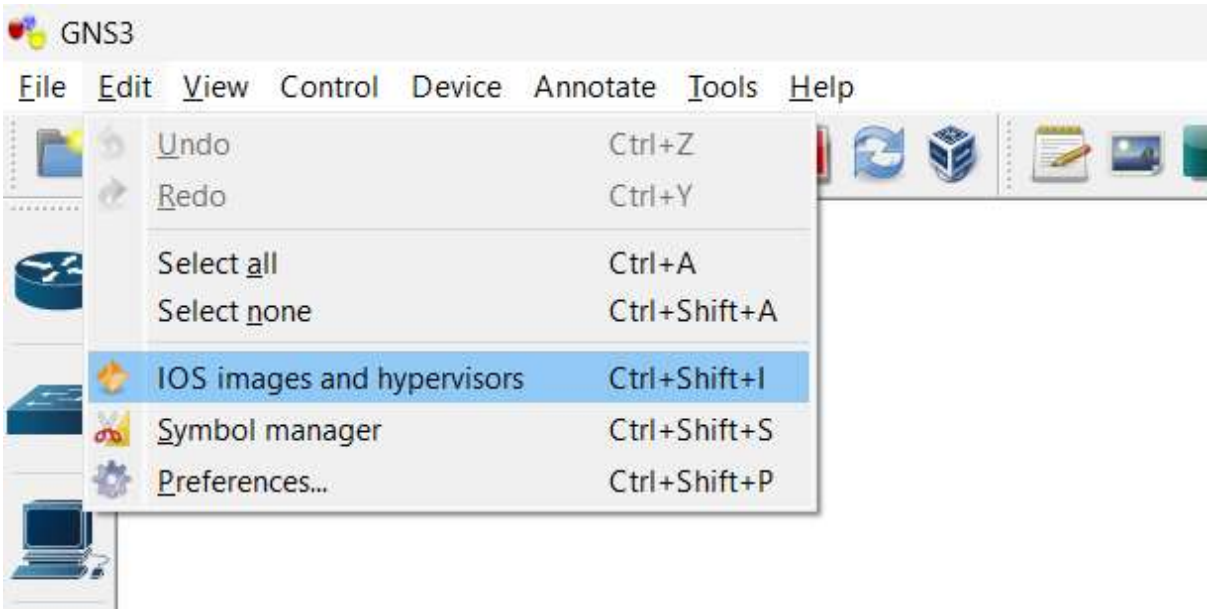
INDEX

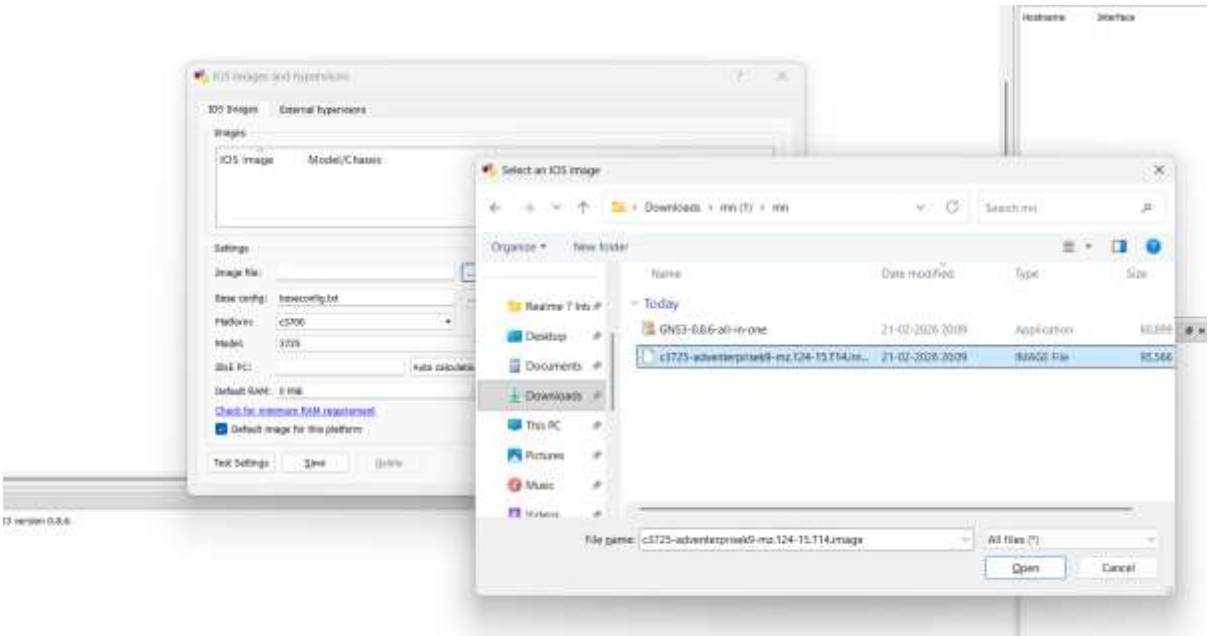
PRACTICAL 1

AIM : Configure IP SLA Tracking and Path Control

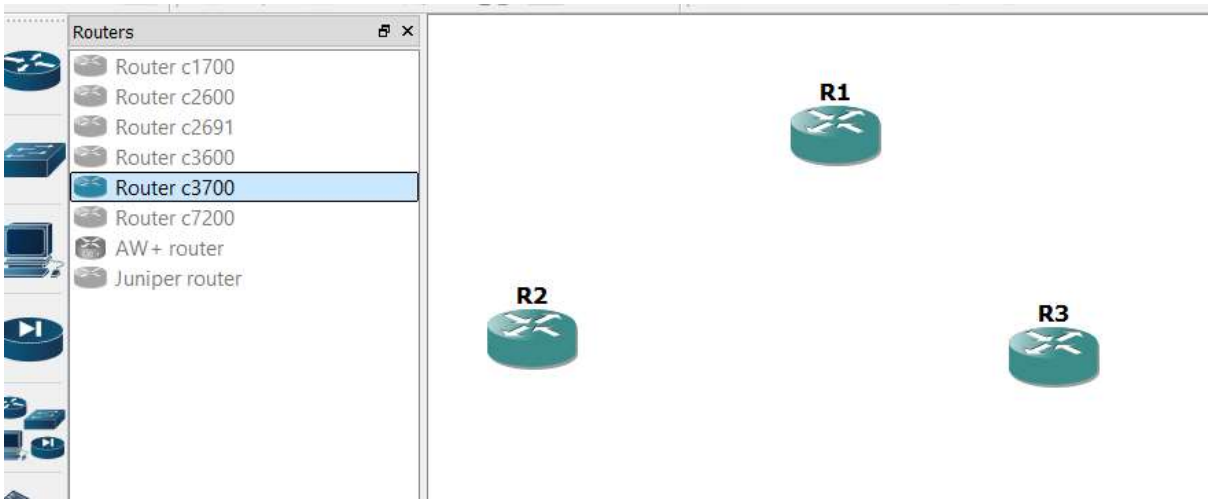
Step 1 > edit > ios image ….>



Step 2 > ios image ….> 3 dots (image file) > second file in folder >select > save > close

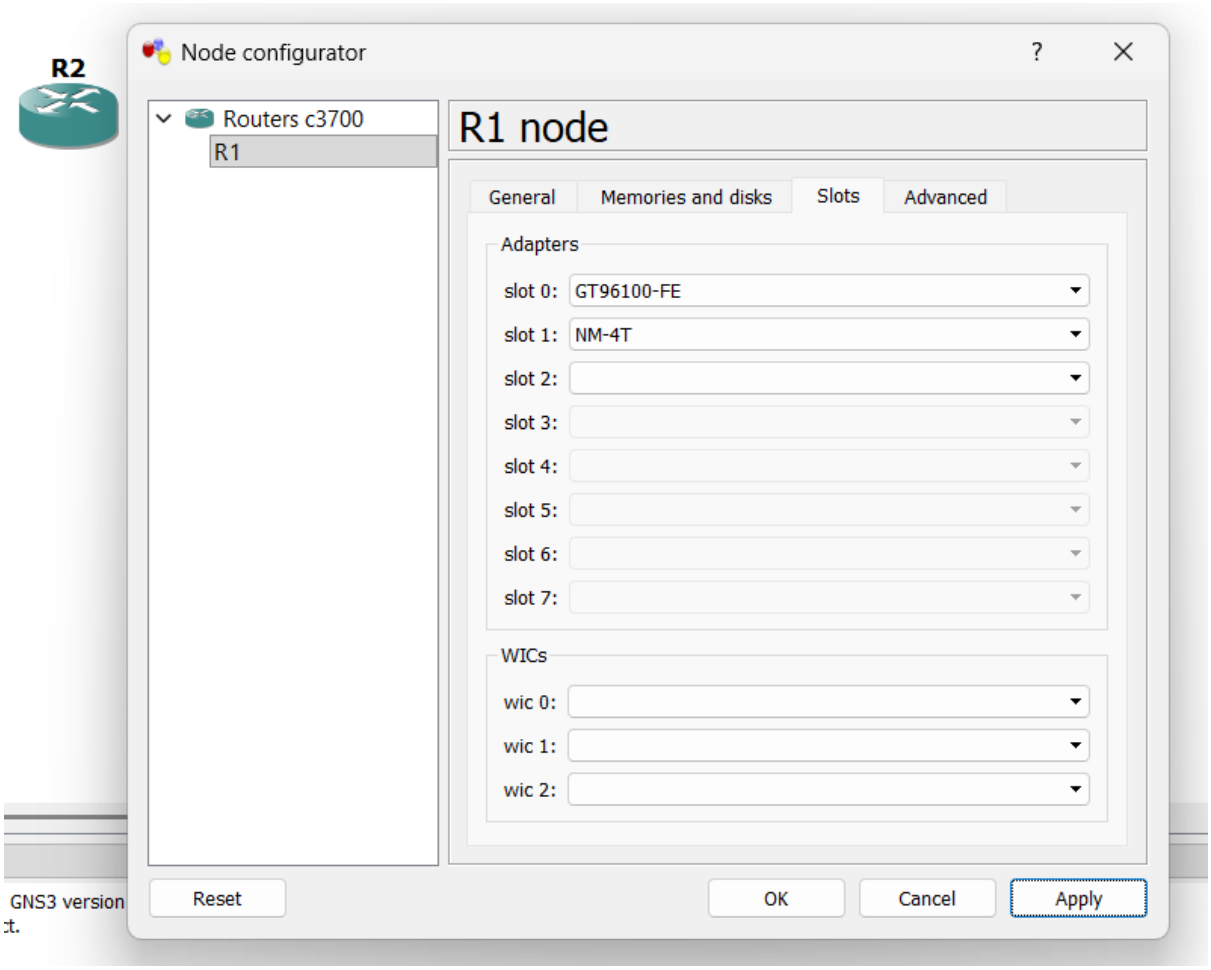


Step 3 >

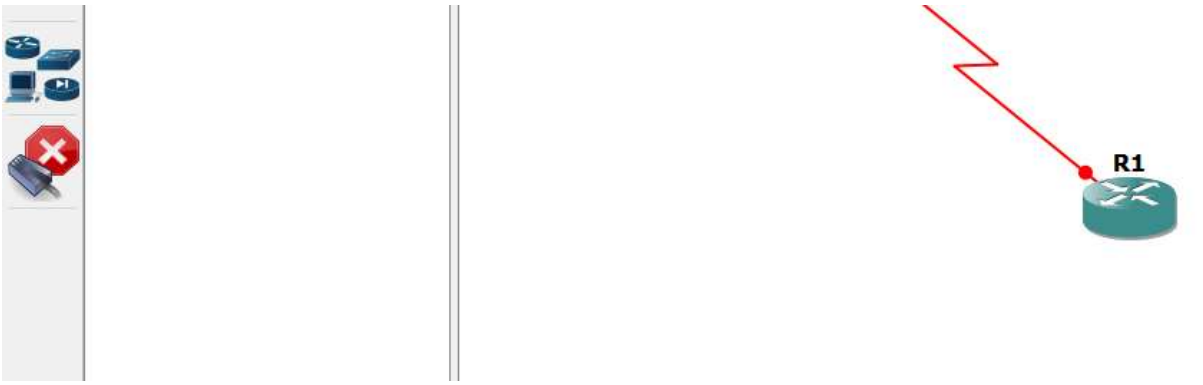


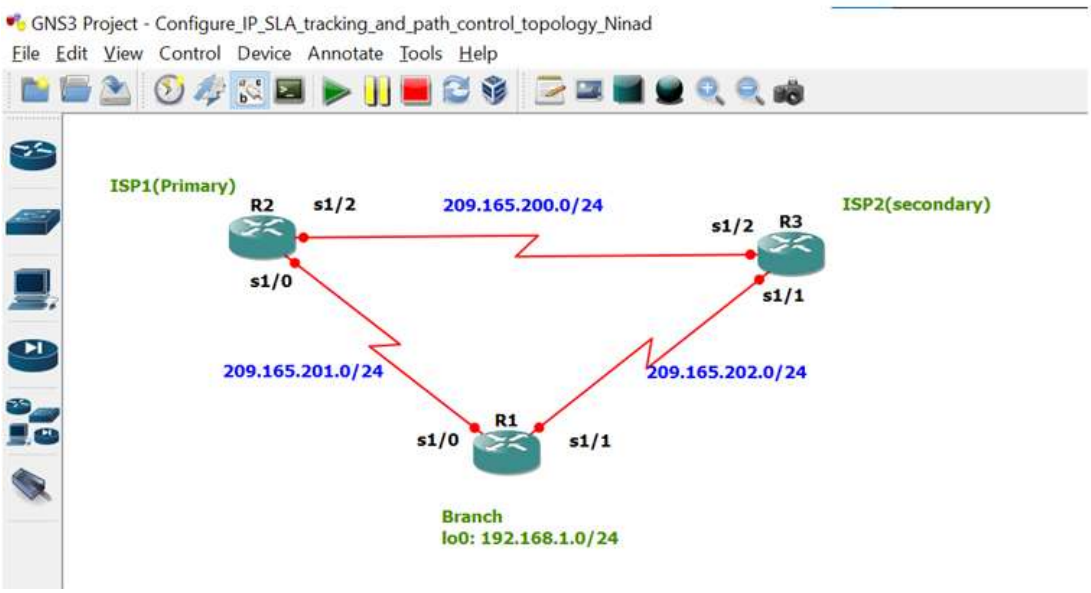
Step 4 > DOUBLE TAP R1 > R1 > slot > NM-4T >APPLY CLOSE

SAME FOR ALL ROUTER

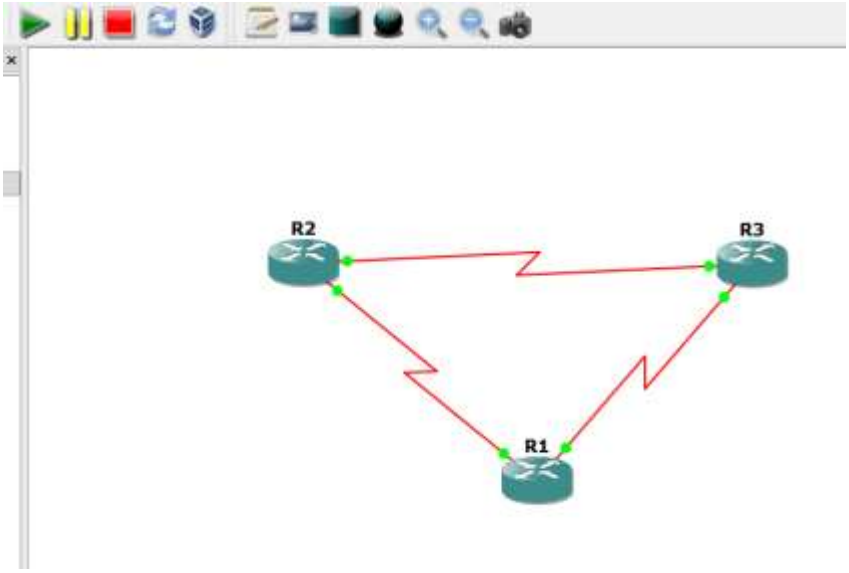


Connect router > R1 S1/0 R2 , R2 S1/2 R3 , R3 S1/1 R1



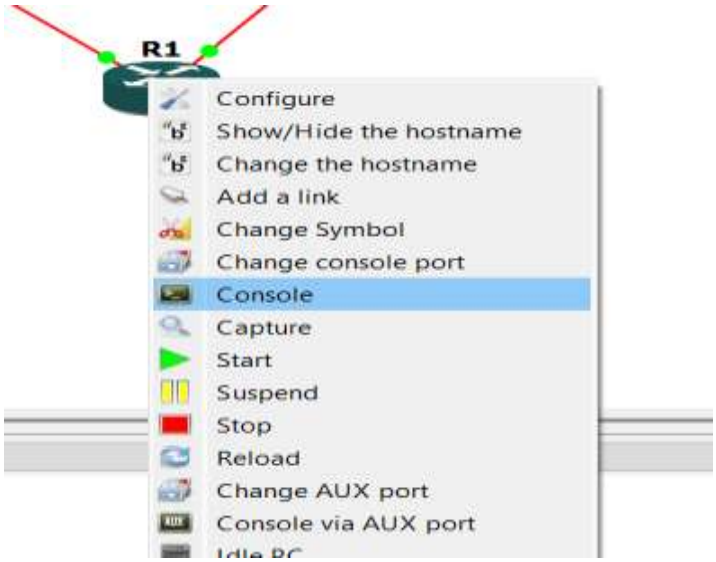


See corner > click on green button



R1 CODE :

Close wire > right click r1 > console > paste code the copy code **by right click**



conf t

int s1/0

ip add 209.165.201.1 255.255.255.0

no sh

int s1/1

ip add 209.165.202.1 255.255.255.0

no sh

int lo0

ip add 192.168.1.1 255.255.255.0

do sh ip int br | include up

router 2 CODE :

conf t

int s1/0

ip add 209.165.201.2 255.255.255.0

no sh

int s1/2

ip add 209.165.200.2 255.255.255.0

no sh

do sh ip int br | include up

router 3 CODE :

conf t

int s1/1

ip add 209.165.202.3 255.255.255.0

no sh

int s1/2

ip add 209.165.200.3 255.255.255.0

no sh

do sh ip int br | include up

Task 2: Configure static routing on branch router and dynamic routing using eigrp

On router 1 console

conf t

ip route 0.0.0.0 0.0.0.0 209.165.201.2

On router 2 console

router eigrp 1

network 209.165.200.0 0.0.0.255

network 209.165.201.0 0.0.0.255

no auto-summary

On router 3 console

router eigrp 1

network 209.165.200.0 0.0.0.255

network 209.165.202.0 0.0.0.255

no auto-summary

On router 2 console

exit

ip route 192.168.1.0 255.255.255.0 209.165.201.1

On router 3 console

exit

ip route 192.168.1.0 255.255.255.0 209.165.202.1

Ping other routers

For R1:

do ping 209.165.200.3

For R2:

do ping 209.165.201.1

Ping other routers

For R2:

do ping 192.168.1.1

For R3:

do ping 192.168.1.1

Give hostname (COPY FROM #....)

R1(config) # hostname r1-branch

R2(config) # hostname r2-isp1

R3(config) # hostname r3-isp2

Task 3: Configure IP SLA probes at branch router

On router 1 console

ip sla 11

icmp-echo 209.165.201.2

frequency 10

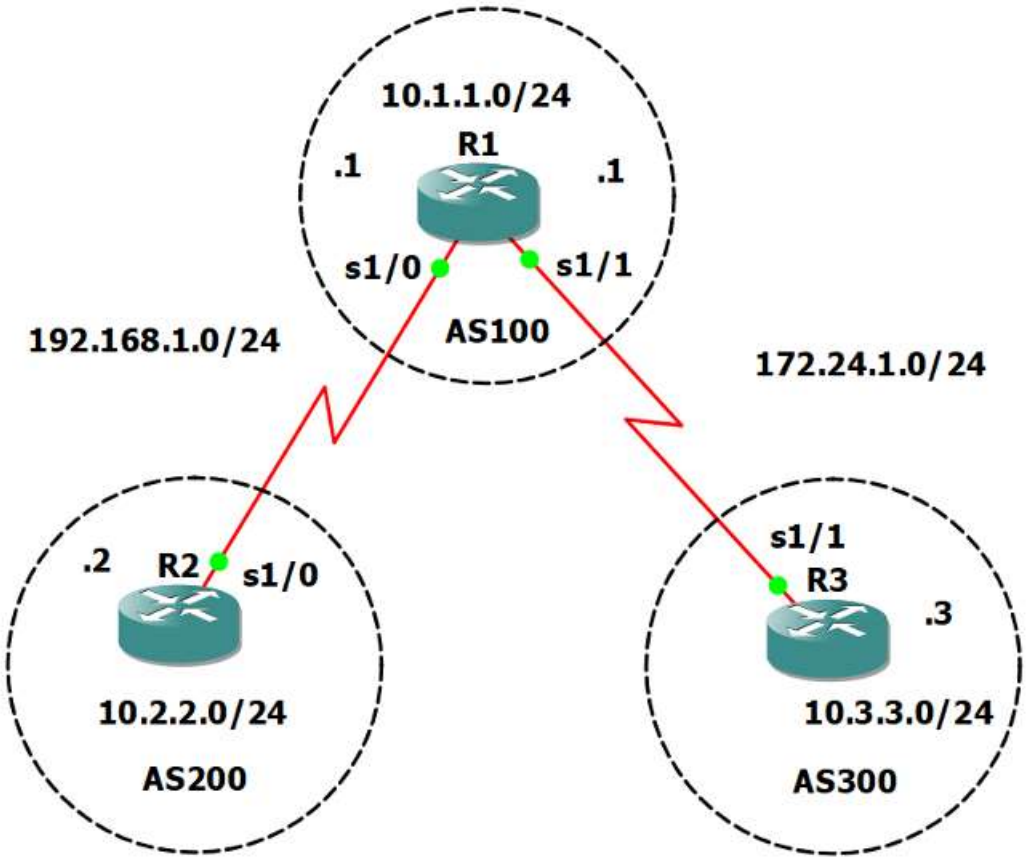
exit

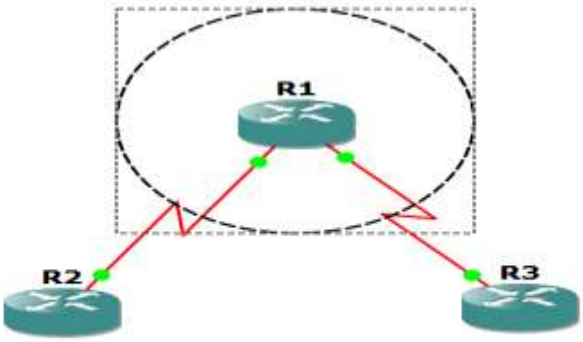
ip sla schedule 11 life forever start-time now

do sh ip sla configuration 11

PRACTICAL NO . 2

Implementation of BGP using AS_path attribute.





Take 3 routers -> Configure -> slots -> NM-4T

R1 Console

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

R2 Console

conf t

int s1/0

ip add 192.168.1.2 255.255.255.0

no sh

R3 Console

conf t

int s1/1

ip add 172.24.1.3 255.255.255.0

no sh

To add loopback address ,On Router console type following commands one by one.

R1 Console

int lo0

ip add 10.1.1.1 255.255.255.0

R2 Console

int lo0

ip add 10.2.2.2 255.255.255.0

R3 Console

int lo0

ip add 10.3.3.3 255.255.255.0

To add bgp protocol, On Router console type following commands one by one.

R1 Console

router bgp 100

neighbor 192.168.1.2 remote-as 200

neighbor 172.24.1.3 remote-as 300

network 10.1.1.0 mask 255.255.255.0

R2 Console

router bgp 200

neighbor 192.168.1.1 remote-as 100

network 10.2.2.0 mask 255.255.255.0

R3 Console

router bgp 300

neighbor 172.24.1.1 remote-as 100

network 10.3.3.0 mask 255.255.255.0

To show ip route type following command in each router console

do sh ip route

To verify output type following commands: (OUTPUT)

R2

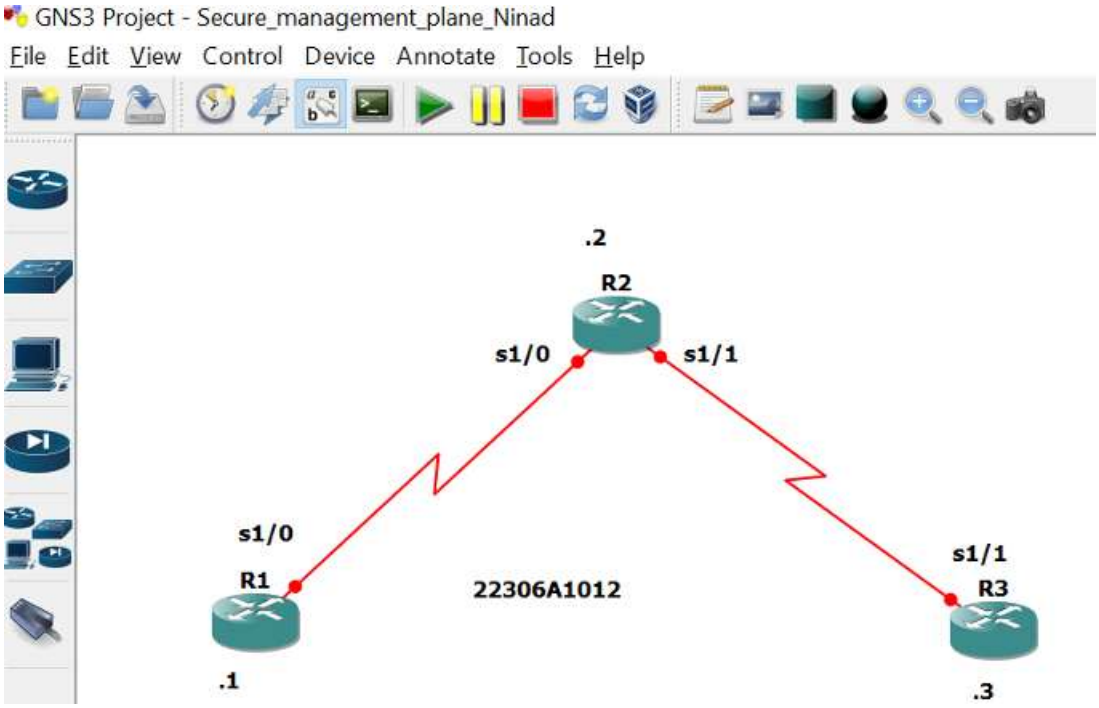
do ping 10.3.3.3 source lo0

R3

do ping 10.2.2.2 source lo0

PRACTICAL NO 4

Secure management plane.



Take 3 routers -> Configure -> slots -> NM-4T

R1 Console

conf t

int s1/0

ip add 10.1.1.1 255.255.255.0

no sh

int lo0

ip add 192.168.1.1 255.255.255.0

R2 Console

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 Console

conf t

int s1/1

ip add 10.2.2.3 255.255.255.0

no sh

int lo0

ip add 192.168.3.3 255.255.255.0

Part 2 : Routing

R1 Console

exit

ip route 0.0.0.0 0.0.0.0 10.1.1.2

R2 Console

exit

ip route 192.168.1.0 255.255.255.0 10.1.1.1

ip route 192.168.3.0 255.255.255.0 10.2.2.3

R3 Console

exit

ip route 0.0.0.0 0.0.0.0 10.2.2.2

Ping

R1 Console

do ping 192.168.3.3

R3 Console

do ping 192.168.1.1

Part 3: Security Management Access

R1 Console

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

conf t

service password-encryption

banner motd $Unauthorized access not allowed$

exit

R3 Console (Same as R1)

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

conf t

service password-encryption

banner motd $Unauthorized access not allowed$

exit

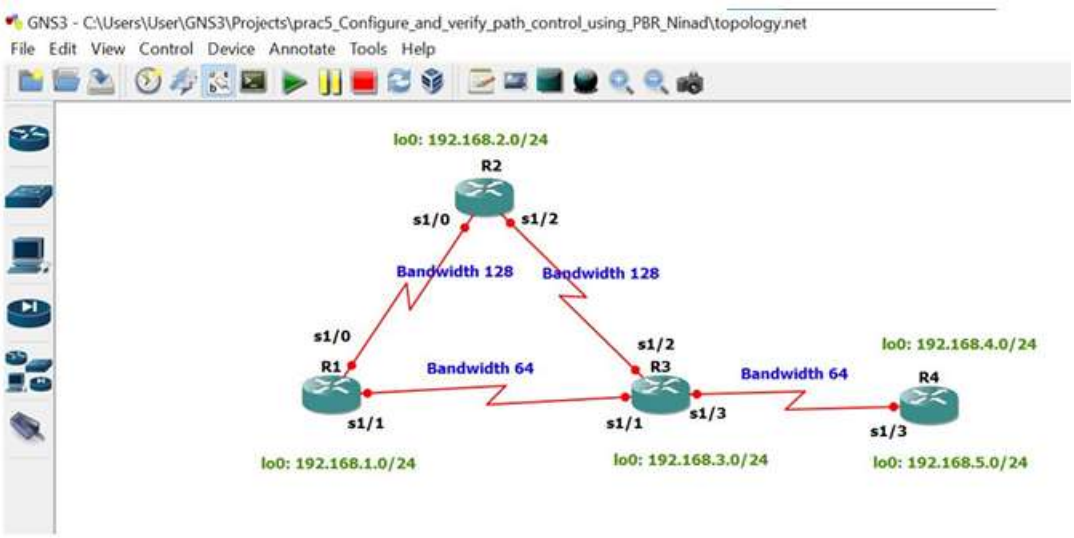
R3 Console

telnet 10.1.1.1

(password-> ciscovtypass)

PRACTICAL NO 5

Configure and Verify Path Control



Take 4 routers -> Configure -> slots -> NM-4T

STEP 1: Perform IP configuration

On router 1 console

conf t

hostname r1

int s1/0

ip add 172.16.12.1 255.255.255.0

bandwidth 128

no sh

int s1/1

ip add 172.16.13.1 255.255.255.0

bandwidth 64

no sh

int lo0

ip add 192.168.1.1 255.255.255.0

do sh ip int br | include up

On router 2 console

conf t

hostname r2

int s1/0

ip add 172.16.12.2 255.255.255.0

bandwidth 128

no sh

int s1/2

ip add 172.16.23.2 255.255.255.0

bandwidth 128

no sh

int lo0

ip add 192.168.2.2 255.255.255.0

do sh ip int br | include up

On router 3 console

conf t

hostname r3

int s1/1

ip add 172.16.13.3 255.255.255.0

bandwidth 64

no sh

int s1/2

ip add 172.16.23.3 255.255.255.0

bandwidth 128

no sh

int s1/3

ip add 172.16.34.3 255.255.255.0

bandwidth 64

no sh

int lo0

ip add 192.168.3.3 255.255.255.0

r3(config-if)#do sh ip int br | include up

On router 4 console

conf t

hostname r4

int s1/3

ip add 172.16.34.4 255.255.255.0

bandwidth 64

no sh

int lo0

ip add 192.168.4.1 255.255.255.0

int lo1

ip add 192.168.4.1 255.255.255.0

ip add 192.168.5.1 255.255.255.0

do sh ip int br | include up

STEP 2 : Configure eigrp on all routers

On router 1 console

router eigrp 1

network 172.16.12.0 0.0.0.255

network 172.16.13.0 0.0.0.255

network 192.168.1.0

no auto-summary

On router 2 console

router eigrp 1

network 172.16.12.0 0.0.0.255

network 172.16.23.0 0.0.0.255

network 192.168.2.0

no auto-summary

On router 3 console

router eigrp 1

network 172.16.13.0 0.0.0.255

network 172.16.13.0 0.0.0.255

network 172.16.23.0 0.0.0.255

network 172.16.34.0 0.0.0.255

network 192.168.3.0

no auto-summary

On router 4 console

router eigrp 1

network 172.16.34.0 0.0.0.255

network 192.168.4.0

network 192.168.5.0

no auto-summary

STEP 3: Command on all routers

do sh ip route

do ping 192.168.1.1

do ping 192.168.4.1

R4

do traceroute 192.168.1.1 source 192.168.4.1

do traceroute 192.168.1.1 source 192.168.5.1

On router 3 console

ip access-list standard pbr-acl

permit 192.168.5.0 0.0.0.255

exit

route-map r3-to-r1 permit

match ip address pbr-acl

set ip next-hop 172.16.13.1

exit

int s1/3

ip policy route-map r3-to-r1

end

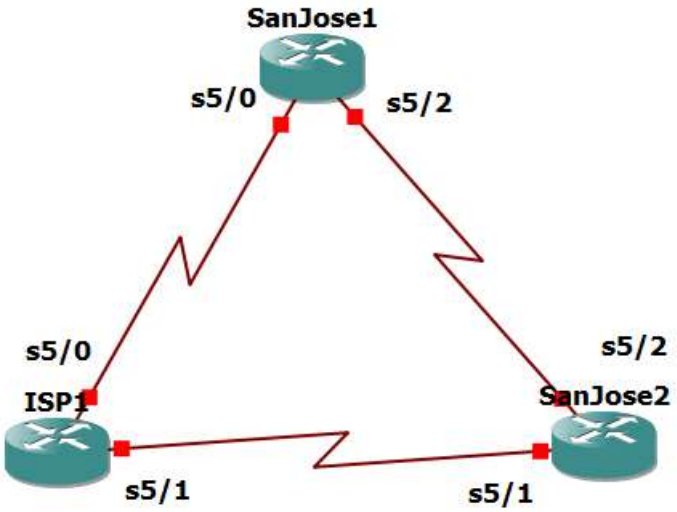
On router 4 console

do traceroute 192.168.1.1 source 192.168.4.1

do traceroute 192.168.1.1 source 192.168.5.1

Practical 3

AIM : Configuring IBGP and EBGP Sessions, Local Preference, and MED



put this step in each router

no ip domain-lookup

line con 0

logging synchronous

exec-timeout 0 0

R1

conf t

interface Loopback0

ip address 192.168.100.1 255.255.255.0

exit

interface Serial5/0

ip address 192.168.1.5 255.255.255.252

clock rate 128000

no shutdown

exit

interface Serial5/1

ip address 192.168.1.1 255.255.255.252

no shutdown

end

R2

conf t

interface Loopback0

ip address 172.16.64.1 255.255.255.0

exit

interface Serial5/0

ip address 192.168.1.6 255.255.255.252

no shutdown

exit

interface Serial5/2

ip address 172.16.1.1 255.255.255.0

clock rate 128000

no shutdown

end

R3

conf t

interface Loopback0

ip address 172.16.32.1 255.255.255.0

exit

interface Serial5/1

ip address 192.168.1.2 255.255.255.252

clock rate 128000

no shutdown

exit

interface Serial5/2

ip address 172.16.1.2 255.255.255.0

no shutdown

end

R1

router eigrp 1

network 172.16.0.0

R2

router eigrp 1

network 172.16.0.0

R2

router bgp 64512

neighbor 172.16.32.1 remote-as 64512

neighbor 172.16.32.1 update-source lo0

R2

router bgp 64512

neighbor 172.16.64.1 remote-as 64512

neighbor 172.16.64.1 remote-as 64512

R3

show ip bgp neighbors

R1

router bgp 200

neighbor 192.168.1.6 remote-as 64512

neighbor 192.168.1.2 remote-as 64512

network 192.168.100.0

R2

ip route 172.16.0.0 255.255.0.0 null0

R2

router bgp 64512

neighbor 192.168.1.5 remote-as 200

network 172.16.0.0

R2

SanJose1# show ip bgp neighbors

R3

ip route 172.16.0.0 255.255.0.0 null0

router bgp 64512

neighbor 192.168.1.1 remote-as 200

network 172.16.0.0

r3

show ip bgp summary

R1

clear ip bgp *

R1

ping 172.16.64.1

R1

ping 172.16.1.1

R1

ping 172.16.32.1

R1

ping 172.16.1.2

R1

show ip bgp

R1

show ip bgp

R1

ping 172.16.1.1 source 192.168.100.1

ping 172.16.32.1 source 192.168.100.1

ping 172.16.1.2 source 192.168.100.1

ping 172.16.64.1 source 192.168.100.1

R1

ping

Target IP address: 172.16.64.1

Extended commands [n]: y

Source address or interface: 192.168.100.1

R1

router bgp 200

network 192.168.1.0 mask 255.255.255.252

network 192.168.1.4 mask 255.255.255.252

R1

show ip bgp

R3

show ip route

R1

router bgp 200

no network 192.168.1.0 mask 255.255.255.252

no network 192.168.1.4 mask 255.255.255.252

exit

interface serial5/1

shutdown

R3

show ip bgp

show ip route

R2

router bgp 64512

neighbor 172.16.32.1 next-hop-self

R3

router bgp 64512

neighbor 172.16.64.1 next-hop-self

R2

clear ip bgp *

R3

clear ip bgp *

R3

show ip bgp

show ip route

R1

no shutdown

R3

show ip route

R2

route-map PRIMARY_T1_IN permit 10

set local-preference 150

exit

router bgp 64512

neighbor 192.168.1.5 route-map PRIMARY_T1_IN in

R3

route-map SECONDARY_T1_IN permit 10

set local-preference 125

exit

router bgp 64512

neighbor 192.168.1.1 route-map SECONDARY_T1_IN in

R2

SanJose1# clear ip bgp * soft

R3

SanJose2# clear ip bgp * soft

R2

SanJose1# show ip bgp

R3

SanJose2# show ip bgp

R1

show ip bgp

show ip route

SanJose2# ping

Target IP address: 192.168.100.1

Extended commands [n]: y

Source address or interface: 172.16.32.1

Loose, Strict, Record, Timestamp, Verbose[none]: record

R2

route-map PRIMARY_T1_MED_OUT permit 10

set Metric 50

exit

router bgp 64512

neighbor 192.168.1.5 route-map PRIMARY_T1_MED_OUT out

R3

route-map SECONDARY_T1_MED_OUT permit 10

set Metric 75

exit

router bgp 64512

neighbor 192.168.1.1 route-map SECONDARY_T1_MED_OUT out

R2

SanJose1# clear ip bgp * soft

R3

SanJose2# clear ip bgp * soft

R2

SanJose1# show ip bgp

R3

SanJose2# show ip bgp

R3

ping

Target IP address: 192.168.100.1

Extended commands [n]: y

Source address or interface: 172.16.32.1

R1

show ip bgp

router bgp 200

neighbor 192.168.1.6 default-originate

neighbor 192.168.1.2 default-originate

exit

interface loopback 10

ip address 10.0.0.1 255.255.255.0

R2

show ip route

R3

show ip route

R3

show ip bgp

traceroute 10.0.0.1

R1

interface serial 5/0

shutdown

R2

show ip route

R3

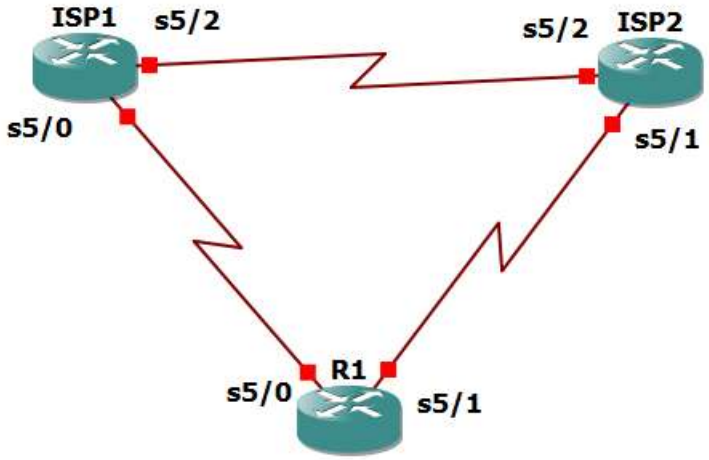
show ip route

R2

trace 10.0.0.1

Practical 6

AIM : Configure IP SLA Tracking and Path Control with gateway



Router R1

config

hostname R1

interface Loopback 0

description R1 LAN

ip address 192.168.1.1 255.255.255.0

interface Serial5/0

description R1 --> ISP1

ip address 209.165.201.2 255.255.255.252

clock rate 128000

bandwidth 128

no shutdown

interface Serial5/1

description R1 --> ISP2

ip address 209.165.202.130 255.255.255.252

bandwidth 128

```
 no shutdown

Router ISP1 (R2)
config
hostname ISP1
interface Loopback0
 description Simulated Internet Web Server
 ip address 209.165.200.254 255.255.255.255

interface Loopback1
 description ISP1 DNS Server
 ip address 209.165.201.30 255.255.255.255

interface Serial5/0
 description ISP1 --> R1
 ip address 209.165.201.1 255.255.255.252
 bandwidth 128
 no shutdown

interface Serial5/2
 description ISP1 --> ISP2
 ip address 209.165.200.225 255.255.255.252
 clock rate 128000
 bandwidth 128
 no shutdown


Router ISP2 (R3)
config
hostname ISP2
interface Loopback0
```

```
 description Simulated Internet Web Server
 ip address 209.165.200.254 255.255.255.255

interface Loopback1
 description ISP2 DNS Server
 ip address 209.165.202.158 255.255.255.255

interface Serial5/1
 description ISP2 --> R1
 ip address 209.165.202.129 255.255.255.252
 clock rate 128000
 bandwidth 128
 no shutdown

interface Serial5/2
 description ISP2 --> ISP1
 ip address 209.165.200.226 255.255.255.252
 bandwidth 128
 no shutdown


R1# show interfaces description | include up

R1(config)# ip route 0.0.0.0 0.0.0.0 209.165.201.1

ISP1(config)# router eigrp 1
network 209.165.200.224 0.0.0.3
network 209.165.201.0 0.0.0.31
no auto-summary
exit
```

```
ISP1(config)# router eigrp 1
 ip route 192.168.1.0 255.255.255.0 209.165.201.2

ISP2(config)# router eigrp 1
network 209.165.200.224 0.0.0.3
network 209.165.202.128 0.0.0.31
no auto-summary
exit

ISP2(config)# ip route 192.168.1.0 255.255.255.0 209.165.202.130

R1#tclsh
foreach address {
209.165.200.254
209.165.201.30
209.165.202.158
} {
ping $address source 192.168.1.1
}

R1
foreach address {
209.165.200.254
209.165.201.30
209.165.202.158
} {
trace $address source 192.168.1.1
}

R1(config)# ip sla 11
icmp-echo 209.165.201.30
```

```
frequency 10
exit

R1(config)# ip sla schedule 11 life forever start-time now

R1# show ip sla configuration 11

R1# show ip sla statistics

R1(config)# ip sla 22
icmp-echo 209.165.202.158
frequency 10
exit

R1(config)# ip sla schedule 22 life forever start-time now
end

R1# show ip sla configuration 22

R1# show ip sla configuration 22

R1# show ip sla statistics 22

R1(config)# no ip route 0.0.0.0 0.0.0.0 209.165.201.1
ip route 0.0.0.0 0.0.0.0 209.165.201.1 5
exit

R1# show ip route | begin Gateway

R1(config)# track 1 ip sla 11 reachability
delay down 10 up 1
```

exit

R1# debug ip routing

R1(config)# ip route 0.0.0.0 0.0.0.0 209.165.201.1 2 track 1

R1(config)# track 2 ip sla 22 reachability

delay down 10 up 1

exit

R1(config)# ip route 0.0.0.0 0.0.0.0 209.165.202.129 3 track 2

R1#show ip route | begin Gateway

ISP1

config

interface serial5/0

ISP1(config-if)# int lo1

shutdown

R1# show ip route | begin Gateway

R1# show ip sla statistics

R1# trace 209.165.200.254 source 192.168.1.1

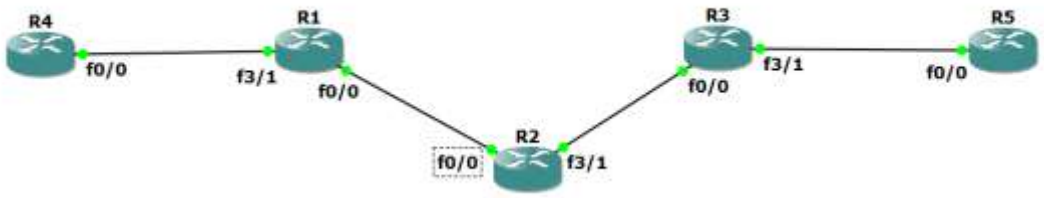
ISP1(config-if)# no shutdown

R1# show ip sla statistics

R1# show ip route | begin Gateway

Practical 7

Aim : Configuring Basic MPLS Using OSPF



R1

conf t

hostname R1

int lo0

ip add 1.1.1.1 255.255.255.255

ip ospf 1 area 0

int f0/0

ip add 10.0.0.1 255.255.255.0

no shut

ip ospf 1 area 0

R2

hostname R2

int lo0

ip add 2.2.2.2 255.255.255.255

ip ospf 1 are 0

int f0/0

ip add 10.0.0.2 255.255.255.0

no shut

ip ospf 1 area 0

int f3/1

ip add 10.0.1.2 255.255.255.0

no shut

ip ospf 1 area 0

R3

hostname R3

int lo0

ip add 3.3.3.3 255.255.255.255

ip ospf 1 are 0

int f0/0

ip add 10.0.1.3 255.255.255.0

no shut

ip ospf 1 area 0

R1

ping 3.3.3.3 source lo0

R1

conf t

router ospf 1

mpls ldp autoconfig

R2

conf t

router ospf 1

mpls ldp autoconfig

R3

conf t

router ospf 1

mpls ldp autoconfig

R2#

sh mpls interface

R2#

sh mpls ldp neigh

R1#

trace 3.3.3.3

R1#

conf t

router bgp 1

neighbor 3.3.3.3 remote-as 1

neighbor 3.3.3.3 update-source Loopback0

no auto-summary

!

address-family vpnv4

neighbor 3.3.3.3 activate

R3#

conf t

router bgp 1

neighbor 1.1.1.1 remote-as 1

neighbor 1.1.1.1 update-source Loopback0

no auto-summary

!

address-family vpnv4

neighbor 1.1.1.1 activate

R1#

sh bgp vpnv4 unicast all summary

R4

int lo0

ip add 4.4.4.4 255.255.255.255

ip ospf 2 area 2

int f0/0

ip add 192.168.1.4 255.255.255.0

ip ospf 2 area 2

no shut

R1

conf t

int f3/1

no shut

ip add 192.168.1.1 255.255.255.0

R1

conf t

ip vrf RED

rd 4:4

route-target both 4:4

R1

conf t

int f3/1

ip vrf forwarding RED

R1

ip vrf fo

R1

ip vrf forwarding RED

R1

conf t

int f3/1

ip address 192.168.1.1 255.255.255.0

R1#

sh run int f3/1

R1#

sh ip route

R1#

sh ip route vrf red

R1#

sh ip route vrf RED

R1

conf t

int f3/1

ip ospf 2 area 2

R1#

sh ip route vrf RED

R5

conf t

int lo0

ip add 6.6.6.6 255.255.255.255

ip ospf 2 area 2

int f0/0

ip add 192.168.2.6 255.255.255.0

ip ospf 2 area 2

no shut

R3

conf t

int f3/1

no shut

ip add 192.168.2.3 255.255.255.0

R3

conf t

ip vrf RED

rd 4:4

route-target both 4:4

R3

conf t

int f3/1

ip vrf forwarding RED

R3

ip vrf forwarding RED

R3

conf t

int f3/1

ip address 192.168.2.1 255.255.255.0

R3#

sh run int f3/1

R3

conf t

int f3/1

ip ospf 2 area 2

R3#

sh ip route vrf RED

R4#

sh ip route

R1#

sh ip route

R1#

sh ip route vrf RED

R1

conf t

router bgp 1

address-family ipv4 vrf RED

redistribute ospf 2

R3

conf t

router bgp 1

address-family ipv4 vrf RED

redistribute ospf 2

R1#

sh ip bgp vpnv4 vrf RED

R3#

sh ip bgp vpnv4 vrf RED

R1

conf t

router ospf 2

redistribute bgp 1 subnets

R3

conf t

router ospf 2

redistribute bgp 1 subnets

R4#

sh ip route

R5#

sh ip route

R4#

ping 6.6.6.6

R4#

trace 6.6.6.6