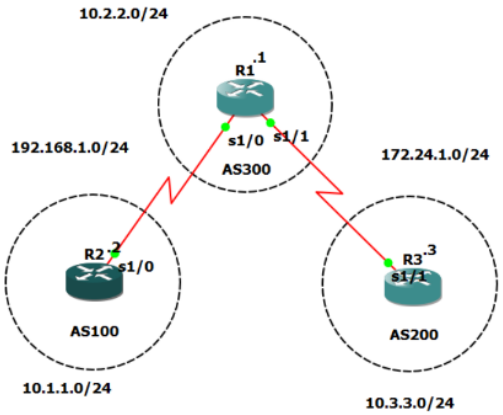
1. Aim:-Implementation of BGP using AS_path attribute.

Topology:



Steps/Commands:
Step1: Configuration

R2# conf t
int s1/0
ip add 192.168.1.2 255.255.255.0
no sh

R1# conf t
int s1/0
ip add 192.168.1.1 255.255.255.0
no sh
int s1/1
ip add 172.24.1.1 255.255.255.0
no sh

R3# conf t
int s1/1
ip add 172.24.1.3 255.255.255.0
no sh

Step2: Loopback

R2# int lo0
ip add 10.1.1.1 255.255.255.0

R1# int lo0
ip add 10.2.2.2 255.255.255.0

R3# int lo0
ip add 10.3.3.3 255.255.255.0
Step3: Configure as-bgp

R2# router bgp 100
neighbor 192.168.1.1 remote-as 300
network 10.1.1.0 mask 255.255.255.0

R1# router bgp 300
neighbor 192.168.1.2 remote-as 100
neighbor 172.24.1.3 remote-as 200
network 10.2.2.0 mask 255.255.255.0

R3# router bgp 200
neighbor 172.24.1.1 remote-as 300
network 10.3.3.0 mask 255.255.255.0

ON ALL ROUTERS:
do sh ip route

Step4: ping routers

R1#do ping 10.3.3.3 source lo0
R3#do ping 10.2.2.2 source lo0

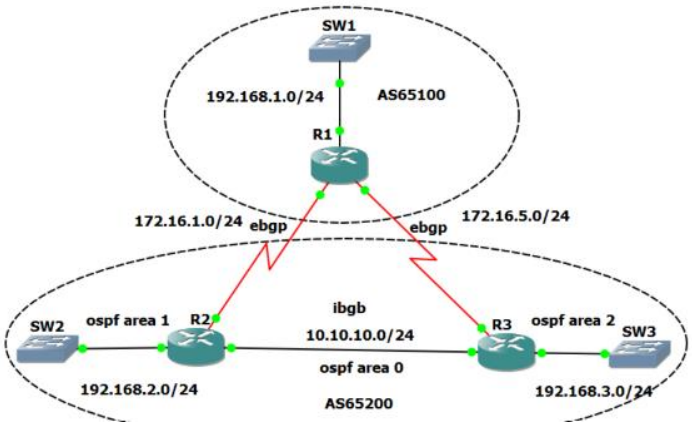
Output:

```
R3(config)#do ping 10.2.2.2 source lo0

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.2.2.2, timeout is 2 seconds:
Packet sent with a source address of 10.3.3.3
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/30/32 ms
R3(config)#
```

```
R2(config-router)#exit
R2(config)#do ping 10.3.3.3 source lo0

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.3.3.3, timeout is 2 seconds:
Packet sent with a source address of 10.1.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/59/68 ms
R2(config)#
```

2. Aim: Configuring IBGP and EBGP sessions.

Topology:



Steps/Commands:

Step 1: Drag and drop R1, R2 and R3; take 3 Ethernet switch and perform configurations on given routers.

R1# conf t
int f0/1
ip add 192.168.1.1 255.255.255.0
no sh
int s1/0
ip add 172.16.1.1 255.255.255.0
no sh
int s1/1
ip add 172.16.5.1 255.255.255.0
no sh

R2# conf t
int f0/0
ip add 10.10.10.2 255.255.255.0
no sh
int f0/1
ip add 192.168.2.2 255.255.255.0
no sh
int s1/0
ip add 172.16.1.2 255.255.255.0
no sh

R3# conf t

int f0/0
ip add 10.10.10.3 255.255.255.0
no sh
int f0/1
ip add 192.168.3.3 255.255.255.0
no sh
int s1/1
ip add 172.16.5.3 255.255.255.0
no sh

ON ALL ROUTERS:

do sh ip int br | include up

Step 2: Configure IRP(Interior Routing Protocol [using OSPF]) in autonomous system 65200(AS65200)

R2(config)
router ospf 1
network 10.10.10.0 0.0.0.255 area 0
network 192.168.2.0 0.0.0.255 area 1

R3#(config)
router ospf 1
network 10.10.10.0 0.0.0.255 area 0
network 192.168.3.0 0.0.0.255 area 2

ON BOTH ROUTERS:

R3>(config)
do ping 192.168.2.2

R2>(config)
do ping 192.168.3.3

Step 3: IBGP and EBGP configurations

R1>(config)
router bgp 65100
network 192.168.1.0
network 172.16.1.0 mask 255.255.255.0
network 172.16.5.0 mask 255.255.255.0
neighbor 172.16.1.2 remote-as 65200

neighbor 172.16.5.3 remote-as 65200

R2>(config)
router bgp 65200
network 172.16.1.0 mask 255.255.255.0
redistribute ospf 1
neighbor 172.16.1.1 remote-as 65100
neighbor 10.10.10.3 remote-as 65200

R3>(config)
router bgp 65200
network 172.16.5.0 mask 255.255.255.0
redistribute ospf 1
neighbor 172.16.5.1 remote-as 65100
neighbor 10.10.10.2 remote-as 65200

Step 4: Final output:

(ON ALL ROUTERS)
(config) do sh ip route

(DO THIS ONLY WHEN EXAMINER ASKS)
R1> (config)
do ping 192.168.2.2
do ping 192.168.3.3

Output:

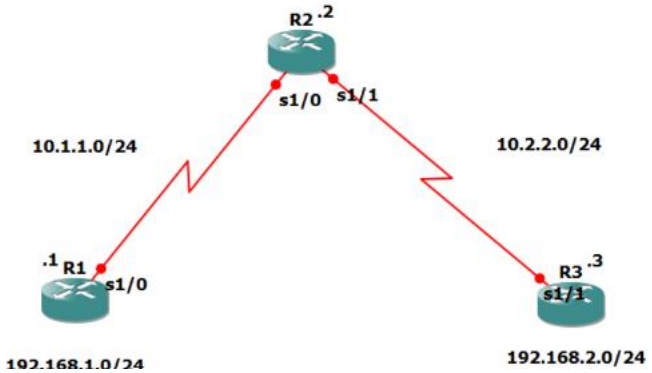
```
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#do sh ip int br | include up
FastEthernet0/0            10.10.10.2      YES NVRAM  up                    up
FastEthernet0/1            192.168.2.2     YES NVRAM  up                    up
Serial1/0                  172.16.1.2      YES NVRAM  up                    up
```

```
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#do sh ip int br | include up
FastEthernet0/1            192.168.1.1     YES NVRAM  up                    up
Serial1/0                  172.16.1.1      YES NVRAM  up                    up
Serial1/1                  172.16.5.1      YES NVRAM  up                    up
```

```
R1(config)#do sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 2 subnets
C       172.16.5.0 is directly connected, Serial1/1
C       172.16.1.0 is directly connected, Serial1/0
     10.0.0.0/24 is subnetted, 1 subnets
B       10.10.10.0 [20/0] via 172.16.5.3, 00:19:37
C    192.168.1.0/24 is directly connected, FastEthernet0/1
B    192.168.2.0/24 [20/0] via 172.16.1.2, 00:19:37
B    192.168.3.0/24 [20/0] via 172.16.5.3, 00:19:37
R1(config)#
```

3. Aim: Secure management plane.

Topology:



Steps/Commands:

Step 1: Configure routers.

R1> conf t
int s1/0
ip add 10.1.1.1 255.255.255.0

no sh
int lo1
ip add 192.168.1.1 255.255.255.0

R2> conf t
int s1/0
ip add 10.1.1.2 255.255.255.0
no sh
int s1/1
ip add 10.2.2.2 255.255.255.0
no sh

R3> conf t
int s1/1
ip add 10.2.2.3 255.255.255.0
no sh
int lo1
ip add 192.168.2.1 255.255.255.0

Step2: Configure Routing:

R1> ip route 0.0.0.0 0.0.0.0 10.1.1.2
R2> ip route 192.168.1.0 255.255.255.0 10.1.1.1
ip route 192.168.2.0 255.255.255.0 10.2.2.3
R3> ip route 0.0.0.0 0.0.0.0 10.2.2.2
R1> do ping 192.168.2.1
R3> do ping 192.168.1.1

(START ONLY WHEN 100% SUCCESS ON PING)

Step3: Secure management access
R1> (config)
hostname r1
security password min-length 10
enable secret class12345
line console 0

password ciscoconpass
exec-timeout 5 0
login
logging synchronous
exit

```
line vty 0 4
password ciscovtypass
exec-timeout 5 0
login
exit
line aux 0
no exec
end
do wr

conf t
service password-encryption
banner motd $Unauthorized access not allowed$
exit

R3> (config)
hostname r3
security password min-length 10
enable secret class12345
line console 0

password ciscoconpass
exec-timeout 5 0
login
logging synchronous
exit


line vty 0 4
password ciscovtypass
exec-timeout 5 0
login
exit
line aux 0
no exec
end
do wr

conf t
(config)
service password-encryption
banner motd $Unauthorized access not allowed$
exit
```

r2> telnet 10.1.1.1

Output:-

```
R1(config)#do ping 192.168.2.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.2.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 48/60/76 ms
R1(config)#
```

```
R3(config)#do ping 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/62/68 ms
R3(config)#
```

```
R2#telnet 10.1.1.1
Trying 10.1.1.1 ... Open
Unauthorized access not allowed

User Access Verification

Password:
*Mar  1 00:16:33.175: %SYS-5-CONFIG_I: Configured from console by console
Password:
r1>exit

[Connection to 10.1.1.1 closed by foreign host]
R2#telnet 10.2.2.3
Trying 10.2.2.3 ... Open
Unauthorized access not allowed

User Access Verification

Password:
Password:
r3>
```