BGP Implementation Using 32–bit AS Number
Configuration Example

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Introduction

This document describes how to configure Border Gateway Protocol (BGP) using 32–bit AS number. In BGP, each routing domain is a single administrative domain and has a unique AS number assigned to it, and is operated within a uniform set of routing policies. It also maintains interdomain routing.

In this document, BGP peering is configured between 16–bit and 32–bit speaking BGP routers. The new 32–bit AS mode is compatible with the 16–bit AS mode. The BGP peers which can operate in 32–bit mode respond positively to the new capability, and that session operates in new mode. On the other hand, the 32–bit BGP peers when communicating with the 16–bit BGP speakers, the 16–bit speaking routers ignore this new capability and operate their BGP session in 16–bit mode.

Prerequisites

Requirements

Cisco recommends that you have basic knowledge of BGP.

Hardware and Software Versions

The configurations in this document are based on the Cisco 7200 Series Router with Cisco IOS® Software Release 15.0(1).

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Configure

In this example, routers R1 and R3 are configured to be in AS 100 forming iBGP relationship using 16–bit AS mode. Routers R2 and R4 are configured in AS 10.1, and form iBGP peering using the 32–bit AS mode.
The routers R1 and R2 run and IGP protocol, in this example OSPF between each other and also forms eBGP neighboring between them.

**Note:** Use the Command Lookup Tool (registered customers only) in order to find more information on the commands used in this document.

**Network Diagram**

This document uses this network setup:

![Network Diagram]

**Configurations**

This document uses these configurations:

- Router R1
- Router R2
- Router R3
- Router R4

```
R1#show run
Building configuration...
!
version 15.0
!
hostname R1
!
ip cef
```
! interface Loopback0
  ip address 1.1.1.1 255.255.255.255
!
interface Loopback10
  ip address 192.168.100.1 255.255.255.0
!
interface Loopback20
  ip address 192.168.200.1 255.255.255.0
!
interface FastEthernet1/0
  ip address 192.168.10.1 255.255.255.0
duplex auto
  speed auto
!
interface Serial2/0
  ip address 10.10.100.1 255.255.255.0
  serial restart-delay 0
!
router ospf 1
  log-adjacency-changes
  network 1.1.1.1 0.0.0.0 area 0
  network 10.10.100.0 0.0.0.255 area 0
!
router bgp 100

!--- BGP is configured using 16-bit AS number

  no synchronization
  bgp router-id 10.10.10.10
  bgp asnotation dot

!--- This command change the default asplain notation to dot notation.

!--- Note that without this command the AS number will treated as asplain notation i.e. 10.1 will be displayed as 655361

  bgp log-neighbor-changes
  network 192.168.100.0
  network 192.168.200.0
  neighbor 2.2.2.2 remote-as 10.1

!--- The AS number of the eBGP peer in 32-bit

  neighbor 2.2.2.2 ebgp-multihop 255
  neighbor 2.2.2.2 update-source Loopback0
  neighbor 192.168.10.2 remote-as 100
  neighbor 192.168.10.2 next-hop-self
  no auto-summary
!
end

---

Router R2

R2#show run
!
version 15.0
!
hostname R2
!
ip cef
interface Loopback0
ip address 2.2.2.2 255.255.255.0
!
interface Loopback10
ip address 10.1.1.1 255.255.255.255
!
interface Loopback20
ip address 20.1.1.1 255.255.255.255
!
interface FastEthernet1/0
ip address 172.16.10.1 255.255.255.0
duplex auto
speed auto
!
interface Serial2/0
ip address 10.10.100.2 255.255.255.0
serial restart-delay 0
!
router ospf 1
log-adjacency-changes
network 2.2.2.2 0.0.0.0 area 0
network 10.10.100.0 0.0.0.255 area 0
!
router bgp 10.1

!--- BGP is configured using 32-bit AS number

no synchronization
bgp router-id 20.20.20.20
bgp asnotation dot
bgp log-neighbor-changes
network 10.1.1.1 mask 255.255.255.255
network 20.1.1.1 mask 255.255.255.255
neighbor 1.1.1.1 remote-as 100
neighbor 1.1.1.1 ebgp-multihop 255
neighbor 1.1.1.1 update-source Loopback0
neighbor 172.16.10.2 remote-as 10.1
neighbor 172.16.10.2 next-hop-self
no auto-summary
!
end

Router R3

R3#show run
Building configuration...
!
version 15.0
ip cef
!
interface Loopback0
ip address 30.30.30.30 255.255.255.255
!
interface FastEthernet1/0
ip address 192.168.10.2 255.255.255.0
duplex auto
speed auto
!
router bgp 100
no synchronization
bgp router-id 3.3.3.3
bgp log-neighbor-changes
network 30.30.30.30 mask 255.255.255.255
neighbor 192.168.10.1 remote-as 100
eighbor 192.168.10.1 next-hop-self
no auto-summary

!--- iBGP peering is formed between routers R1 and R3 using 16-bit AS number.
!
end

---

**Router R4**

R4#show run
Building configuration...
!
version 15.0
ip cef
!
interface Loopback0
  ip address 40.40.40.40 255.255.255.255
!
interface FastEthernet1/0
  ip address 172.16.10.2 255.255.255.0
duplex auto
speed auto
!
router bgp 10.1
  no synchronization
  bgp router-id 4.4.4.4
  bgp asnotation dot
  bgp log-neighbor-changes
  network 40.40.40.40 mask 255.255.255.255
  neighbor 172.16.10.1 remote-as 10.1
  no auto-summary
!
end

!--- iBGP peering is formed between routers R2 and R4 using 32-bit AS number.

---

**Verify**

Use this section in order to confirm that your configuration works properly.

The Output Interpreter Tool (registered customers only) (OIT) supports certain `show` commands. Use the OIT in order to view an analysis of `show` command output.

**Show Commands**

In order to verify that BGP can support 32–bit ASN, use the `show ip bgp neighbor` command.

**show ip bgp neighbor**

**In router R1**

R1#show ip bgp neighbor 2.2.2.2
BGP neighbor is 2.2.2.2, remote AS 10.1, external link
  BGP version 4, remote router ID 20.20.20.20
  BGP state = Established, up for 03:28:22
  Last read 00:00:41, last write 00:00:29, hold time is 180, keepalive interval is 60 seconds
Neighbor sessions:
1 active, is multisession capable
Neighbor capabilities:
Route refresh: advertised and received (new)
Four-octets ASN Capability: advertised and received
Address family IPv4 Unicast: advertised and received
Multisession Capability: advertised and received
Message statistics, state Established:
InQ depth is 0
OutQ depth is 0

<table>
<thead>
<tr>
<th>Sent</th>
<th>Rcvd</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>229</td>
<td>230</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>233</td>
<td>234</td>
</tr>
</tbody>
</table>

!--- Output omitted---!

To show the entries in the BGP routing table, use the **show ip bgp** command.

**In router R1**

```
R1#sh ip bgp
BGP table version is 13, local router ID is 10.10.10.10
Status codes: s suppressed, d damped, h history, * valid, > best, I − internal,
r RIB−failure, S Stale
Origin codes: I − IGP, e − EGP, ? − incomplete

<table>
<thead>
<tr>
<th>Network</th>
<th>Next Hop</th>
<th>Metric LocPrf Weight Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>*&gt; 10.1.1.1/32</td>
<td>2.2.2.2</td>
<td>0             0 10.1 I</td>
</tr>
<tr>
<td>*&gt; 20.1.1.1/32</td>
<td>2.2.2.2</td>
<td>0             0 10.1 I</td>
</tr>
<tr>
<td>*&gt; 192.168.10.2</td>
<td>2.2.2.2</td>
<td>0             0 10.1 I</td>
</tr>
<tr>
<td>*&gt; 40.40.40.32</td>
<td>2.2.2.2</td>
<td>0             0 10.1 I</td>
</tr>
<tr>
<td>*&gt; 192.168.100.0</td>
<td>192.168.10.1</td>
<td>0     100      0 I</td>
</tr>
<tr>
<td>*&gt; 192.168.200.0</td>
<td>192.168.10.1</td>
<td>0     100      0 I</td>
</tr>
</tbody>
</table>
```

!--- Note that the routes highlighted are received from the eBGP peer router R2 which is in 32-bit AS 10.1.

**In router R3**

```
R3#sh ip bgp
BGP table version is 11, local router ID is 3.3.3.3
Status codes: s suppressed, d damped, h history, * valid, > best, I − internal,
r RIB−failure, S Stale
Origin codes: I − IGP, e − EGP, ? − incomplete

<table>
<thead>
<tr>
<th>Network</th>
<th>Next Hop</th>
<th>Metric LocPrf Weight Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>*&gt; 10.1.1.1/32</td>
<td>192.168.10.1</td>
<td>0             100 655361 I</td>
</tr>
<tr>
<td>*&gt; 120.1.1.1/32</td>
<td>192.168.10.1</td>
<td>0             100 655361 I</td>
</tr>
<tr>
<td>*&gt; 30.30.30.30/32</td>
<td>32768 I</td>
<td></td>
</tr>
<tr>
<td>*&gt; 192.168.10.1</td>
<td>0</td>
<td>100 655361 I</td>
</tr>
<tr>
<td>*&gt; 192.168.100.0</td>
<td>192.168.10.1</td>
<td>0             100 I</td>
</tr>
<tr>
<td>*&gt; 192.168.200.0</td>
<td>192.168.10.1</td>
<td>0             100 I</td>
</tr>
</tbody>
</table>
```
The router R3 does not have `bgp asnotation dot` configured in it. Therefore, the route received from the router in 32-bit AS **AS 10.1** is displayed as **655361**.

In router R4

R4#sh ip bgp

BGP table version is 7, local router ID is 4.4.4.4
Status codes: s suppressed, d damped, h history, * valid, > best, I - internal, r RIB-failure, S Stale
Origin codes: I - IGP, e - EGP, ? - incomplete

<table>
<thead>
<tr>
<th>Network</th>
<th>Next Hop</th>
<th>Metric</th>
<th>LocPrf</th>
<th>Weight</th>
<th>Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>*&gt;i10.1.1.1/32</td>
<td>172.16.10.1</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>I</td>
</tr>
<tr>
<td>*&gt;i20.1.1.1/32</td>
<td>172.16.10.1</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>I</td>
</tr>
<tr>
<td>*&gt;i30.30.30.30/32</td>
<td>172.16.10.1</td>
<td>0</td>
<td>100</td>
<td>0 100</td>
<td>I</td>
</tr>
<tr>
<td>*&gt; 40.40.40.40/32</td>
<td>0.0.0.0</td>
<td>0</td>
<td>32768</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>*&gt;i192.168.100.0</td>
<td>172.16.10.1</td>
<td>0</td>
<td>100</td>
<td>0 100</td>
<td>I</td>
</tr>
<tr>
<td>*&gt;i192.168.200.0</td>
<td>172.16.10.1</td>
<td>0</td>
<td>100</td>
<td>0 100</td>
<td>I</td>
</tr>
</tbody>
</table>

The above output shows the entries in BGP routing table of router R4.

In order to verify reachability between routers, use the `ping` command.

**From router R3**

R3#ping 40.40.40.40

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 40.40.40.40, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 68/101/148 ms

**From router R4**

R4#ping 30.30.30.30

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 30.30.30.30, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 56/89/112 ms

The above output shows that End to End connectivity is established between R3 and R4, where R3 is **AS 100** (16-bit AS) and router R4 is in **AS 10.1** (32-bit AS).

**Related Information**

- Cisco IOS BGP 4-Byte ASN Support
- BGP Support Page
- BGP Case Studies
- Exploring Autonomous System Numbers
- Technical Support & Documentation – Cisco Systems