BGP Implementation Using 32−bit AS Number Configuration Example

Document ID: 113593

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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 the16−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

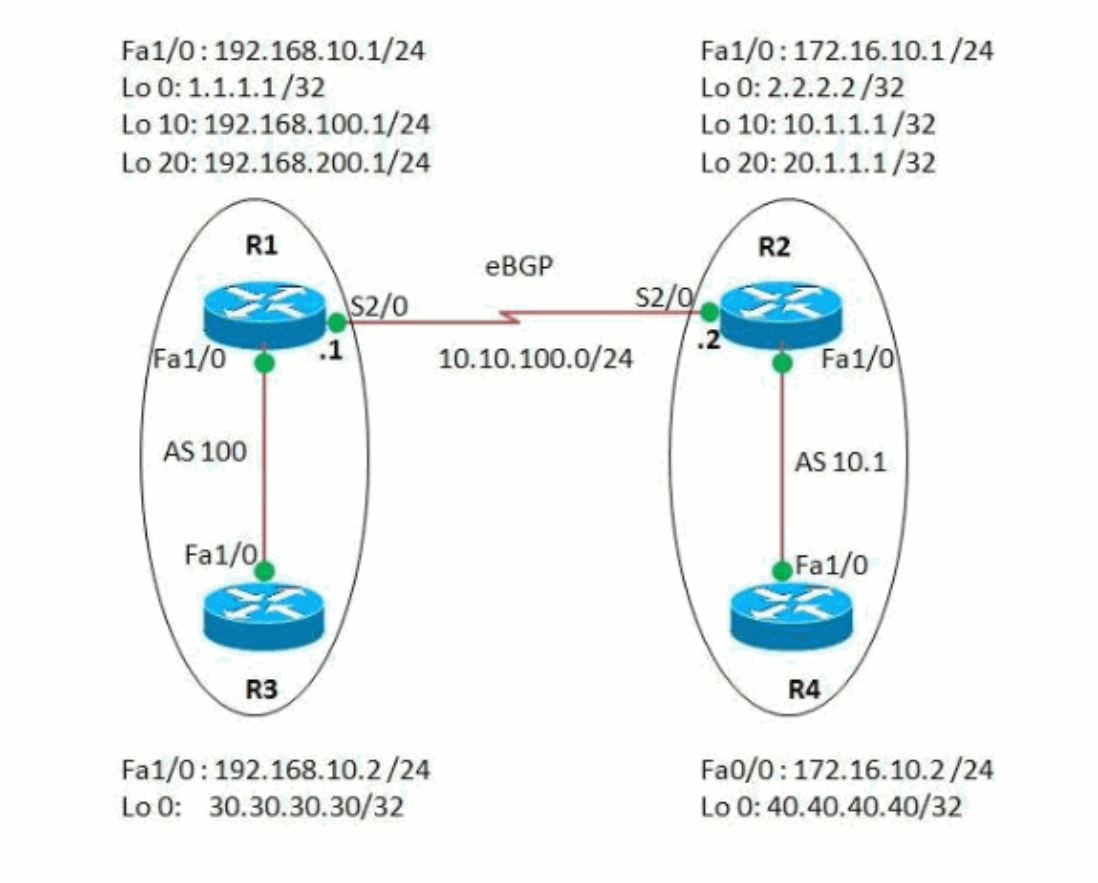
In this example, routers R1 and R3 are configured to be in AS 100 forming iBGP relationship using 16−bit AS mode. Routers R2 and R4 are configured in AS 10.1, and form iBGP peering using the 32−bit AS mode.

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:



Configurations

This document uses these configurations:

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

Router R1

```
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
 neighbor 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

                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                3          3
    Keepalives:           229        230
    Route Refresh:          0          0
    Total:                233        234


!--- Output omitted---!
```

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

show ip bgp

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

   Network          Next Hop            Metric LocPrf Weight Path
*> 10.1.1.1/32      2.2.2.2                  0             0 10.1 I
*> 20.1.1.1/32      2.2.2.2                  0             0 10.1 I
*>i30.30.30.30/32   192.168.10.2             0    100      0 I
*> 40.40.40.40/32   2.2.2.2                                0 10.1 I
*> 192.168.100.0    0.0.0.0                  0         32768 I
*> 192.168.200.0    0.0.0.0                  0         32768 I


!--- 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

   Network          Next Hop            Metric LocPrf Weight Path
*>i10.1.1.1/32      192.168.10.1             0    100      0 655361 I
*>i20.1.1.1/32      192.168.10.1             0    100      0 655361 I
*> 30.30.30.30/32   0.0.0.0                  0         32768 I
*>i40.40.40.40/32   192.168.10.1             0    100      0 655361 I
*>i192.168.100.0    192.168.10.1             0    100      0 I
*>i192.168.200.0    192.168.10.1             0    100      0 I
```

```
!--- 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

   Network          Next Hop            Metric LocPrf Weight Path
*>i10.1.1.1/32      172.16.10.1              0    100      0 I
*>i20.1.1.1/32      172.16.10.1              0    100      0 I
*>i30.30.30.30/32   172.16.10.1              0    100      0 100 I
*> 40.40.40.40/32   0.0.0.0                  0         32768 I
*>i192.168.100.0    172.16.10.1              0    100      0 100 I
*>i192.168.200.0    172.16.10.1              0    100      0 100 I


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

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

ping

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**

Updated: Jun 25, 2012 Document ID: 113593