DE-CIX Academy: BGP Introduction

Links and Examples

Where networks meet

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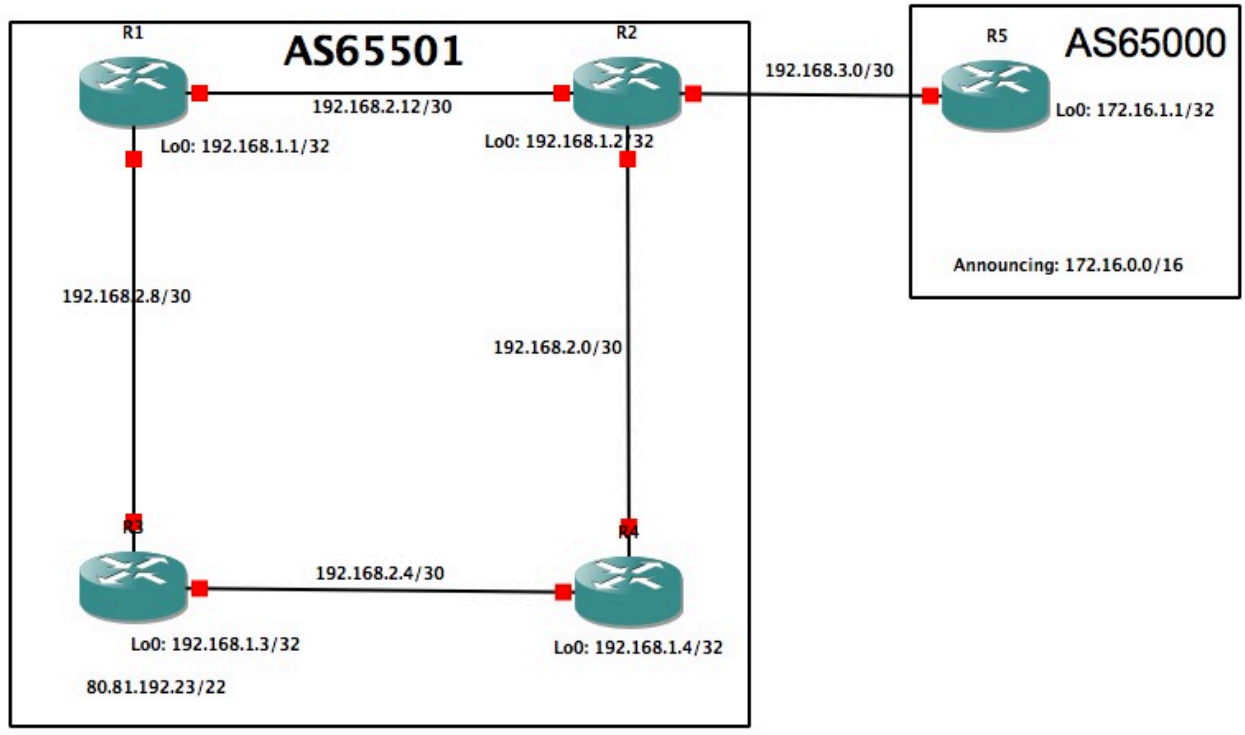
## BGP Configuration Examples

- → All examples are for Cisco IOS
- → Translation to other systems should not be too hard - ask your local network engineer

### *Network Diagram for all examples*



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## *Interface addresses*

- → A *Loopback* interface is needed (it never goes down)
- → IP addresses of all interfaces have to be redistributed by a routing protocol
- → In this example we are using OSPF for that
- → Config shown is for R2, other routers are similar

```
! Config for R2
interface Loopback0
   ip address 192.168.1.2 255.255.255.255
!
interface GigabitEthernet1/0
 ip address 192.168.2.14 255.255.255.252
!
interface GigabitEthernet2/0
 ip address 192.168.2.1 255.255.255.252
!
router ospf 65501
 redistribute connected subnets tag 2
 network 192.168.2.0 0.0.0.255 area 0
```

## *iBGP*

- → A peer group is used for common config statements
- → Best is to use an interface which cannot go "down" to tie iBGP on: Loopback0
- → Then only one line of config is needed for each iBGP peer
- → Remember: iBGP needs to be fully meshed.

```
! Config for R2
router bgp 65501
   neighbor internal peer-group
   neighbor internal remote-as 65501
   neighbor internal send-community both
   neighbor internal update-source Loopback0
   neighbor 192.168.1.1 peer-group internal
   neighbor 192.168.1.3 peer-group internal
   neighbor 192.168.1.4 peer-group internal
```

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# Adding routes to BGP

## General

- → Control what you announce !
- → Do not allow any prefixes uncontrolled into BGP!!
- → You need to have the route in your routing table
- → Easiest is a static route which will never go away - just route it to the Null0 interface
- → You can do this on one or on all iBGP routers.

```
ip route 10.2.0.0 255.255.0.0 Null0
```

## Using a "network" statement

- → This tells BGP to announce this prefix **if it is in the routing table**

```
router bgp 65501
  network 10.2.0.0 mask 255.255.0.0
```

## Using a "redistribute" statement

- → Again, route needs to be in the routing table
- → Also create an access list with all prefixes and matching netmask you want in BGP
- → Use a route-map with the access list to filter

```
ip prefix-list customer-routes seq 5 permit 10.2.0.0/16
ip prefix-list customer-routes seq 99999 deny 0.0.0.0/0
!
route-map static-to-bgp permit 10
   match ip address prefix-list customer-routes
!
router bgp 65501
   redistribute static route-map static-to-bgp
```

## eBGP

- → Use peer groups whenever possible
  - Configure common statements inside the group config
  - Add individual information like AS number with the peer
- → Use Route-Maps

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## Appendix - Router configurations

Find below initial router configurations for GNS3 network emulator

In this example, all routers are Cisco 72xx style routers with 1-3 (Gig)Ethernet interfaces. Only relevant parts of the configurations are listed.

### Router R1

```
!
hostname R1
ip bgp-community new-format
!
interface Loopback0
 ip address 192.168.1.1 255.255.255.255
!
interface GigabitEthernet1/0
 ip address 192.168.2.13 255.255.255.252
 negotiation auto
!
interface GigabitEthernet2/0
 ip address 192.168.2.9 255.255.255.252
 negotiation auto
!
router ospf 65501
 redistribute connected subnets tag 1
 network 192.168.2.0 0.0.0.255 area 0
!
router bgp 65501
 bgp log-neighbor-changes
 neighbor internal peer-group
 neighbor internal remote-as 65501
 neighbor internal send-community both
 neighbor internal update-source Loopback0
 neighbor 192.168.1.2 peer-group internal
 neighbor 192.168.1.3 peer-group internal
 neighbor 192.168.1.4 peer-group internal
!
end
```

## *Router R2 (this one will be changed)*

```
!
hostname R2
!
interface GigabitEthernet0/0
 ip address 192.168.3.1 255.255.255.252
 negotiation auto
!
interface GigabitEthernet1/0
 ip address 192.168.2.14 255.255.255.252
 negotiation auto
!
interface GigabitEthernet2/0
 ip address 192.168.2.1 255.255.255.252
 negotiation auto
!
end
```

## *Router R3*

```
!
hostname R3
!
interface Loopback0
 ip address 192.168.1.3 255.255.255.255
!
interface GigabitEthernet1/0
 ip address 192.168.2.5 255.255.255.252
 negotiation auto
!
interface GigabitEthernet2/0
 ip address 192.168.2.10 255.255.255.252
 negotiation auto
!
router ospf 65501
 redistribute connected subnets tag 3
 network 192.168.2.0 0.0.0.255 area 0
```

```
!
router bgp 65501
 bgp log-neighbor-changes
 neighbor internal peer-group
 neighbor internal remote-as 65501
 neighbor internal update-source Loopback0
 neighbor internal send-community both
 neighbor 192.168.1.1 peer-group internal
 neighbor 192.168.1.2 peer-group internal
 neighbor 192.168.1.4 peer-group internal
!
ip bgp-community new-format
!
end
```

## *Router R4*

```
!
hostname R4
!
interface Loopback0
 ip address 192.168.1.4 255.255.255.255
!
interface GigabitEthernet1/0
 ip address 192.168.2.6 255.255.255.252
 negotiation auto
!
interface GigabitEthernet2/0
 ip address 192.168.2.2 255.255.255.252
 negotiation auto
!
router ospf 65501
 redistribute connected subnets tag 4
 network 192.168.2.0 0.0.0.255 area 0
!
router bgp 65501
 bgp log-neighbor-changes
 neighbor internal peer-group
 neighbor internal remote-as 65501
 neighbor internal update-source Loopback0
 neighbor internal send-community both
```

```
 neighbor 192.168.1.1 peer-group internal
 neighbor 192.168.1.2 peer-group internal
 neighbor 192.168.1.3 peer-group internal
!
ip bgp-community new-format
!
end
```

## *Router R5 (this one will be changed)*

```
!
hostname R5
!
interface Loopback0
 ip address 172.16.1.1 255.255.255.255
!
interface GigabitEthernet0/0
 ip address 192.168.3.2 255.255.255.252
 negotiation auto
!
router bgp 65000
 no bgp enforce-first-as
 bgp log-neighbor-changes
 redistribute static route-map static-to-bgp
 neighbor upstream peer-group
 neighbor upstream send-community both
 neighbor upstream soft-reconfiguration inbound
 neighbor upstream route-map upstream-in in
 neighbor upstream route-map upstream-out out
 neighbor 192.168.3.1 remote-as 65501
 neighbor 192.168.3.1 peer-group upstream
!
ip bgp-community new-format
!
ip community-list expanded announce-to-upstream permit 65000:5(1|3|7).*
ip community-list expanded scrub-incoming permit 65000:.*
ip community-list expanded announce-to-peering permit 65000:5(2|3|7).*
!
ip route 172.16.0.0 255.255.0.0 Null0
!
!
ip prefix-list customer-routes seq 5 permit 172.16.0.0/16
```

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```
ip prefix-list customer-routes seq 99999 deny 0.0.0.0/0
!
route-map upstream-in permit 10
 set comm-list scrub-incoming delete
!
route-map upstream-out permit 10
 match community announce-to-upstream
 set extcommunity rt 6695:4200000000 4200000000:6695
!
route-map static-to-bgp permit 10
 description customer routes
 match ip address prefix-list customer-routes
 set community 65000:53001
!
end
```