Chapter 13

Verify the BGP Protocol and Peers

This chapter describes how to check whether the Border Gateway Protocol (BGP) is configured correctly on a Juniper Networks router in your network, the internal Border Gateway Protocol (IBGP) and exterior Border Gateway Protocol (EBGP) sessions are properly established, the external routes are advertised and received correctly, and the BGP path selection process is working properly. (See Table 34.)

Table 34: Checklist for Verifying the BGP Protocol and Peers

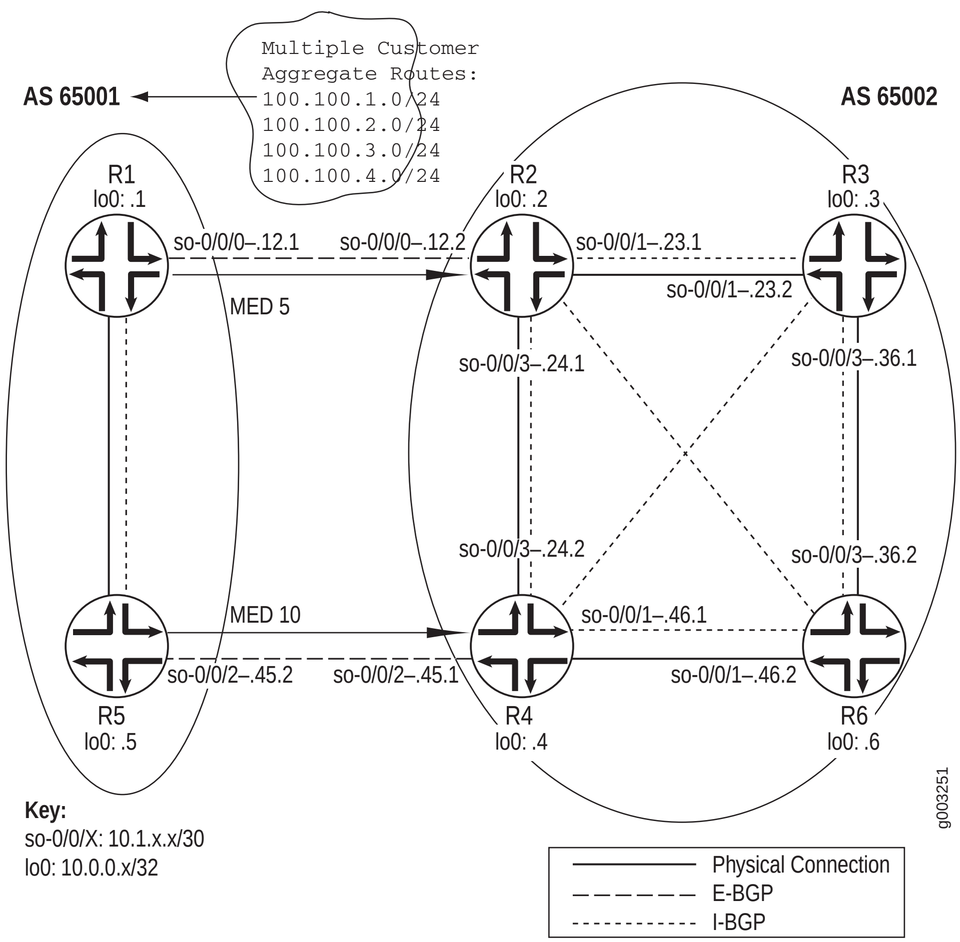
Verify the BGP Protocol and Peers Tasks	Command or Action
Verify the BGP Protocol on page 158	
1. Verify BGP on an Internal Router on page 159	show configuration
2. Verify BGP on a Border Router on page 162	show configuration
Verify BGP Peers on page 165	
1. Check That BGP Sessions Are Up on page 166	show bgp summary
2. Verify That a Neighbor is Advertising a Particular Route on page 169	show route advertising-protocol bgp *neighbor-address*
3. Verify That a Particular BGP Route Is Received on Your Router on page 170	show route receive-protocol bgp *neighbor-address*
Examine BGP Routes and Route Selection on page 171	
1. Examine the Local Preference Selection on page 173	show route *destination-prefix* < detail >
2. Examine the Multiple Exit Discriminator Route Selection on page 174	show route *destination-prefix* < detail >
3. Examine the EBGP over IBGP Selection on page 175	show route *destination-prefix* < detail >
4. Examine the IGP Cost Selection on page 176	show route *destination-prefix* < detail >
Examine Routes in the Forwarding Table on page 177	show route forwarding-table

Verify the BGP Protocol

Purpose For BGP to run on a router in your network, you must define the local autonomous system (AS) number, configure at least one group, and include information about at least one peer in the group. If the peer is an EBGP peer, include the peer's AS number. For all peers, include either the peer's interface IP address or loopback (lo0) IP address. When configuring BGP on an interface, you must also include the family inet statement at the [edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level.

Figure 14 illustrates the example configurations used in this section.

Figure 14: BGP Configuration Topology



The network in Figure 14 consists of two directly connected ASs. IP addresses included in the network diagram are as follows:

- 10.1.12.1—AS 650001external IP address on R1
- 10.1.45.2—AS 650001 external IP address on R5
- 10.0.0.1—Internal loopback (lo0) IP address for R1

- 10.0.0.5—Internal loopback (lo0) IP address for R5
- 10.1.12.2—AS 65002 external IP address on R2
- 10.1.45.1—AS 65002 external IP address on R5
- 10.0.0.2—Internal loopback (lo0) address for R2
- 10.0.0.3—Internal loopback (lo0) address for R3
- 10.0.0.4—Internal loopback (lo0) address for R4
- 10.0.0.6—Internal loopback (lo0) address for R6

All routers within each AS maintain an IBGP session between each router in that AS. R1 and R5 have an IBGP session through their loopback (lo0) interfaces: 10.0.0.1 and 10.0.05. R2, R3, R4, and R6 maintain IBGP sessions between each other through their loopback (lo0) interfaces: 10.0.0.2, 10.0.0.3, 10.0.0.4, and 10.0.0.6.

The two routers in AS 65001 each contain one EBGP link to AS 65002 (R2 and R4) over which they announce aggregated prefixes: 100.100/16. Routers at the edge of a network that communicate directly with routers in other networks are called border routers. Border routers use EBGP to exchange routing information between networks.

Adjacent BGP routers are referred to as neighbors or peers. Peers can be internal or external to the AS. Internal and external peers are configured slightly differently. In general, internal peers communicate using the loopback (lo0) interface, and external peers communicate through the shared interface. See Figure 14 for the loopback (lo0) and interface information.

Steps To Take To verify the BGP configuration of a router in your network, follow these steps:

1. Verify BGP on an Internal Router on page 159
2. Verify BGP on a Border Router on page 162

Step 1: Verify BGP on an Internal Router

Action To verify the BGP configuration of an internal router, enter the following JUNOS command-line interface (CLI) command:

user@host> **show configuration**

Sample Output The following sample output is for a BGP configuration on R3 in the network shown in Figure 14:

```
user@R3> show configuration
[...Output truncated...]
interfaces {
    so-0/0/1 {
        unit 0 {
            family inet {
                address 10.1.23.2/30;
            }
            family iso;
```

```
            }
        }
        so-0/0/3 {
            unit 0 {
                family inet {
                    address 10.1.36.1/30;
                }
                family iso;
            }
        }
        lo0 {
            unit 0 {
                family inet {
                    address 10.0.0.3/32;
                }
                family iso {
                    address 49.0002.1000.0000.0003.00;
                }
            }
        }
    }
    routing-options {
        [...Output truncated...]
        router-id 10.0.0.3;
        autonomous-system 65002;
    }
    protocols {
        bgp {
            group internal {
                type internal;
                local-address 10.0.0.3;
                neighbor 10.0.0.2;
                neighbor 10.0.0.4;
                neighbor 10.0.0.6;
            }
        }
        isis {
            level 1 disable;
            interface all {
                level 2 metric 10;
            }
            interface lo0.0;
        }
    }

    user@R6> show configuration |
    [Output truncated...]
    interfaces {
        so-0/0/1 {
            unit 0 {
                family inet {
                    address 10.1.46.2/30;
                }
                family iso;
            }
        }
        so-0/0/3 {
            unit 0 {
                family inet {
                    address 10.1.36.2/30;
                }
                family iso;
            }
```

```
    }
    lo0 {
        unit 0 {
            family inet {
                address 10.0.0.6/32;
            }
            family iso {
                address 49.0003.1000.0000.0006.00;
            }
        }
    }
}
routing-options {
    [Output truncated...]
    router-id 10.0.0.6;
    autonomous-system 65002;
}
protocols {
    bgp {
        group internal {
            type internal;
            local-address 10.0.0.6;
            neighbor 10.0.0.2;
            neighbor 10.0.0.3;
            neighbor 10.0.0.4;
        }
    }
    isis {
        level 1 disable;
        interface all {
            level 2 metric 10;
        }
        interface lo0.0;
    }
}
```

What It Means The sample output shows a basic BGP configuration on routers R3 and R6. The local AS (65002) and one group (internal) are configured on both routers. R3 has three internal peers—10.0.0.2, 10.0.0.4, and 10.0.0.6—included at the [protocols bgp group *group*] hierarchy level. R6 also has three internal peers: 10.0.0.2, 10.0.0.3, and 10.0.0.4. The underlying IGP protocol is Intermediate System-to-Intermediate System (IS-IS), and relevant interfaces are configured to run IS-IS.

Note that in this configuration the router ID is manually configured to avoid any duplicate router ID problems.

Step 2: Verify BGP on a Border Router

Action To verify the BGP configuration of a border router, enter the following JUNOS CLI operational mode command:

user@host> **show configuration**

Sample Output The following sample output is for a BGP configuration on two border routers from AS 65002 (R2 and R4) shown in Figure 14:

```
user@R2> show configuration
[...Output truncated...]
interfaces {
    so-0/0/0 {
        unit 0 {
            family inet {
                address 10.1.12.2/30;
            }
            family iso;
        }
    }
    so-0/0/1 {
        unit 0 {
            family inet {
                address 10.1.23.1/30;
            }
            family iso;
        }
    }
    so-0/0/3 {
        unit 0 {
            family inet {
                address 10.1.24.1/30;
            }
            family iso;
        }
    }
    lo0 {
        unit 0 {
            family inet {
                address 10.0.0.2/32;
            }
            family iso {
                address 49.0002.1000.0000.0002.00;
            }
        }
    }
}
routing-options {
[...Output truncated...]
    router-id 10.0.0.2;
    autonomous-system 65002;
}
protocols {
    bgp {
        group internal {
            type internal;
            export next-hop-self;
            neighbor 10.0.0.3;
            neighbor 10.0.0.4;
            neighbor 10.0.0.6;
```

```
        }
        group toR1 {
            type external;
            import import-toR1;
            peer-as 65001;
            neighbor 10.1.12.1;
        }
    }
    isis {
        level 1 disable;
        interface all {
            level 2 metric 10;
        }
        interface lo0.0;
    }
}
policy-options {
    policy-statement next-hop-self {
        term change-next-hop {
            from neighbor 10.1.12.1;
            then {
                next-hop self;
            }
        }
    }
    policy-statement import-toR1 {
        term 1 {
            from {
                route-filter 100.100.1.0/24 exact;
            }
            then {
                local-preference 200;
            }
        }
    }

user@R4> show configuration
[...Output truncated...]
interfaces {
    so-0/0/1 {
        unit 0 {
            family inet {
                address 10.1.46.1/30;
            }
            family iso;
        }
    }
    so-0/0/2 {
        unit 0 {
            family inet {
                address 10.1.45.1/30;
            }
            family iso;
        }
    }
    so-0/0/3 {
        unit 0 {
            family inet {
                address 10.1.24.2/30;
            }
            family iso;
        }
    }
```

```
    lo0 {
        unit 0 {
            family inet {
                address 10.0.0.4/32;
            }
            family iso {
                address 49.0001.1000.0000.0004.00;
            }
        }
    }
}
routing-options {
    [...Output truncated...]
    router-id 10.0.0.4;
    autonomous-system 65002;
}
protocols {
    bgp {
        group internal {
            type internal;
            local-address 10.0.0.4;
            export next-hop-self;
            neighbor 10.0.0.2;
            neighbor 10.0.0.3;
            neighbor 10.0.0.6;
        }
        group toR5 {
            type external;
            peer-as 65001;
            neighbor 10.1.45.2;
        }
    }
    isis {
        level 1 disable;
        interface all {
            level 2 metric 10;
        }
        interface lo0.0;
    }
}
policy-options {
    policy-statement next-hop-self {
        term change-next-hop {
            from neighbor 10.1.45.2;
            then {
                next-hop self;
            }
        }
    }
```

What It Means

The sample output shows a basic BGP configuration on border routers R2 and R4. Both routers have the AS (65002) included at the [routing-options] hierarchy level. Each router has two groups included at the [protocols bgp group *group*] hierarchy level. External peers are included in the external group, either toR1 or toR5, depending on the router. Internal peers are included in the internal group. The underlying IGP protocol is IS-IS on both routers, and relevant interfaces are configured to run IS-IS.

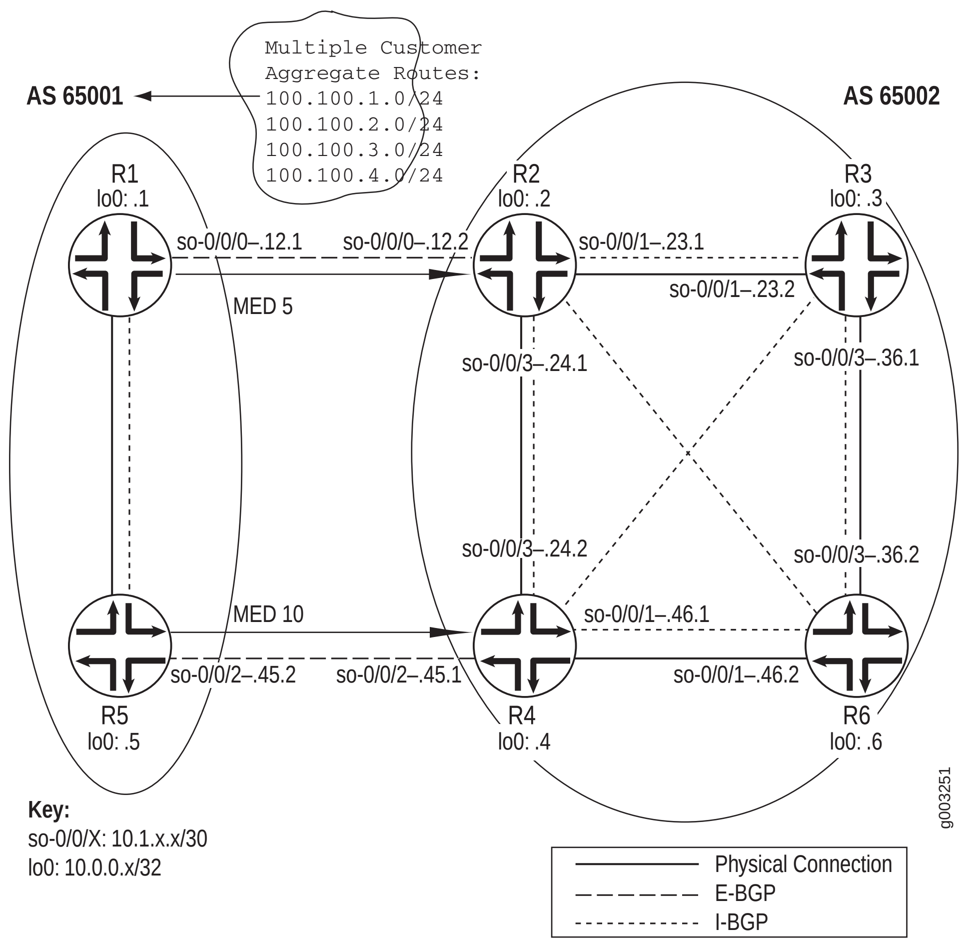
Note that in the configuration on both routers, the router ID is manually configured to avoid duplicate router ID problems, and the next-hop-self statement is included to avoid any BGP next-hop reachability problems.

Verify BGP Peers

Purpose Assuming that all the routers are correctly configured for BGP, you can verify if IBGP and EBGP sessions are properly established, external routes are advertised and received correctly, and the BGP path selection process is working properly.

Figure 15 illustrates an example BGP network topology used in this section

Figure 15: BGP Network Topology



The network consists of two directly connected ASs consisting of external and internal peers. The external peers are directly connected through a shared interface and are running EBGP. The internal peers are connected through their loopback (lo0) interfaces through IBGP. AS 65001 is running OSPF and AS 65002 is running IS-IS as its underlying IGP. IBGP routers do not have to be directly connected, the underlying IGP allows neighbors to reach one another.

The two routers in AS 65001 each contain one EBGP link to AS 65002 (R2 and R4) over which they announce aggregated prefixes: 100.100.1.0, 100.100.2.0, 100.100.3.0, and 100.100.4.0. Also, R1 and R5 are injecting multiple exit discriminator (MED) values of 5 and 10, respectively, for some routes.

The internal routers in both ASs are using a full mesh IBGP topology. A full mesh is required because the networks are not using confederations or route reflectors, so any routes learned through IBGP are not distributed to other internal neighbors. For example, when R3 learns a route from R2, R3 does not distribute that route to R6 because the route is learned through IBGP, so R6 must have a direct BGP connection to R2 to learn the route.

In a full mesh topology, only the border router receiving external BGP information distributes that information to other routers within its AS. The receiving router does not redistribute that information to other IBGP routers in its own AS.

From the point of view of AS 65002, the following sessions should be up:

- The four routers in AS 65002 should have IBGP sessions established with each other.
- R2 should have an EBGP session established with R1.
- R4 should have an EBGP session established with R5.

To verify BGP peers, follow these steps:

1. Check That BGP Sessions Are Up on page 166
2. Verify That a Neighbor is Advertising a Particular Route on page 169
3. Verify That a Particular BGP Route Is Received on Your Router on page 170

Step 1: Check That BGP Sessions Are Up

Action To check that all IBGP and EBGP sessions are properly established, enter the following JUNOS CLI operational mode command:

user@host> **show bgp summary**

Sample Output 1 The following sample output from R2 shows four peers that are *not* established:

```
user@R2> show bgp summary
Groups: 2 Peers: 4 Down peers: 1
Table          Tot Paths  Act Paths Suppressed    History Damp State    Pending
inet.0                6          4          0          0          0          0
Peer               AS      InPkt     OutPkt    OutQ   Flaps Last Up/Dwn State|#Active/Received/Damped...
10.0.0.3        65002         86         90       0       2       42:54 0/0/0                0/0/0
10.0.0.4        65002         90         91       0       1       42:54 0/2/0                0/0/0
10.0.0.6        65002         87         90       0       3           3 Active
10.1.12.1       65001         89         89       0       1       42:54 4/4/0                0/0/0
```

Sample Output 2 The following sample output shows that all peers are established:

```
user@R2> show bgp summary
Groups: 2 Peers: 4 Down peers: 0
Table          Tot Paths  Act Paths Suppressed    History Damp State    Pending
inet.0                6          4          0          0          0          0
Peer               AS      InPkt     OutPkt    OutQ   Flaps Last Up/Dwn State|#Active/Received/Damped..
10.0.0.3        65002      54440      54457       0       1     2w4d21h 0/0/0                0/0/0
10.0.0.4        65002      51505      51507       0       0     2w3d21h 0/2/0                0/0/0
```

```
10.0.0.6        65002      14066      14070        0        1 4d 21:15:14 0/0/0                 0/0/0
10.1.12.1       65001      88580      88587        0        0     4w2d18h 4/4/0                 0/0/0

user@R3> show bgp summary
Groups: 1 Peers: 3 Down peers: 0
Table          Tot Paths  Act Paths Suppressed    History Damp State    Pending
inet.0                 6          4          0          0          0          0
Peer               AS      InPkt     OutPkt    OutQ   Flaps Last Up/Dwn State|#Active/Received/Damped..
10.0.0.2        65002      54476      54460       0       1        7:17 4/4/0                 0/0/0
10.0.0.4        65002      51527      51511       0       0     2w3d21h 0/2/0                 0/0/0
10.0.0.6        65002      54459      54459       0       0     2w4d21h 0/0/0                 0/0/0

user@R4> show bgp summary
Groups: 2 Peers: 4 Down peers: 0
Table          Tot Paths  Act Paths Suppressed    History Damp State    Pending
inet.0                 8          4          0          0          0          0
Peer               AS      InPkt     OutPkt    OutQ   Flaps Last Up/Dwn
State|#Active/Received/Damped...
10.0.0.2        65002      51530      51532       0       1        8:59 2/4/0                 0/0/0
10.0.0.3        65002      51512      51531       0       0     2w3d21h 0/0/0                 0/0/0
10.0.0.6        65002      51515      51530       0       0     2w3d21h 0/0/0                 0/0/0
10.1.45.2       65001      51520      51530       0       0     2w3d21h 2/4/0                 0/0/0

user@R6> show bgp summary
Groups: 1 Peers: 3 Down peers: 0
Table          Tot Paths  Act Paths Suppressed    History Damp State    Pending
inet.0                 6          4          0          0          0          0
Peer               AS      InPkt     OutPkt    OutQ   Flaps Last Up/Dwn State|#Active/Received/Damped..
10.0.0.2        65002      88610      88587       0       2       10:30 2/4/0                 0/0/0
10.0.0.3        65002      54464      54468       0       1     2w4d22h 0/0/0                 0/0/0
10.0.0.4        65002      51532      51520       0       0     2w3d21h 2/2/0
```

What It Means Sample output 1 shows a peer that is not established, while sample output 2 shows that all IBGP and EBGP sessions shown in the network diagram in Figure 15 are established.

Sample output 1 shows one peer (10.0.0.6) is not established, as indicated by the Down Peers: 1 field. The State|#Active/Received/Damped column also displays Active, indicating that the peer is in the Active state and not yet established.

The State|#Active/Received/Damped) column is a dual purpose field, as indicated by the pipe (|). When a peer is not established (as in our example), the field indicates the state of the peering session, such as active, connect, or idle. When the peer is in the Established state, the field displays the *number* of active, received, or damped routes received from the neighbor. For example, peer 10.0.0.6 is an example of the last column displaying the Active state, and peer 10.1.12.1 is an example of the last column showing the number of active, received, and damped routes (4/4/0). For more detailed information on the show bgp summary command, see the *JUNOS Routing Protocols and Policies Command Reference*.

If the BGP neighbor session is not established, use the ping and show route commands to verify network connectivity to the BGP neighbor. Also, use the show log messages command to look for any errors pertaining to the peer in question.

Sample output 2 shows that all IBGP and EBGP sessions shown in the network diagram in Figure 15 are established, as indicated by the Down Peers: 0 field and the last column that shows the number of routes.

Following is a description of the output for all established BGP peers, R2, R3, R4, and R6.

The route information for border router R2 shows the following:

- 0/0/0 for internal peers 10.0.0.3 and 10.0.0.6, indicating that no BGP routes are received or active in the routing table from those peers. No BGP routes are damped.
- 0/2/0 for internal peer 10.0.0.4, indicating that two received BGP routes are not active in the routing table. No BGP routes are damped.
- 4/4/0 for external peer 10.1.12.1, indicating that four received BGP routes are active in the routing table. No BGP routes are damped.

The route information for internal router R3 shows the following:

- 0/0/0 for internal peer 10.0.0.6, indicating that no BGP routes are received or active in the routing table from that peer. No BGP routes are damped.
- 0/2/0 for internal peer 10.0.0.4, indicating that two received BGP routes are not active in the routing table. No BGP routes are damped.
- 4/4/0 for internal peer 10.0.0.2, indicating that four received BGP routes are active in the routing table. No BGP routes are damped.

The route information for border router R4 shows the following:

- 0/0/0 for internal peers 10.0.0.3 and 10.0.0.6, indicating that no BGP routes are received or active in the routing table from those peers. No BGP routes are damped.
- 2/4/0 for internal peer 10.0.0.2 and external peer 10.1.45.1, indicating that two BGP routes are active in the routing table, but four are received. No BGP routes are damped.

The route information for internal router R6 shows the following:

- 0/0/0 for internal peer 10.0.0.3, indicating that no BGP routes are received or active in the routing table from that peer. No BGP routes are damped.
- 2/4/0 for internal peers 10.0.0.2,and 10.0.0.4, indicating that of the four received BGP routes, two are active in the routing table. No BGP routes are damped.

Other information in the sample output includes the following:

- Number of configured BGP groups: R2 has two groups configured (internal and toR1), and R4 also has two BGP groups configured (internal and toR5).
- Number of BGP peers to which the router is linked: R2 and R4 have four (one EBGP and three IBGP), and R3 and R6 have three IBGP. One peer is down (R6) in sample output 1.

- The name of the routing table storing the BGP routes, all routers are using inet.0.
- The total number of BGP paths, for example, R4 has a total of eight BGP paths from all of its peers.
- The number of active BGP routes, for example, R4 has a total of four active BGP routes from all of its peers.
- The second column of values (0/0/0) in the State|#Active/Received/Damped field indicates the number of multiprotocol BGP (MBGP) routes. All routers do not have any received, active, or damped MBGP routes.

Step 2: Verify That a Neighbor is Advertising a Particular Route

Purpose You can determine if a particular route that you have configured is being advertised by a neighbor.

Action To verify that a neighbor is advertising a particular route, enter the following JUNOS CLI operational mode command:

user@host> **show route advertising-protocol bgp** *neighbor-address*

Sample Output

```
user@R2> show route advertising-protocol bgp 10.0.0.4

inet.0: 20 destinations, 22 routes (20 active, 0 holddown, 0 hidden)
  Prefix                  Nexthop              MED     Lclpref    AS path
* 100.100.1.0/24          Self                 5       200        65001 I
* 100.100.2.0/24          Self                 5       100        65001 I
* 100.100.3.0/24          Self                         100        65001 I
* 100.100.4.0/24          Self                         100        65001 I
```

What It Means The sample output shows the BGP routes advertised from R2 to its neighbor, 10.0.0.4 (R4). Out of 22 total routes in the inet.0 routing table, 20 are active destinations . No routes are hidden or in the hold-down state. Routes reside in the hold-down state prior to being declared active, and routes rejected by a routing policy can be placed into the hidden state. The information displayed reflects the routes that the routing table exported to the BGP routing protocol.

Step 3: Verify That a Particular BGP Route Is Received on Your Router

Purpose Display the routing information as it is received through a particular BGP neighbor and advertised by the local router to the neighbor.

Action To verify that a particular BGP route is received on your router, enter the following JUNOS CLI operational mode command:

user@host> **show route receive-protocol bgp** *neighbor-address*

Sample Output

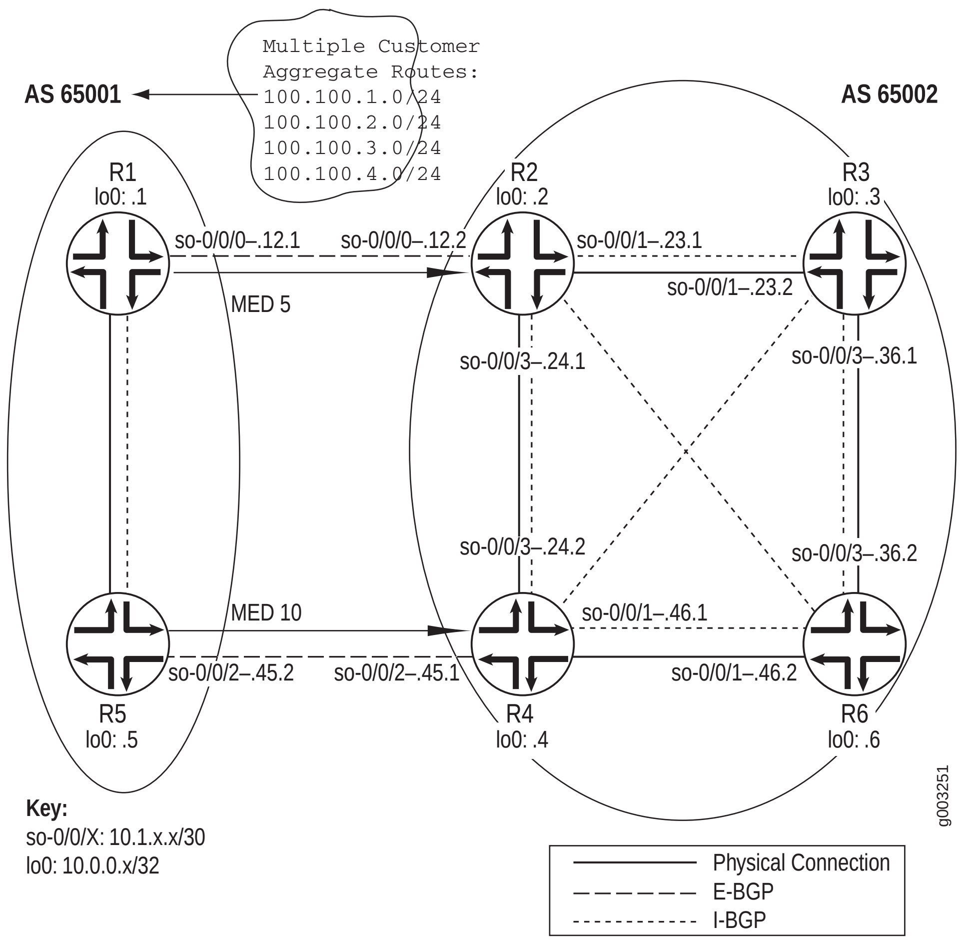
```
user@R6> show route receive-protocol bgp 10.0.0.2

inet.0: 18 destinations, 20 routes (18 active, 0 holddown, 0 hidden)
  Prefix                  Nexthop              MED     Lclpref    AS path
* 100.100.1.0/24          10.0.0.2             5       200        65001 I
* 100.100.2.0/24          10.0.0.2             5       100        65001 I
  100.100.3.0/24          10.0.0.2                     100        65001 I
  100.100.4.0/24          10.0.0.2                     100        65001 I

iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)

user@R6> show route receive-protocol bgp 10.0.0.4

inet.0: 18 destinations, 20 routes (18 active, 0 holddown, 0 hidden)
  Prefix                  Nexthop              MED     Lclpref    AS path
* 100.100.3.0/24          10.0.0.4                     100        65001 I
* 100.100.4.0/24          10.0.0.4                     100        65001 I

iso.0: 1 destinations, 1 routes (1 active, 0 holddown, 0 hidden)
```

What It Means The sample output shows four BGP routes from R2 and two from R4. Of the four routes from R2, only two are active in the routing table, as indicated by the asterisk (*), while both routes received from R4 are active in the routing table. All BGP routes came through AS 65001.

Examine BGP Routes and Route Selection

Purpose You can examine the BGP path selection process to determine the single, active path when BGP receives multiple routes to the same destination prefix.

Figure 16: BGP Network Topology



The network in Figure 16 shows that R1 and R5 announce the same aggregate routes to R2 and R4, which results in R2 and R4 receiving two routes to the same destination prefix. The route selection process on R2 and R4 determines which of the two BGP routes received is active and advertised to the other internal routers (R3 and R6).

Before the router installs a BGP route, it must make sure that the BGP next-hop attribute is reachable. If the BGP next hop cannot be resolved, the route is not installed. When a BGP route is installed in the routing table, it must go through a path selection process if multiple routes exist to the same destination prefix. The BGP path selection process proceeds in the following order:

1. Route preference in the routing table is compared. For example, if an OSPF and a BGP route exist for a particular destination, the OSPF route is selected as the active route because the OSPF route has a default preference of 10, while the BGP route has a default preference of 170.

2. Routes are compared for local preference. The route with the highest local preference is preferred. For example, see "Examine the Local Preference Selection" on page 173.

3. The AS path attribute is evaluated. The shorter AS path is preferred.

4. The origin code is evaluated. The lowest origin code is preferred (I (IGP) < E (EGP) < ? (Incomplete)).

5. The MED value is evaluated. By default, if any of the routes are advertised from the same neighboring AS, the lowest MED value is preferred. The absence of a MED value is interpreted as a MED of 0. For an example, see "Examine the Multiple Exit Discriminator Route Selection" on page 174.

6. The route is evaluated as to whether it is learned through EBGP or IBGP. EBGP learned routes are preferred to IBGP learned routes. For an example, see "Examine the EBGP over IBGP Selection" on page 175

7. If the route is learned from IBGP, the route with the lowest IGP cost is preferred. For an example, see "Examine the IGP Cost Selection" on page 176. The physical next hop to the IBGP peer is installed according to the following three rules:

    a. After BGP examines the inet.0 and inet.3 routing tables, the physical next hop of the route with the lowest preference is used.

    b. If the preference values in the inet.0 and the inet.3 routing tables are a tie, the physical next hop of the route in the inet.3 routing table is used.

    c. When a preference tie exists in the same routing table, the physical next hop of the route with more paths is installed.

8. The route reflection cluster list attribute is evaluated. The shortest length cluster list is preferred. Routes without a cluster list are considered to have a cluster list length of 0.

9. The router ID is evaluated. The route from the peer with the lowest router ID is preferred (usually the loopback address).

10. The peer address value is examined. The peer with the lowest peer IP address is preferred.

Steps To Take To determine the single, active path when BGP receives multiple routes to the same destination prefix, enter the following JUNOS CLI operational mode command:

user@host> **show route** *destination-prefix* < detail >

The following steps illustrate the inactive reason displayed when BGP receives multiple routes to the same destination prefix and one route is selected as the single, active path:

1. Examine the Local Preference Selection on page 173
2. Examine the Multiple Exit Discriminator Route Selection on page 174
3. Examine the EBGP over IBGP Selection on page 175
4. Examine the IGP Cost Selection on page 176

Step 1: Examine the Local Preference Selection

Action To examine a route to determine if local preference is the selection criteria for the single, active path, enter the following JUNOS CLI operational mode command:

user@host> **show route** *destination-prefix* < detail >

Sample Output

```
user@R4> show route 100.100.1.0 detail

inet.0: 20 destinations, 24 routes (20 active, 0 holddown, 0 hidden)
100.100.1.0/24 (2 entries, 1 announced)
        *BGP    Preference: 170/-201
                Source: 10.0.0.2
                Next hop: 10.1.24.1 via so-0/0/3.0, selected
                Protocol next hop: 10.0.0.2 Indirect next hop: 8644000 277
                State: <Active Int Ext>
                Local AS: 65002 Peer AS: 65002
                Age: 2:22:34    Metric: 5       Metric2: 10
                Task: BGP_65002.10.0.0.2+179
                Announcement bits (3): 0-KRT 3-BGP.0.0.0.0+179 4-Resolve inet.0
                AS path: 65001 I
                Localpref: 200
                Router ID: 10.0.0.2
         BGP    Preference: 170/-101
                Source: 10.1.45.2
                Next hop: 10.1.45.2 via so-0/0/2.0, selected
                State: <Ext>
                Inactive reason: Local Preference
                Local AS: 65002 Peer AS: 65001
                Age: 2w0d 1:28:31       Metric: 10
                Task: BGP_65001.10.1.45.2+179
                AS path: 65001 I
                Localpref: 100
                Router ID: 10.0.0.5
```

What It Means The sample output shows that R4 received two instances of the 100.100.1.0 route: one from 10.0.0.2 (R2) and one from 10.1.45.2 (R5). R4 selected the path from R2 as its active path, as indicated by the asterisk (*). The selection is based on the local preference value contained in the Localpref field. The path with the *highest* local preference is preferred. In the example, the path with the higher local preference value is the path from R2, 200.

The reason that the route from R5 is not selected is in the Inactive reason field, in this case, Local Preference.

Note that the two paths are from the same neighboring network: AS 65001.

Step 2: Examine the Multiple Exit Discriminator Route Selection

Action To examine a route to determine if the MED is the selection criteria for the single, active path, enter the following JUNOS CLI operational mode command:

user@host> **show route** *destination-prefix* < detail >

Sample Output

```
user@R4> show route 100.100.2.0 detail

inet.0: 20 destinations, 24 routes (20 active, 0 holddown, 0 hidden)
100.100.2.0/24 (2 entries, 1 announced)
        *BGP    Preference: 170/-101
                Source: 10.0.0.2
                Next hop: 10.1.24.1 via so-0/0/3.0, selected
                Protocol next hop: 10.0.0.2 Indirect next hop: 8644000 277
                State: <Active Int Ext>
                Local AS: 65002 Peer AS: 65002
                Age: 2:32:01    Metric: 5       Metric2: 10
                Task: BGP_65002.10.0.0.2+179
                Announcement bits (3): 0-KRT 3-BGP.0.0.0.0+179 4-Resolve inet.0
                AS path: 65001 I
                Localpref: 100
                Router ID: 10.0.0.2
         BGP    Preference: 170/-101
                Source: 10.1.45.2
                Next hop: 10.1.45.2 via so-0/0/2.0, selected
                State: <NotBest Ext>
                Inactive reason: Not Best in its group
                Local AS: 65002 Peer AS: 65001
                Age: 2w0d 1:37:58       Metric: 10
                Task: BGP_65001.10.1.45.2+179
                AS path: 65001 I
                Localpref: 100
                Router ID: 10.0.0.5
```

What It Means The sample output shows that R4 received two instances of the 100.100.2.0 route: one from 10.0.0.2 (R2), and one from 10.1.45.2 (R5). R4 selected the path from R2 as its active route, as indicated by the asterisk (*). The selection is based on the MED value contained in the Metric: field. The path with the lowest MED value is preferred. In the example, the path with the lowest MED value (5) is the path from R2. Note that the two paths are from the same neighboring network: AS 65001.

The reason that the inactive path is not selected is displayed in the Inactive reason: field, in this case, Not Best in its group. The wording is used because the JUNOS software uses the process of deterministic MED selection, by default.

Step 3: Examine the EBGP over IBGP Selection

Action To examine a route to determine if EBGP is selected over IBGP as the selection criteria for the single, active path, enter the following JUNOS CLI operational mode command:

user@host> **show route** *destination-prefix* < detail >

Sample Output

```
user@R4> show route 100.100.3.0 detail

inet.0: 20 destinations, 24 routes (20 active, 0 holddown, 0 hidden)
100.100.3.0/24 (2 entries, 1 announced)
        *BGP    Preference: 170/-101
                Source: 10.1.45.2
                Next hop: 10.1.45.2 via so-0/0/2.0, selected
                State: <Active Ext>
                Local AS: 65002 Peer AS: 65001
                Age: 5d 0:31:25
                Task: BGP_65001.10.1.45.2+179
                Announcement bits (3): 0-KRT 3-BGP.0.0.0.0+179 4-Resolve inet.0
                AS path: 65001 I
                Localpref: 100
                Router ID: 10.0.0.5
         BGP    Preference: 170/-101
                Source: 10.0.0.2
                Next hop: 10.1.24.1 via so-0/0/3.0, selected
                Protocol next hop: 10.0.0.2 Indirect next hop: 8644000 277
                State: <NotBest Int Ext>
                Inactive reason: Interior > Exterior > Exterior via Interior
                Local AS: 65002 Peer AS: 65002
                Age: 2:48:18    Metric2: 10
                Task: BGP_65002.10.0.0.2+179
                AS path: 65001 I
                Localpref: 100
                Router ID: 10.0.0.2
```

What It Means The sample output shows that R4 received two instances of the 100.100.3.0 route: one from 10.1.45.2 (R5) and one from 10.0.0.2 (R2). R4 selected the path from R5 as its active path, as indicated by the asterisk (*). The selection is based on a preference for routes learned from an EBGP peer over routes learned from an IBGP. R5 is an EBGP peer.

You can determine if a path is received from an EBGP or IBGP peer by examining the Local As and Peer As fields. For example, the route from R5 shows the local AS is 65002 and the peer AS is 65001, indicating that the route is received from an EBGP peer. The route from R2 shows that both the local and peer AS is 65002, indicating that it is received from an IBGP peer.

The reason that the inactive path is not selected is displayed in the Inactive reason field, in this case, Interior > Exterior > Exterior via Interior. The wording of this reason shows the order of preferences applied when the same route is received from two routers. The route received from a strictly internal source (IGP) is preferred first, the route received from an external source (EBGP) is preferred next, and any route which comes from an external source and is received internally (IBGP) is preferred last.

Step 4: Examine the IGP Cost Selection

Action To examine a route to determine if EBGP is selected over IBGP as the selection criteria for the single, active path, enter the following JUNOS CLI operational mode command:

user@host> **show route** *destination-prefix* < detail >

Sample Output

```
user@R6> show route 100.100.4.0 detail

inet.0: 18 destinations, 20 routes (18 active, 0 holddown, 0 hidden)
100.100.4.0/24 (2 entries, 1 announced)
        *BGP    Preference: 170/-101
                Source: 10.0.0.4
                Next hop: 10.1.46.1 via so-0/0/1.0, selected
                Protocol next hop: 10.0.0.4 Indirect next hop: 864c000 276
                State: <Active Int Ext>
                Local AS: 65002 Peer AS: 65002
                Age: 2:16:11    Metric2: 10
                Task: BGP_65002.10.0.0.4+4120
                Announcement bits (2): 0-KRT 4-Resolve inet.0
                AS path: 65001 I
                Localpref: 100
                Router ID: 10.0.0.4
         BGP    Preference: 170/-101
                Source: 10.0.0.2
                Next hop: 10.1.46.1 via so-0/0/1.0, selected
                Next hop: 10.1.36.1 via so-0/0/3.0
                Protocol next hop: 10.0.0.2 Indirect next hop: 864c0b0 278
                State: <NotBest Int Ext>
                Inactive reason: IGP metric
                Local AS: 65002 Peer AS: 65002
                Age: 2:16:03    Metric2: 20
                Task: BGP_65002.10.0.0.2+179
                AS path: 65001 I
                Localpref: 100
                Router ID: 10.0.0.2
```

What It Means The sample output shows that R6 received two instances of the 100.100.4.0 route: one from 10.0.0.4 (R4) and one from 10.0.0.2 (R2). R6 selected the path from R4 as its active route, as indicated by the asterisk (*). The selection is based on the IGP metric, displayed in the Metric2 field. The route with the lowest IGP metric is preferred. In the example, the path with the lowest IGP metric value is the path from R4, with an IGP metric value of 10, while the path from R2 has an IGP metric of 20. Note that the two paths are from the same neighboring network: AS 65001.

The reason that the inactive path was not selected is displayed in the Inactive reason field, in this case, IGP metric.

Examine Routes in the Forwarding Table

Purpose When you run into problems, such as connectivity problems, you may need to examine routes in the forwarding table to verify that the routing protocol process has relayed the correct information into the forwarding table.

Action To display the set of routes installed in the forwarding table, enter the following JUNOS CLI operational mode command:

user@host> **show route forwarding-table**

Sample Output

```
user@R2> show route forwarding-table
Routing table: inet
Internet:
Destination        Type RtRef Next hop          Type Index NhRef Netif
default            perm     0                   rjct    10     1
10.0.0.2/32        intf     0 10.0.0.2          locl   256     1
10.0.0.3/32        user     1 10.1.23.0         ucst   282     4 so-0/0/1.0
10.0.0.4/32        user     1 10.1.24.0         ucst   290     7 so-0/0/3.0
10.0.0.6/32        user     1 10.1.24.0         ucst   290     7 so-0/0/3.0
10.1.12.0/30       intf     1 ff.3.0.21         ucst   278     6 so-0/0/0.0
10.1.12.0/32       dest     0 10.1.12.0         recv   280     1 so-0/0/0.0
10.1.12.2/32       intf     0 10.1.12.2         locl   277     1
10.1.12.3/32       dest     0 10.1.12.3         bcst   279     1 so-0/0/0.0
10.1.23.0/30       intf     0 ff.3.0.21         ucst   282     4 so-0/0/1.0
10.1.23.0/32       dest     0 10.1.23.0         recv   284     1 so-0/0/1.0
10.1.23.1/32       intf     0 10.1.23.1         locl   281     1
10.1.23.3/32       dest     0 10.1.23.3         bcst   283     1 so-0/0/1.0
10.1.24.0/30       intf     0 ff.3.0.21         ucst   290     7 so-0/0/3.0
10.1.24.0/32       dest     0 10.1.24.0         recv   292     1 so-0/0/3.0
10.1.24.1/32       intf     0 10.1.24.1         locl   289     1
10.1.24.3/32       dest     0 10.1.24.3         bcst   291     1 so-0/0/3.0
10.1.36.0/30       user     0 10.1.23.0         ucst   282     4 so-0/0/1.0
10.1.46.0/30       user     0 10.1.24.0         ucst   290     7 so-0/0/3.0
100.100.1.0/24     user     0 10.1.12.0         ucst   278     6 so-0/0/0.0
100.100.2.0/24     user     0 10.1.12.0         ucst   278     6 so-0/0/0.0
100.100.3.0/24     user     0 10.1.12.0         ucst   278     6 so-0/0/0.0
100.100.4.0/24     user     0 10.1.12.0         ucst   278     6 so-0/0/0.0
[...Output truncated...]
```

What It Means The sample output shows the network-layer prefixes and their next hops installed in the forwarding table. The output includes the same next-hop information as in the show route detail command (the next-hop address and interface name). Additional information includes the destination type, the next-hop type, the number of references to this next hop, and an index into an internal next-hop database. (The internal database contains additional information used by the Packet Forwarding Engine to ensure proper encapsulation of packets sent out an interface. This database is not accessible to the user.

For detailed information about the meanings of the various flags and types fields, see the *JUNOS Routing Protocols and Policies Command Reference*.