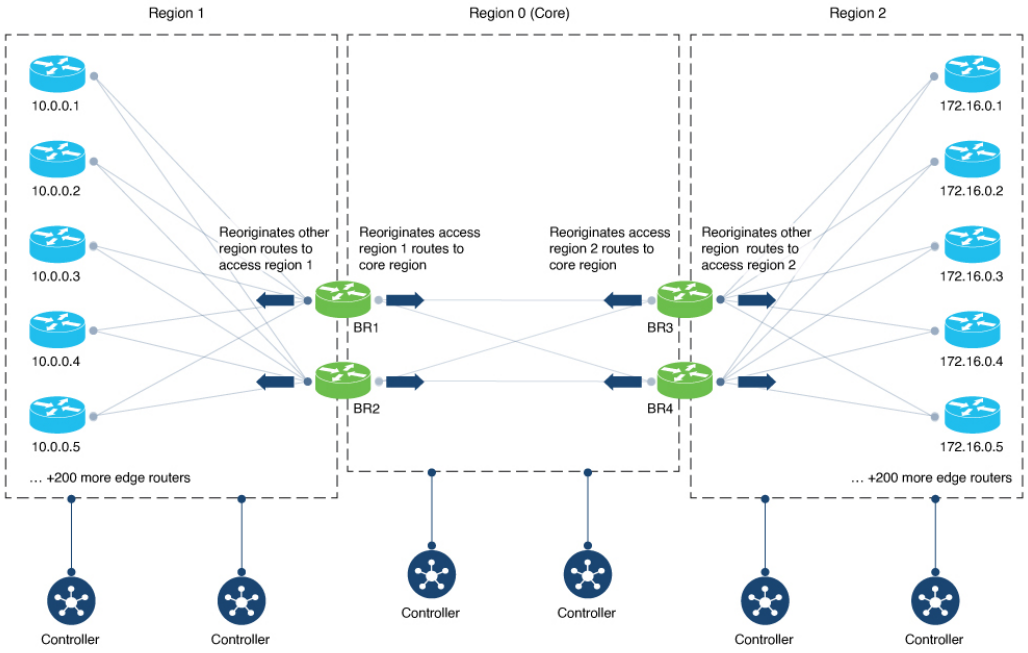
Cisco IOS XE Catalyst SD-WAN devices

Use Cases for Route Aggregation on Border Routers and Transport Gateways

Minimum releases: Cisco Catalyst SD-WAN Control Components Release 20.11.x, Cisco IOS XE Catalyst SD-WAN Release 17.11.1a

An organization using Multi-Region Fabric has a large number of edge routers in two access regions, with two Cisco SD-WAN Controllers managing each access region and the core region. The large number of routes reoriginated by each of two border routers for each access region strain the resources of the Cisco SD-WAN Controllers for the core region.

Figure 3: Route Aggregation on Border Routers



To reduce the number of routes reoriginated in the core region, configure border routers BR1 and BR2 to aggregate the routes for the 200+ edge routers in region 1. Configure the border routers BR3 and BR4 to aggregate the routes for the 200+ edge routers in region 2.

Configure Route Aggregation on Border Routers and Transport Gateways Using Cisco SD-WAN Manager

Minimum releases: Cisco Catalyst SD-WAN Control Components Release 20.11.x, Cisco IOS XE Catalyst SD-WAN Release 17.11.1a

Before You Begin

When configuring route aggregation for a border router, ensure that the VPN template in the procedure that follows is attached to the device template of a border router. If not, the **core** and **access** options that occur in the procedure are not available.

For information about configuring a device as a border router, see Assign a Role and Region to a Device Using Cisco SD-WAN Manager.

Configure Route Aggregation on Border Routers and Transport Gateways

1. If you do not have a VPN template attached to the device template of the border router that you are configuring, do the following to create a VPN template:
   a. From the Cisco SD-WAN Manager menu, choose **Configuration** > **Templates**.
   b. Click **Feature Templates**.
   c. Click **Add Template**.
   d. Choose the device type of the border router.
   e. Choose the VPN template.
   f. In the **Template Name** and **Description** fields, enter a name and description for the template.
   g. Click **Save** to save the template.
   h. Attach the VPN template to the border router device template for the border router you are configuring, or to the device template of the transport gateway router you are configuring.
2. From the Cisco SD-WAN Manager menu, choose **Configuration** > **Templates**.
3. Click **Feature Templates**.
4. Locate the VPN template that is attached to the border router you are configuring. Adjacent to the VPN template, click **…** and choose **Edit**.
5. In the **Advertise OMP** section of the template, click **New Advertise OMP**.
6. In the **Protocol** field, choose **Aggregate**.
7. Click **Add**.
8. Click **New Aggregate**.
9. In the **Prefix** field, enter the prefix, in CIDR notation, for the range of IP addresses corresponding to routes to aggregate. Example: 10.0.0.0/8
10. (This step applies only for a border router. It does not apply to a transport gateway edge router.) In the **Region** field, choose **Core** or **Access** to indicate whether the router advertises the prefix of aggregated routes to the core region or the access region that it serves.
11. Click **Add**.
12. Click **Save** to save the template.

Configure Route Aggregation on Border Routers and Transport Gateways Using a CLI Template

Minimum releases: Cisco Catalyst SD-WAN Control Components Release 20.11.x, Cisco IOS XE Catalyst SD-WAN Release 17.11.1a

For more information about using CLI templates, see CLI Add-On Feature Templates and CLI Templates. By default, CLI templates execute commands in global configuration mode.

Note By default, CLI templates execute commands in global config mode.

For a border router performing route aggregation, we recommend configuring either **region core** or **region access**.

1. Enter OMP configuration mode.

   ```
   sdwan omp
   ```

2. Enter VRF configuration mode.

   ```
   address-family {ipv4 | ipv6} vrf vrf-id
   ```

3. Configure aggregation of routes of a specific IP range, using a prefix in CIDR notation. If you are configuring a border router, you can optionally specify whether the border router advertises the aggregated routes to the core region or its access region. If you do not specify one, the border router applies the aggregation to both the access region that it serves and the core region.

   Use **aggregate-only** to advertise only the aggregate prefix and not the component routes included within the range of the prefix.

   - Border router, which may or may not also be configured as a transport gateway

   Note If you omit **region** {**core** | **access**}, the border router advertises the routes to both its access region and the core region.

   ```
   advertise aggregate prefix [aggregate-only] [region {core | access}]
   ```

   - Transport gateway edge router

   ```
   advertise aggregate prefix [aggregate-only]
   ```

Examples

The following example configures route aggregation on a border router, advertising the aggregated routes only to the core region:

```
sdwan omp
  address-family ipv4 vrf 1
    advertise aggregate 10.0.0.0/8 aggregate-only region core
```

```
    !
  !
```

The following example configures route aggregation on a transport gateway:

```
sdwan omp
  address-family ipv4 vrf 1
    advertise aggregate 10.0.0.0/8 aggregate-only
    !
  !
```