

1. Configure IPv4 and IPv6, interface addresses and OSPF

#Router R_A

enable

configure terminal

hostname R_A

ipv6 unicast-routing

interface loopback 0

ip address 10.3.12.21 255.255.255.255

ipv6 address fd00:10:3:12::21/128

ipv6 ospf 1 area 0

no shutdown

interface gigabitEthernet 0/0

ip address 10.3.8.1 255.255.252.0

ipv6 address fd00:10:3:8::1/64

ipv6 ospf 1 area 0

no shutdown

interface gigabitEthernet 0/1

ip address 10.3.12.1 255.255.255.252

ipv6 address fd00:10:3:1::1/64

ipv6 ospf 1 area 0

no shutdown

interface fastEthernet 1/0

ip address 10.3.12.13 255.255.255.252

ipv6 address fd00:10:3:3::1/64

ipv6 ospf 1 area 0

no shutdown

interface fastEthernet 1/1

ip address 10.0.16.6 255.255.255.252

no shutdown

router ospf 1

router-id 10.3.12.21

auto-cost reference-bandwidth 1000

network 10.3.12.21 0.0.0.0 area 0

```
network 10.3.8.0 0.0.3.255 area 0
network 10.3.12.0 0.0.0.3 area 0
network 10.3.12.12 0.0.0.3 area 0
```

```
ipv6 router ospf 1
router-id 10.3.12.21
```

```
exit
```

```
exit
```

#Router R_B

```
enable
configure terminal
```

```
hostname R_B
```

```
ipv6 unicast-routing
```

```
interface loopback 0
ip address 10.3.12.22 255.255.255.255
ipv6 address fd00:10:3:12::22/128
ipv6 ospf 1 area 0
no shutdown
```

```
interface gigabitEthernet 0/0
ip address 10.3.8.2 255.255.252.0
ipv6 address fd00:10:3:8::2/64
ipv6 ospf 1 area 0
no shutdown
```

```
interface gigabitEthernet 0/1
ip address 10.3.12.5 255.255.255.252
ipv6 address fd00:10:3:2::1/64
ipv6 ospf 1 area 0
no shutdown
```

```
interface fastEthernet 1/0
ip address 10.3.12.9 255.255.255.252
no shutdown
```

```
router ospf 1
router-id 10.3.12.22
auto-cost reference-bandwidth 1000
network 10.3.12.22 0.0.0.0 area 0
network 10.3.8.0 0.0.3.255 area 0
network 10.3.12.4 0.0.0.3 area 0
```

```
ipv6 router ospf 1
router-id 10.3.12.22
```

```
exit
```

```
exit
```

#Router R_C

```
enable
configure terminal
```

```
hostname R_C
```

```
ipv6 unicast-routing
```

```
interface loopback 0
ip address 10.3.12.23 255.255.255.255
ipv6 address fd00:10:3:12::23/128
ipv6 ospf 1 area 0
no shutdown
```

```
interface gigabitEthernet 0/0
ip address 10.3.0.1 255.255.248.0
ipv6 address fd00:10:3::1/64
ipv6 ospf 1 area 0
no shutdown
```

```
interface gigabitEthernet 0/1
ip address 10.3.12.2 255.255.255.252
ipv6 address fd00:10:3:1::2/64
ipv6 ospf 1 area 0
no shutdown
```

```
router ospf 1
router-id 10.3.12.23
```

```
auto-cost reference-bandwidth 1000
network 10.3.12.23 0.0.0.0 area 0
network 10.3.0.0 0.0.7.255 area 0
network 10.3.12.0 0.0.0.3 area 0
```

```
ipv6 router ospf 1
router-id 10.3.12.23
```

```
exit
```

```
exit
```

#Router R_D

```
enable
configure terminal
```

```
hostname R_D
```

```
ipv6 unicast-routing
```

```
interface loopback 0
ip address 10.3.12.24 255.255.255.255
ipv6 address fd00:10:3:12::24/128
ipv6 ospf 1 area 0
no shutdown
```

```
interface gigabitEthernet 0/0
ip address 10.3.0.2 255.255.248.0
ipv6 address fd00:10:3::2/64
ipv6 ospf 1 area 0
no shutdown
```

```
interface gigabitEthernet 0/1
ip address 10.3.12.6 255.255.255.252
ipv6 address fd00:10:3:2::2/64
ipv6 ospf 1 area 0
no shutdown
```

```
interface fastEthernet 1/0
ip address 10.3.12.14 255.255.255.252
ipv6 address fd00:10:3:3::2/64
ipv6 ospf 1 area 0
```

no shutdown

```
router ospf 1
router-id 10.3.12.24
auto-cost reference-bandwidth 1000
network 10.3.12.24 0.0.0.0 area 0
network 10.3.0.0 0.0.7.255 area 0
network 10.3.12.4 0.0.0.3 area 0
network 10.3.12.12 0.0.0.3 area 0
```

```
ipv6 router ospf 1
router-id 10.3.12.24
```

exit

exit

For all routers, manually

```
ping 10.3.12.1
ping 10.3.12.2
ping 10.3.12.5
ping 10.3.12.6
ping 10.3.12.13
ping 10.3.12.14
ping 10.3.0.1
ping 10.3.0.2
ping 10.3.8.1
ping 10.3.8.2
ping 10.3.12.21
ping 10.3.12.22
ping 10.3.12.23
ping 10.3.12.24
ping 10.3.8.10 // dhcp / dns / webserver
ping 10.3.8.11 // voip server
ping 10.3.0.10 // dhcp relay
```

```
ping ipv6 fd00:10:3:0::1
ping ipv6 fd00:10:3:0::2
ping ipv6 fd00:10:3:1::1
ping ipv6 fd00:10:3:1::2
ping ipv6 fd00:10:3:2::1
```

```
ping ipv6 fd00:10:3:2::2
ping ipv6 fd00:10:3:3::1
ping ipv6 fd00:10:3:3::2
ping ipv6 fd00:10:3:8::1
ping ipv6 fd00:10:3:8::2
ping ipv6 fd00:10:3:8::10 // dhcp / dns / webserver
ping ipv6 fd00:10:3:8::11 // voip server
ping ipv6 fd00:10:3:0::10 // dhcp relay
```

2. Configure HSRP

#Router R_A

```
enable
configure terminal

track 10 interface gigabitEthernet 0/1 line-protocol

interface gigabitEthernet 0/0
standby 1 ip 10.3.8.3
standby 1 preempt
standby 1 priority 110
standby 1 track 10 decrement 20

standby version 2
standby 2 ipv6 fe80::1
standby 2 preempt
standby 2 priority 110
standby 2 track 10 decrement 20

exit

exit
```

#Router R_B

```
enable
configure terminal

interface gigabitEthernet 0/0
standby 1 ip 10.3.8.3
standby 1 preempt
```

```
standby version 2
standby 2 ipv6 fe80::1
standby 2 preempt
```

```
exit
```

```
exit
```

#Router R_C

```
enable
configure terminal
```

```
track 10 interface gigabitEthernet 0/1 line-protocol
```

```
interface gigabitEthernet 0/0
standby 1 ip 10.3.0.3
standby 1 preempt
standby 1 priority 110
standby 1 track 10 decrement 20
```

```
standby version 2
standby 2 ipv6 fe80::1
standby 2 preempt
standby 2 priority 110
standby 2 track 10 decrement 20
```

```
exit
```

```
exit
```

#Router R_D

```
enable
configure terminal
```

```
interface gigabitEthernet 0/0
standby 1 ip 10.3.0.3
standby 1 preempt
```

```
standby version 2
standby 2 ipv6 fe80::1
```

standby 2 preempt

exit

exit

for all routers, ping the VIPs

ping 10.3.0.3

ping 10.3.8.3

3. Configure PIM-SM

#Router R_A

enable

configure terminal

ip multicast-routing

interface loopback 0

ip pim sparse-mode

interface gigabitEthernet 0/0

ip pim sparse-mode

interface gigabitEthernet 0/1

ip pim sparse-mode

interface fastEthernet 1/0

ip pim sparse-mode

ip pim rp-address 10.3.12.21

exit

exit

#Router R_B

enable

configure terminal


```
ip multicast-routing
```

```
interface loopback 0
```

```
ip pim sparse-mode
```

```
interface gigabitEthernet 0/0
```

```
ip pim sparse-mode
```

```
interface gigabitEthernet 0/1
```

```
ip pim sparse-mode
```

```
ip pim rp-address 10.3.12.21
```

```
exit
```

```
exit
```

#Router R_C

```
enable
```

```
configure terminal
```

```
ip multicast-routing
```

```
interface loopback 0
```

```
ip pim sparse-mode
```

```
interface gigabitEthernet 0/0
```

```
ip pim sparse-mode
```

```
interface gigabitEthernet 0/1
```

```
ip pim sparse-mode
```

```
ip pim rp-address 10.3.12.21
```

```
exit
```

```
exit
```

#Router R_D

```
enable
```

```
configure terminal
```

```
ip multicast-routing
```

```
interface loopback 0  
ip pim sparse-mode
```

```
interface gigabitEthernet 0/0  
ip pim sparse-mode
```

```
interface gigabitEthernet 0/1  
ip pim sparse-mode
```

```
interface fastEthernet 1/0  
ip pim sparse-mode
```

```
ip pim rp-address 10.3.12.21
```

```
exit
```

```
exit
```

test the multicast

sender, server side VM

```
mcast -i eth1 -d 0 239.0.x.4:8989 where x is the table nr
```

listen, client side VM

```
mrcv -i eth1 239.0.x.4:8989
```

on the router

```
show ip mroute
```

4. Configure BGP

#Router R_A

```
enable  
configure terminal
```

```
interface fastEthernet 1/1  
duplex auto  
speed auto
```

```
router ospf 1
```

```
redistribute bgp 12 metric 50 subnets route-map BGP-To_OSPF
```

```
route-map BGP-To_OSPF permit 10  
  match source-protocol bgp 12
```

```
router bgp 12  
network 10.3.0.0 mask 255.255.240.0  
neighbor 10.3.12.22 remote-as 12  
neighbor 10.3.12.22 update-source loopback 0  
neighbor 10.3.12.22 next-hop-self  
neighbor 10.0.16.5 remote-as 1
```

```
aggregate-address 10.3.0.0 255.255.240.0 summary-only
```

```
redistribute ospf 1
```

```
bgp redistribute-internal
```

```
exit
```

```
exit
```

#Router R_B

```
enable  
configure terminal
```

```
interface fastEthernet 1/0  
duplex auto  
speed auto
```

```
router ospf 1  
redistribute bgp 12 metric 100 subnets route-map BGP-To_OSPF
```

```
route-map BGP-To_OSPF permit 10  
  match source-protocol bgp 12
```

```
route-map change_local_preference permit 10  
  match source-protocol bgp 11  
  set local-preference 90
```

```
route-map increase_as_path permit 10
```

```
set as-path prepend 12 12
```

```
router bgp 12
```

```
neighbor 10.3.12.21 remote-as 12
```

```
neighbor 10.3.12.21 update-source loopback 0
```

```
neighbor 10.3.12.21 next-hop-self
```

```
neighbor 10.3.12.10 remote-as 11
```

```
neighbor 10.3.12.10 route-map increase_as_path out
```

```
neighbor 10.3.12.10 route-map change_local_preference in
```

```
aggregate-address 10.3.0.0 255.255.240.0 summary-only
```

```
redistribute ospf 1
```

```
bgp redistribute-internal
```

```
exit
```

```
exit
```

#Router R_A R_B Access List block external access to VoIP:80 (Sanity Check!)

```
enable
```

```
configure terminal
```

```
interface gigabitEthernet 0/0
```

```
access-list 100 deny tcp any host 10.3.8.11 eq 80
```

```
access-list 100 permit ip any any
```

```
ipv6 access-list 101
```

```
deny tcp any host fd00:10:3:8::11 eq 80
```

```
permit any any
```

```
exit
```

```
exit
```