

## Attribute Types

- Well-known Mandatory** · Must be supported and propagated
- Well-known Discretionary** · Must be supported; propagation optional
- Optional Transitive** · Marked as partial if unsupported by neighbor
- Optional Nontransitive** · Deleted if unsupported by neighbor

## Attributes

| Name                                     | Type | Description  |
|--|------|--|
| <b>Aggregator</b>                        | OT   | ID and AS of router which performed summarization                          |
| <b>AS Path</b>                           | WM   | List of autonomous systems which the advertisement has traversed           |
| <b>Atomic Aggregate</b>                  | WD   | Includes ASes which have been dropped due to route aggregation             |
| <b>Cluster ID</b>                        | ON   | Originating cluster  |
| <b>Community</b>                         | OT   | Route tag  |
| <b>Local Preference</b>                  | WD   | Metric for internal neighbors to reach external destinations (default 100) |
| <b>Multiple Exit Discriminator (MED)</b> | ON   | Metric for external neighbors to reach the local AS (default 0)            |
| <b>Next Hop</b>                          | WM   | External peer in neighboring AS  |
| <b>Origin</b>                            | WM   | Origin type (IGP, EGP, or unknown)   |
| <b>Originator ID</b>                     | ON   | Identifies a route reflector   |
| <b>Weight</b>                            | O    | Cisco proprietary, not communicated to peers (default 0)                   |

## Path Selection

| Attribute                 | Description  | Preference |
|---------------------------|--|------------|
| <b>1 Weight</b>           | Administrative preference                                | Highest    |
| <b>2 Local Preference</b> | Communicated between peers within an AS                  | Highest    |
| <b>3 Self-originated</b>  | Prefer paths originated locally                          | True       |
| <b>4 AS Path</b>          | Minimize AS hops   | Shortest   |
| <b>5 Origin</b>           | Prefer IGP-learned routes over EGP, and EGP over unknown | IGP        |
| <b>6 MED</b>              | Used externally to enter an AS                           | Lowest     |
| <b>7 External</b>         | Prefer eBGP routes over iBGP                             | eBGP       |
| <b>8 IGP Cost</b>         | Consider IGP metric                                      | Lowest     |
| <b>9 eBGP Peering</b>     | Favor more stable routes                                 | Oldest     |
| <b>10 Router ID</b>       | Tie breaker  | Lowest     |

## Influencing Path Selection

**Weight** neighbor 172.16.0.1 weight 200      **Local Preference** bgp default local-preference 100  
**MED** default-metric 400      **Route Map** neighbor 172.16.0.1 route-map Foo

## About BGP

|                       |             |
|-----------------------|-------------|
| <b>Type</b>           | Path Vector |
| <b>eBGP AD</b>        | 20          |
| <b>iBGP AD</b>        | 200         |
| <b>Standard</b>       | RFC 4271    |
| <b>Protocols</b>      | IP          |
| <b>Transport</b>      | TCP/179     |
| <b>Authentication</b> | MD5         |

## Terminology

### Autonomous System (AS)

A logical domain under the control of a single entity

### External BGP (eBGP)

BGP adjacencies which span autonomous system boundaries

### Internal BGP (iBGP)

BGP adjacencies formed within a single autonomous system

### Synchronization Requirement

A route must be known by an IGP before it may be advertised to BGP peers

## Packet Types

|                  |                     |
|------------------|---------------------|
| <b>Open</b>      | <b>Update</b>       |
| <b>Keepalive</b> | <b>Notification</b> |

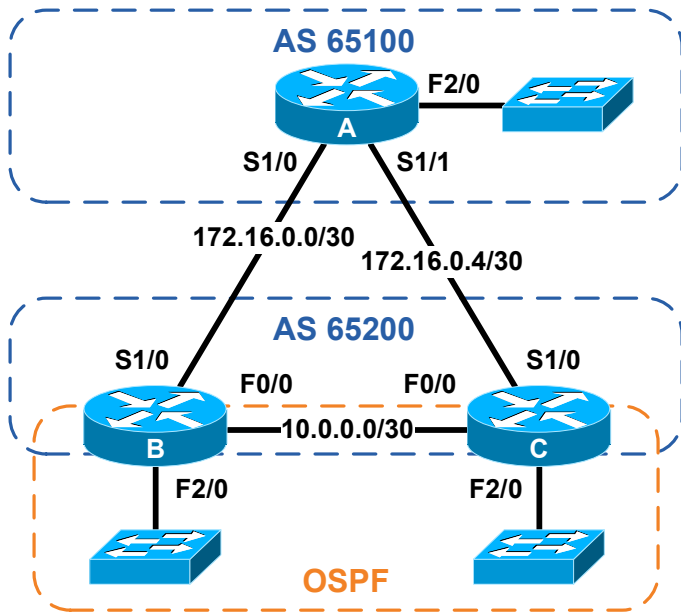
## Neighbor States

- Idle** · Neighbor is not responding
- Active** · Attempting to connect
- Connect** · TCP session established
- Open Sent** · Open message sent
- Open Confirm** · Response received
- Established** · Adjacency established

## Troubleshooting

```
show ip bgp [summary]
show ip bgp neighbors
show ip route [bgp]
clear ip bgp * [soft]
debug ip bgp [...]
```

## Configuration Example



```

interface Serial1/0
description Backbone to B
ip address 172.16.0.1 255.255.255.252
!
interface Serial1/1
description Backbone to C
ip address 172.16.0.5 255.255.255.252
!
interface FastEthernet2/0
description LAN
ip address 192.168.1.1 255.255.255.0
!
router bgp 65100
no synchronization
network 172.16.0.0 mask 255.255.255.252
network 172.16.0.4 mask 255.255.255.252
network 192.168.1.0
neighbor South peer-group
neighbor South remote-as 65200
neighbor 172.16.0.2 peer-group South
neighbor 172.16.0.6 peer-group South
no auto-summary
    
```

```

interface FastEthernet0/0
description Backbone to C
ip address 10.0.0.1 255.255.255.252
!
interface Serial1/0
description Backbone to A
ip address 172.16.0.2 255.255.255.252
!
interface FastEthernet2/0
description LAN
ip address 192.168.2.1 255.255.255.0
!
router ospf 100
network 10.0.0.1 0.0.0.0 area 0
network 192.168.2.1 0.0.0.0 area 1
!
router bgp 65200
no synchronization
redistribute ospf 100 route-map LAN_Subnets
neighbor 10.0.0.2 remote-as 65200
neighbor 172.16.0.1 remote-as 65100
no auto-summary
!
access-list 10 permit 192.168.0.0 0.0.255.255
!
route-map LAN_Subnets permit 10
match ip address 10
set metric 100
    
```

```

interface FastEthernet0/0
description Backbone to B
ip address 10.0.0.2 255.255.255.252
!
interface Serial1/0
description Backbone to A
ip address 172.16.0.6 255.255.255.252
!
interface FastEthernet2/0
description LAN
ip address 192.168.3.1 255.255.255.0
!
router ospf 100
network 10.0.0.2 0.0.0.0 area 0
network 192.168.3.1 0.0.0.0 area 2
!
router bgp 65200
no synchronization
redistribute ospf 100 route-map LAN_Subnets
neighbor 10.0.0.1 remote-as 65200
neighbor 172.16.0.5 remote-as 65100
no auto-summary
!
access-list 10 permit 192.168.0.0 0.0.255.255
!
route-map LAN_Subnets permit 10
match ip address 10
set metric 100
    
```

### Router A Routing Table

```

172.16.0.0/30 is subnetted, 2 subnets
C    172.16.0.4 is directly connected, S1/1
C    172.16.0.0 is directly connected, S1/0
C    192.168.1.0/24 is directly connected, F2/0
B    192.168.2.0/24 [20/100] via 172.16.0.2
B    192.168.3.0/24 [20/100] via 172.16.0.2
    
```

### Router B Routing Table

```

172.16.0.0/30 is subnetted, 2 subnets
B    172.16.0.4 [20/0] via 172.16.0.1
C    172.16.0.0 is directly connected, S1/0
10.0.0.0/30 is subnetted, 1 subnets
C    10.0.0.0 is directly connected, F0/0
B    192.168.1.0/24 [20/0] via 172.16.0.1
C    192.168.2.0/24 is directly connected, F2/0
0 IA 192.168.3.0/24 [110/2] via 10.0.0.2, F0/0
    
```