BGP Accumulated IGP

The BGP Accumulated IGP feature is an optional nontransitive Border Gateway Protocol (BGP) path attribute. The attribute type code for the accumulated interior gateway protocol (AIGP) attribute is assigned by the Internet Assigned Numbers Authority (IANA). The value field of the AIGP attribute is defined as a set of type, length, value (TLV) elements. The AIGP TLV contains the AIGP metric.

Information About BGP Accumulated IGP

Overview of BGP Accumulated IGP

The BGP Accumulated IGP feature is required to simulate the current Open Shortest Path First (OSPF) behavior of computing the distance associated with a path. OSPF or Label Distribution Protocol (LDP) carries the prefix or label information only in the local area. Then, Border Gateway Protocol (BGP) carries the prefix or label to all the remote areas by redistributing the routes into BGP at area boundaries. The routes or labels are then advertised using label-switched paths (LSP). The next-hop for the route is changed at each Area Border Router (ABR) to a local device, which removes the need to leak OSPF routes across area boundaries. The bandwidth available on each of the core links is mapped to the OSPF cost; therefore, it is imperative that BGP carries this cost correctly between each of the provider edge (PE) devices. This functionality is achieved by using the BGP Accumulated IGP feature.

You need to enable accumulated interior gateway protocol (AIGP) processing for internal Border Gateway Protocol (iBGP) and external Border Gateway Protocol (eBGP) neighbors to carry the AIGP attribute. Neighbors configured with the AIGP attribute are put in a separate update group from other iBGP neighbors. A separate update group is required for neighbors that are enabled to send the AIGP value to cost community. BGP needs to translate the AIGP attribute to the cost community or multi-exit discriminator (MED) and attach it to the route before advertising to legacy.

When BGP installs AIGP attribute routes into the routing information base (RIB), it adds the AIGP cost with the next-hop cost. If the next-hop is a nonrecursive IGP route, BGP sets the AIGP metric to the received AIGP value and the first hop IGP metric to the next-hop. If the next-hop is a recursive route with the AIGP metric, BGP adds the received AIGP metric to the next-hop AIGP metric.

Sending and Receiving BGP Accumulated IGP

When a session receives a prefix with the accumulated interior gateway protocol (AIGP) attribute and is not configured to receive AIGP information, the session discards the AIGP attribute and processes the remainder of the update message, and then it passes the AIGP attribute to other BGP peers. The route is then installed into the routing information base (RIB) and the prefix is sent with the AIGP attribute to all the AIGP-enabled neighbors. The AIGP attribute value is not updated if the next-hop of the route is not changed by the device before advertising it to the neighbor. If the device changes the next-hop of the route, it recalculates the AIGP attribute value by adding the next-hop metric to the received AIGP attribute value.

Originating Prefixes with Accumulated IGP

Origination of routes with the accumulated interior gateway protocol (AIGP) metric is controlled by configuration. AIGP attributes are attached to redistributed routes that satisfy the following conditions:

- The protocol redistributing the route is enabled for AIGP.

- The route is an interior gateway protocol (IGP) route redistributed into Border Gateway Protocol (BGP). The value assigned to the AIGP attribute is the value of the IGP next-hop to the route or as set by a route policy.

- The route is a static route redistributed into BGP. The value assigned is the value of the next-hop to the route or as set by a route policy.

- The route is imported into BGP through a network statement. The value assigned is the value of the next-hop to the route or as set by a route policy.

- The inbound or outbound route map also creates an AIGP attribute route map using the **set aigp-metric** command.

How to Configure BGP Accumulated IGP

Configuring AIGP Metric Value

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *as-number*
4. **address-family ipv4** [**unicast** | **multicast** | **vrf** *vrf-name*]
5. **redistribute** *protocol autonomous-system-number* **route-map** *map-tag*
6. **network** *network-id* **route-map** *map-tag*
7. **exit**
8. **route-map rtmap**
9. **set aigp-metric** [**igp-metric** | *value*]
10. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router bgp** *as-number* **Example:** `Device(config)# router bgp 40000`	Enters router configuration mode for the specified routing process.
Step 4	**address-family ipv4** [**unicast** | **multicast** | **vrf** *vrf-name*] **Example:** `Device(config-router)# address-family ipv4 unicast`	Specifies the IPv4 address family and enters address family configuration mode.
Step 5	**redistribute** *protocol autonomous-system-number* **route-map** *map-tag* **Example:** `Device(config-router-af)# redistribute bgp 100 route-map rtmap`	Redistributes routes from one routing domain to another routing domain.
Step 6	**network** *network-id* **route-map** *map-tag* **Example:** `Device(config-router-af)# network 10.1.1.1 route-map rtmap`	Specifies the networks to be advertised by the Border Gateway Protocol (BGP) routing process.
Step 7	**exit** **Example:** `Device(config-router-af)# exit`	Exits address family configuration mode and returns to global configuration mode.
Step 8	**route-map rtmap** **Example:** `Device(config)# route-map rtmap`	Enters route map configuration mode.

	Command or Action	Purpose
Step 9	**set aigp-metric [igp-metric**	*value*] **Example:** Device(config-route-map)# set aigp-metric igp-metric	Specifies a metric value for the accumulated interior gateway protocol (AIGP) attribute. The manual metric value range is from 0 to 4294967295.
Step 10	**end** **Example:** Device(config-route-map)# end	Exits route map configuration mode and enters privileged EXEC mode.

Enabling Send and Receive for an AIGP Attribute

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *as-number*
4. **address-family {ipv4 | ipv6}** [**unicast**]
5. **neighbor** *ip-address* **aigp**
6. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** Device> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Device# configure terminal	Enters global configuration mode.
Step 3	**router bgp** *as-number* **Example:** Device(config)# router bgp 40000	Enters router configuration mode for the specified routing process.
Step 4	**address-family {ipv4	ipv6}** [**unicast**] **Example:**	Specifies the IPv4 or IPv6 address family and enters address family configuration mode.

	Command or Action	Purpose
	Device(config-router)# address-family ipv4 unicast	
Step 5	**neighbor** *ip-address* **aigp** **Example:** Device(config-router-af)# neighbor 192.168.1.1 aigp	Enables send and receive of the AIGP attribute per neighbor.
Step 6	**end** **Example:** Device(config-router-af)# end	Exits address family configuration mode and returns to privileged EXEC mode.

Configuring BGP Accumulated IGP

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *as-number*
4. **address-family {ipv4 | ipv6}** [**unicast**]
5. **neighbor** *ip-address* **aigp** [**send** {**cost-community** *community-id* **poi** {**igp-cost** | **pre-bestpath**} [**transitive**]} | **med**]
6. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** Device> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Device# configure terminal	Enters global configuration mode.
Step 3	**router bgp** *as-number* **Example:** Device(config)# router bgp 40000	Enters router configuration mode for the specified routing process.

	Command or Action	Purpose
Step 4	**address-family {ipv4 | ipv6} [unicast]** **Example:** `Device(config-router)# address-family ipv4 unicast`	Specifies the IPv4 or IPv6 address family and enters address family configuration mode.
Step 5	**neighbor** *ip-address* **aigp [send {cost-community** *community-id* **poi {igp-cost | pre-bestpath} [transitive]} | med]** **Example:** `Device(config-router-af)# neighbor 192.168.1.1 aigp send med`	Translates the AIGP attribute to MED and attaches it to the route before advertising to legacy provider edge (PE) devices.
Step 6	**end** **Example:** `Device(config-router-af)# end`	Exits address family configuration mode and returns to privileged EXEC mode.

Configuration Examples for BGP Accumulated IGP

Example: Configuring AIGP Metric Value

The following is a sample configuration for originating prefixes with the accumulated internal gateway protocol (AIGP) metric attribute:

```
Device# configure terminal
Device(config)# router bgp 40000
Device(config-router)# address-family ipv4 unicast
Device(config-router-af)# redistribute bgp 100 route-map rtmap
Device(config-router-af)# network 10.1.1.1 route-map rtmap
Device(config-router-af)# exit
Device(config)# route-map rtmap
Device(config-route-map)# set aigp-metric igp-metric
Device(config-route-map)# end
```

Example: Enabling Send and Receive for an AIGP Attribute

The following example shows how to enable AIGP send and receive capability in address family configuration mode:

```
Device# configure terminal
Device(config)# router bgp 40000
Device(config-router)# address-family ipv4 unicast
Device(config-router-af)# neighbor 192.168.1.1 aigp
Device(config-router-af)# exit
```

Example: Configuring BGP Accumulated IGP

In the following example, the device belongs to autonomous system 65000 and is configured to send the cost-community attribute to its neighbor at IP address 172.16.70.23:

```
Device# configure terminal
Device(config)# router bgp 65000
Device(config-router)# address-family ipv4 multicast
Device(config-router-af)# neighbor 172.16.70.23 aigp send cost-community 100 poi igp-cost
transitive
Device(config-router-af)# exit
```

In the following example, the device belongs to autonomous system 65000 and is configured to send the MED attribute to its neighbor at IP address 172.16.70.23:

```
Device# configure terminal
Device(config)# router bgp 65000
Device(config-router)# address-family ipv4 multicast
Device(config-router-af)# neighbor 172.16.70.23 aigp send med
Device(config-router-af)# exit
```

Additional References for BGP Accumulated IGP

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
BGP commands	Cisco IOS IP Routing: BGP Command Reference

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. 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. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/support

Feature Information for BGP Accumulated IGP

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. An account on Cisco.com is not required.

Table 1: Feature Information for BGP Accumulated IGP

Feature Name	Releases	Feature Information
BGP Accumulated IGP		The BGP Accumulated IGP feature is an optional nontransitive Border Gateway Protocol (BGP) path attribute. The attribute type code for the accumulated interior gateway protocol (AIGP) attribute is assigned by the IANA. The value field of the AIGP attribute is defined as a set of type, length, value (TLV) elements. The AIGP TLV contains the AIGP metric. The following commands were introduced: **aigp**, **aigp send cost-community**, **aigp send med**, **bgp bestpath aigp ignore**, **set aigp-metric**