



# BGP Cost Community

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The BGP Cost Community feature introduces the cost extended community attribute. The cost community is a non-transitive extended community attribute that is passed to internal BGP (iBGP) and confederation peers but not to external BGP (eBGP) peers. The cost community feature allows you to customize the local route preference and influence the best-path selection process by assigning cost values to specific routes.

In Cisco IOS XE Release 2.1 and later releases, support was introduced for mixed EIGRP MPLS VPN network topologies that contain VPN and backdoor links.

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## Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

## Prerequisites for the BGP Cost Community Feature

This document assumes that BGP is configured in your network and that peering has been established.



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## Restrictions for the BGP Cost Community Feature

- The BGP Cost Community feature can be configured only within an autonomous system or confederation. The cost community is a non-transitive extended community that is passed to iBGP and confederation peers only and is not passed to eBGP peers.
- The BGP Cost Community feature must be supported on all routers in the autonomous system or confederation before cost community filtering is configured. The cost community should be applied consistently throughout the local autonomous system or confederation to avoid potential routing loops.
- Multiple cost community set clauses may be configured with the **set extcommunity cost** command in a single route map block or sequence. However, each set clause must be configured with a different ID value (0-255) for each point of insertion (POI). The ID value determines preference when all other attributes are equal. The lowest ID value is preferred.

## Information About the BGP Cost Community Feature

- [BGP Cost Community Overview, page 2](#)
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## BGP Cost Community Overview

The cost community is a non-transitive extended community attribute that is passed to iBGP and confederation peers but not to eBGP peers. The configuration of the BGP Cost Community feature allows you to customize the BGP best path selection process for a local autonomous system or confederation.

The cost community attribute is applied to internal routes by configuring the **set extcommunity cost** command in a route map. The cost community set clause is configured with a cost community ID number (0-255) and cost number (0-4294967295). The cost number value determines the preference for the path. The path with the lowest cost community number is preferred. Paths that are not specifically configured with the cost community attribute are assigned a default cost number value of 2147483647 (The midpoint between 0 and 4294967295) and evaluated by the best path selection process accordingly. In the case where two paths have been configured with the same cost number value, the path selection process will then prefer the path with the lowest cost community ID. The cost extended community attribute is propagated to iBGP peers when extended community exchange is enabled with the **neighbor send-community** command.

The following commands can be used to apply the route map that is configured with the cost community set clause:

- `aggregate-address`
- `neighbor default-originate route-map {in | out}`
- `neighbor route-map`
- `network route-map`
- `redistribute route-map`

## How the BGP Cost Community Influences the Best Path Selection Process

The cost community attribute influences the BGP best path selection process at the point of insertion (POI). By default, the POI follows the IGP metric comparison. When BGP receives multiple paths to the same destination, it uses the best path selection process to determine which path is the best path. BGP automatically makes the decision and installs the best path into the routing table. The POI allows you to assign a preference to a specific path when multiple equal cost paths are available. If the POI is not valid for local best path selection, the cost community attribute is silently ignored.

Multiple paths can be configured with the cost community attribute for the same POI. The path with the lowest cost community ID is considered first. In other words, all of the cost community paths for a specific POI are considered, starting with the one with the lowest cost community. Paths that do not contain the cost community (for the POI and community ID being evaluated) are assigned the default community cost value (2147483647). If the cost community values are equal, then cost community comparison proceeds to the next lowest community ID for this POI.

**Note**

Paths that are not configured with the cost community attribute are considered by the best path selection process to have the default cost-value (half of the maximum value [4294967295] or 2147483647).

Applying the cost community attribute at the POI allows you to assign a value to a path originated or learned by a peer in any part of the local autonomous system or confederation. The cost community can be used as a "tie breaker" during the best path selection process. Multiple instances of the cost community can be configured for separate equal cost paths within the same autonomous system or confederation. For example, a lower cost community value can be applied to a specific exit path in a network with multiple equal cost exits points, and the specific exit path will be preferred by the BGP best path selection process. See the scenario described in "Influencing Route Preference in a Multi-Exit IGP Network".

## Cost Community Support for Aggregate Routes and Multipaths

Aggregate routes and multipaths are supported by the BGP Cost Community feature. The cost community attribute can be applied to either type of route. The cost community attribute is passed to the aggregate or multipath route from component routes that carry the cost community attribute. Only unique IDs are passed, and only the highest cost of any individual component route will be applied to the aggregate on a per-ID basis. If multiple component routes contain the same ID, the highest configured cost is applied to the route. For example, the following two component routes are configured with the cost community attribute via an inbound route map:

- 10.0.0.1 (POI=IGP, ID=1, Cost=100)
- 192.168.0.1 (POI=IGP, ID=1, Cost=200)

If these component routes are aggregated or configured as a multipath, the cost value 200 (POI=IGP, ID=1, Cost=200) will be advertised because it is the highest cost.

If one or more component routes does not carry the cost community attribute or if the component routes are configured with different IDs, then the default value (2147483647) will be advertised for the aggregate or multipath route. For example, the following three component routes are configured with the cost community attribute via an inbound route map. However, the component routes are configured with two different IDs.

- 10.0.0.1 (POI=IGP, ID=1, Cost=100)
- 172.16.0.1 (POI=IGP, ID=2, Cost=100)
- 192.168.0.1 (POI=IGP, ID=1, Cost=200)

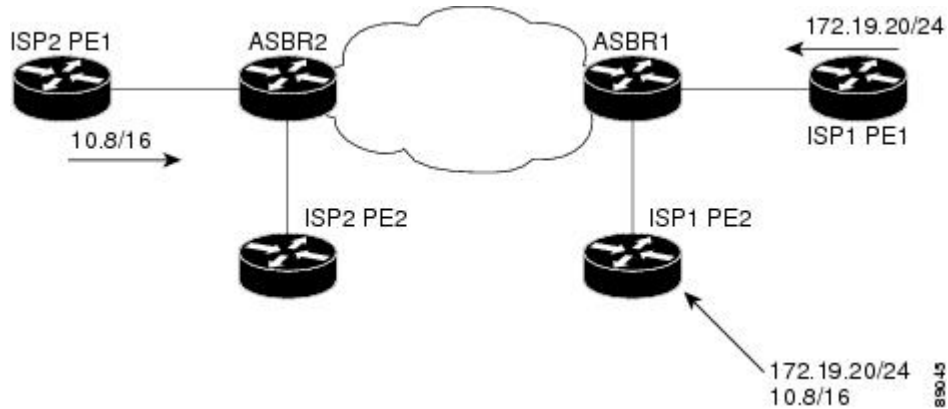
The single advertised path will include the aggregated cost communities as follows:

- {POI=IGP, ID=1, Cost=2147483647} {POI=IGP, ID=2, Cost=2147483647}

## Influencing Route Preference in a Multi-Exit IGP Network

The figure below shows an Interior Gateway Protocol (IGP) network with two autonomous system boundary routers (ASBRs) on the edge. Each ASBR has an equal cost path to network 10.8/16.

**Figure 1** Multi-Exit Point IGP Network



Both paths are considered to be equal by BGP. If multipath loadsharing is configured, both paths will be installed to the routing table and will be used to load balance traffic. If multipath load balancing is not configured, then BGP will select the path that was learned first as the best path and install this path to the routing table. This behavior may not be desirable under some conditions. For example, the path is learned from ISP1 PE2 first, but the link between ISP1 PE2 and ASBR1 is a low-speed link.

The configuration of the cost community attribute can be used to influence the BGP best path selection process by applying a lower cost community value to the path learned by ASBR2. For example, the following configuration is applied to ASBR2.

```
route-map ISP2_PE1 permit 10
  set extcommunity cost 1 1
  match ip address 13
!
ip access-list 13 permit 10.8.0.0 0.0.255.255
```

The above route map applies a cost community number value of 1 to the 10.8.0.0 route. By default, the path learned from ASBR1 will be assigned a cost community value of 2147483647. Because the path learned from ASBR2 has lower cost community value, this path will be preferred.

## BGP Cost Community Support for EIGRP MPLS VPN PE-CE with Backdoor Links

Before EIGRP Site of Origin (SoO) BGP Cost Community support was introduced, BGP preferred locally sourced routes over routes learned from BGP peers. Back door links in an EIGRP MPLS VPN topology will be preferred by BGP if the back door link is learned first. (A back door link, or a route, is a connection that is configured outside of the VPN between a remote and main site. For example, a WAN leased line that connects a remote site to the corporate network).

The "pre-best-path" point of insertion (POI) was introduced in the BGP Cost Community feature to support mixed EIGRP VPN network topologies that contain VPN and backdoor links. This POI is applied

automatically to EIGRP routes that are redistributed into BGP. The "pre-best path" POI carries the EIGRP route type and metric. This POI influences the best path calculation process by influencing BGP to consider this POI before any other comparison step. No configuration is required.

## How to Configure the BGP Cost Community Feature

- [Configuring the BGP Cost Community, page 5](#)
- [Verifying the Configuration of the BGP Cost Community, page 7](#)

### Configuring the BGP Cost Community

To configure the cost community, perform the task in this section.

#### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *autonomous-system-number*
4. **neighbor** *ip-address* **remote-as** *autonomous-system-number*
5. **address-family ipv4** [**mdt** | **multicast** | **tunnel** | **unicast** [**vrf** *vrf-name*] | **vrf** *vrf-name*] | **ipv6** [**multicast** | **unicast**] | **vpn4** [**unicast**]
6. **neighbor** *ip-address* **route-map** *map-name* {**in** | **out**}
7. **exit**
8. **route-map** *map-name* {**permit** | **deny**} [*sequence-number*]
9. **set extcommunity cost** [**igp**] *community-id cost-value*
10. **end**

#### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables higher privilege levels, such as privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.

Command or Action	Purpose
<p><b>Step 3</b> <code>router bgp <i>autonomous-system-number</i></code></p> <p><b>Example:</b></p> <pre>Router(config)# router bgp 50000</pre>	Enters router configuration mode to create or configure a BGP routing process.
<p><b>Step 4</b> <code>neighbor <i>ip-address</i> remote-as <i>autonomous-system-number</i></code></p> <p><b>Example:</b></p> <pre>Router(config-router)# neighbor 10.0.0.1 remote-as 101</pre>	Establishes peering with the specified neighbor or peer-group.
<p><b>Step 5</b> <code>address-family ipv4 [<i>mdt</i>   <i>multicast</i>   <i>tunnel</i>   <i>unicast</i> [<i>vrf vrf-name</i>]   <i>vrf vrf-name</i>]   ipv6 [<i>multicast</i>   <i>unicast</i>]   <i>vpn4</i> [<i>unicast</i>]</code></p> <p><b>Example:</b></p> <pre>Router(config-router)# address-family ipv4</pre>	Places the router in address family configuration mode.
<p><b>Step 6</b> <code>neighbor <i>ip-address</i> route-map <i>map-name</i> {<i>in</i>   <i>out</i>}</code></p> <p><b>Example:</b></p> <pre>Router(config-router)# neighbor 10.0.0.1 route- map MAP-NAME in</pre>	Applies an incoming or outgoing route map for the specified neighbor or peer-group.
<p><b>Step 7</b> <code>exit</code></p> <p><b>Example:</b></p> <pre>Router(config-router)# exit</pre>	Exits router configuration mode and enters global configuration mode.
<p><b>Step 8</b> <code>route-map <i>map-name</i> {<i>permit</i>   <i>deny</i>} [<i>sequence-number</i>]</code></p> <p><b>Example:</b></p> <pre>Router(config)# route-map MAP-NAME permit 10</pre>	Enters route map configuration mode to create or configure a route map.

Command or Action	Purpose
<p><b>Step 9</b> <code>set extcommunity cost [igp] community-id cost-value</code></p> <p><b>Example:</b></p> <pre>Router(config-route-map)# set extcommunity cost 1 100</pre>	<p>Creates a set clause to apply the cost community attribute.</p> <ul style="list-style-type: none"> <li>Multiple cost community set clauses can be configured in each route map block or sequence. Each cost community set clause must have a different ID (0-255). The cost community set clause with the lowest <i>cost-value</i> is preferred by the best path selection process when all other attributes are equal.</li> <li>Paths that are not configured with the cost community attribute will be assigned the default <i>cost-value</i>, which is half of the maximum value (4294967295) or 2147483647.</li> </ul>
<p><b>Step 10</b> <code>end</code></p> <p><b>Example:</b></p> <pre>Router(config-route-map)# end</pre>	<p>Exits route map configuration mode and enters privileged EXEC mode.</p>

## Verifying the Configuration of the BGP Cost Community

BGP cost community configuration can be verified locally or for a specific neighbor. To verify the local configuration cost community, use the **show route-map** or **show running-config** command. To verify that a specific neighbor carries the cost community, use the **show ip bgp ip-address** command. The output from these commands displays the POI (IGP is the default POI), the configured ID, and configured cost. For large cost community values, the output from these commands will also show, with + and - values, the difference between the configured cost and the default cost. See "Verifying the Configuration of the BGP Cost Community" for specific example output.

- [Troubleshooting Tips, page 7](#)

### Troubleshooting Tips

The **bgp bestpath cost-community ignore** command can be used to disable the evaluation of the cost community attribute to help isolate problems and troubleshoot issues that relate to BGP best path selection.

The **debug ip bgp updates** command can be used to print BGP update messages. The cost community extended community attribute will be displayed in the output of this command when received from a neighbor. A message will also be displayed if a non-transitive extended community is received from an external peer.

## Configuration Examples for the BGP Cost Community Feature

- [BGP Cost Community Configuration Example, page 8](#)
- [BGP Cost Community Verification Examples, page 8](#)

## BGP Cost Community Configuration Example

The following example configuration shows the configuration of the **set extcommunity cost** command. The following example applies the cost community ID of 1 and cost community value of 100 to routes that are permitted by the route map. This configuration will cause the best path selection process to prefer this route over other equal cost paths that were not permitted by this route map sequence.

```
Router(config)# router bgp 50000
Router(config-router)# neighbor 10.0.0.1 remote-as 50000
Router(config-router)# neighbor 10.0.0.1 update-source Loopback 0
Router(config-router)# address-family ipv4
Router(config-router-af)# neighbor 10.0.0.1 activate
Router(config-router-af)# neighbor 10.0.0.1 route-map COST1 in
Router(config-router-af)# neighbor 10.0.0.1 send-community both
Router(config-router-af)# exit
Router(config)# route-map COST1 permit 10
Router(config-route-map)# match ip-address 1
Router(config-route-map)# set extcommunity cost 1 100
```

## BGP Cost Community Verification Examples

BGP cost community configuration can be verified locally or for a specific neighbor. To verify the local configuration cost community, use the **show route-map** or **show running-config** command. To verify that a specific neighbor carries the cost community, use the **show ip bgp ip-address** command.

The output of the **show route-map** command will display locally configured route-maps, match, set, continue clauses, and the status and configuration of the cost community attribute. The following sample output is similar to the output that will be displayed:

```
Router# show route-map
route-map COST1, permit, sequence 10
  Match clauses:
    as-path (as-path filter): 1
  Set clauses:
    extended community Cost:igp:1:100
  Policy routing matches: 0 packets, 0 bytes
route-map COST1, permit, sequence 20
  Match clauses:
    ip next-hop (access-lists): 2
  Set clauses:
    extended community Cost:igp:2:200
  Policy routing matches: 0 packets, 0 bytes
route-map COST1, permit, sequence 30
  Match clauses:
    interface FastEthernet0/0
    extcommunity (extcommunity-list filter):300
  Set clauses:
    extended community Cost:igp:3:300
  Policy routing matches: 0 packets, 0 bytes
```

The following sample output shows locally configured routes with large cost community values:

```
Router# show route-map
route-map set-cost, permit, sequence 10
  Match clauses:
  Set clauses:
    extended community RT:1:1 RT:2:2 RT:3:3 RT:4:4 RT:5:5 RT:6:6 RT:7:7
    RT:100:100 RT:200:200 RT:300:300 RT:400:400 RT:500:500 RT:600:600
    RT:700:700 additive
    extended community Cost:igp:1:4294967295 (default+2147483648)
    Cost:igp:2:200 Cost:igp:3:300 Cost:igp:4:400
    Cost:igp:5:2147483648 (default+1) Cost:igp:6:2147484648 (default+1001)
    Cost:igp:7:2147284648 (default-198999)
  Policy routing matches: 0 packets, 0 bytes
```



The output of the **show running-config** command will display match, set, and continue clauses that are configured within a route-map. The following sample output is filtered to show only the relevant part of the running configuration:

```
Router# show running-config | begin route-map
route-map COST1 permit 20
  match ip next-hop 2
  set extcommunity cost igp 2 200
!
route-map COST1 permit 30
  match interface FastEthernet0/0
  match extcommunity 300
  set extcommunity cost igp 3 300
.
.
.
```

The output of the **show ip bgp ip-address** command can be used to verify if a specific neighbor carries a path that is configured with the cost community attribute. The cost community attribute information is displayed in the "Extended Community" field. The POI, the cost community ID, and the cost community number value are displayed. The following sample output shows that neighbor 172.16.1.2 carries a cost community with an ID of 1 and a cost of 100:

```
Router# show ip bgp 10.0.0.0
BGP routing table entry for 10.0.0.0/8, version 2
Paths: (1 available, best #1)
  Not advertised to any peer
  2 2 2
    172.16.1.2 from 172.16.1.2 (172.16.1.2)
      Origin IGP, metric 0, localpref 100, valid, external, best
      Extended Community: Cost:igp:1:100
```

If the specified neighbor is configured with the default cost community number value or if the default value is assigned automatically for cost community evaluation, "default" with + and - values will be displayed after the cost community number value in the output.

## Where to Go Next

For more information about the EIGRP MPLS VPN PE-CE Site of Origin (SoO) feature, refer to the "EIGRP MPLS VPN PE-CE Site of Origin (SoO)" module .

## Additional References

For additional information related to the BGP Cost Community feature, refer to the following references.

## Related Documents

Related Topic	Document Title
BGP Best Path Selection	<a href="#">BGP Best Path Selection Algorithm</a>
EIGRP MPLS VPN PE-CE Site of Origin	"EIGRP MPLS VPN PE-CE Site of Origin (SoO)"
BGP commands	<i>Cisco IOS IP Routing: BGP Command Reference</i>

Related Topic	Document Title
Cisco IOS master command list, all releases	<a href="#">Cisco IOS Master Command List, All Releases</a>
<ul style="list-style-type: none"> <li>• <a href="#">Standards, page 10</a></li> <li>• <a href="#">MIBs, page 10</a></li> <li>• <a href="#">RFCs, page 10</a></li> <li>• <a href="#">Technical Assistance, page 11</a></li> </ul>	

## Standards

Standard	Title
No new or modified standards are supported, and support for existing standards has not been modified.	--

## MIBs

MIBs	MIBs Link
No new or modified MIBs are supported, and support for existing MIBs has not been modified.	To locate and download MIBs for selected platforms, Cisco IOS XE software releases, and feature sets, use Cisco MIB Locator found at the following URL:  <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

## RFCs

RFCs	Title
draft-retana-bgp-custom-decision-00.txt	<a href="#">BGP Custom Decision Process</a>

## Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p>	<a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a>
<p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p>	
<p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	

## Feature Information for BGP Cost Community

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

**Table 1**      **Feature Information for BGP Cost Community**

Feature Name	Releases	Feature Information
BGP Cost Community	Cisco IOS XE Release 2.1	<p>The BGP Cost Community feature introduces the cost extended community attribute. The cost community is a non-transitive extended community attribute that is passed to internal BGP (iBGP) and confederation peers but not to external BGP (eBGP) peers. The cost community feature allows you to customize the local route preference and influence the best-path selection process by assigning cost values to specific routes.</p> <p>This feature was introduced on the Cisco ASR 1000 Series Aggregation Services Routers.</p> <p>The following commands were introduced or modified: <b>bgp bestpath cost-community ignore</b>, <b>debug ip bgp updates</b>, and <b>set extcommunity cost</b>.</p>

Feature Name	Releases	Feature Information
BGP Cost Community Support for EIGRP MPLS VPN PE-CE with Backdoor Links	Cisco IOS XE Release 2.1	<p>Back door links in an EIGRP MPLS VPN topology will be preferred by BGP if the back door link is learned first. The "pre-best-path" point of insertion (POI) was introduced in the BGP Cost Community feature to support mixed EIGRP VPN network topologies that contain VPN and backdoor links. This POI is applied automatically to EIGRP routes that are redistributed into BGP and the POI influences the best path calculation process by influencing BGP to consider this POI before any other comparison step. No configuration is required. This feature is enabled automatically for EIGRP VPN sites when Cisco IOS XE Release 2.1 or later releases, is installed to a PE, CE, or back door router.</p> <p>This feature was introduced on the Cisco ASR 1000 Series Routers.</p>

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