Advanced Routing Workshop

Basic Routing Lab

Contents

1 Routing

1.1 OSPF

1. Create Loopback interface

On R11:

```
interface loopback 0
 ip address 10.10.255.1 255.255.255.255
 ipv6 address fd00:10:ff::1/128
```

do the same for R12 (obviously, using different addresses).

2. Verify and save the configuration.

```
show running-config
write memory
```

3. Try pinging the loopback addresses of your neighbor

```
R11# ping 10.10.255.2           <- R12 loopback
R11# ping fd00:10:ff::2         <- R12 loopback
```

Q. What is happening?

4. Configure a new OSPF routing process.

Notice that we will use the number "42" as the OSPF process number for routers R11 and R12.

This number is local to the router, so it doesn't need to match the process number of a neighboring router. However, it is recommended that you use the same number throughout your network. Most people use their Autonomous System number (although OSPF has nothing to do with the BGP ASN). We just picked 42 here because it's a number we like.

On R11 and R12:

```
router ospf 42
 log-adjacency-changes
 area 0 authentication message-digest
 passive-interface default
!
```

```
ipv6 router ospf 42
 log-adjacency-changes
 passive-interface default
 area 0 authentication ipsec spi 256 md5 0123456789ABCDEF0123456789ABCDEF
```

Note: do notice in the configuration above, how authentication in OSPFv2 (IPv4) and OSPFv3 (IPv6) differs: in IPv6, authentication is enabled, and the md5 digest is specified with a single command. In IPv4, we enable authentication ("area 0 authentication message-digest"), but we still need to specify the key per interface, which we do in the next step.

5. Now configure OSPF on the interfaces where adjacencies need to be established:

On R11 and R12:

```
interface GigabitEthernet2/0
 ip ospf 42 area 0
 ip ospf message-digest-key 1 md5 N$RC

 ip ospf network point-to-point
 ipv6 ospf 42 area 0
 ipv6 ospf network point-to-point
```

Notice two things:

a) We are configuring authentication to have control over who becomes an adjacent router and protect against ilegitimate routing information. We configure authentication per interface in IPv4 and per area in IPv6, just because it is simpler that way.

b) We use the "network point-to-point" statement because we are using point-to-point links over a broadcast network. There is no reason for OSPF to elect a Designated Router (DR) and Backup Designated Router (BDR).

Then, since we have configured OSPF to make all interfaces passive by default (recommended!), we need to explicitly activate the *OSPF Hello* function on the interfaces where routing information needs to be exchanged:

R11 and R12:

```
router ospf 42
 no passive-interface GigabitEthernet2/0
!
ipv6 router ospf 42
 no passive-interface GigabitEthernet2/0
```

Now configure OSPF on any interface that needs to have its subnets advertised by OSPF, if OSPF has not been enabled already:

On R11 and R12:

```
interface Loopback0
 ip ospf 42 area 0
 ipv6 ospf 42 area 0
```

6. STOP. Checkpoint

Now try the following show commands:

```
sh ip ospf neighbor     : show adjacencies
sh ip route             : show routes in routing table
sh ip ospf              : show general OSPF information
sh ip ospf interface    : show the status of OSPF in an interface

show ipv6 ospf neighbor
show ipv6 route
show ipv6 ospf
show ipv6 ospf interface
```

Repeat the last ping tests.

Q. Can you ping the loopback address of the neighboring router now?

1.2 Static default routes

1. Configure static default routes to reach the outside world.

On R12:

```
ip route 0.0.0.0 0.0.0.0 10.201.254.1
ipv6 route ::/0 fd00:201:fe::
```

Also on R12, we are going to include the default route in OSPF, so that R11 will learn it from us:

```
router ospf 42
 default-information originate
```

Do some ping and traceroute tests.

```
R11# ping 10.20.255.1
R11# ping 10.30.255.1
R11# traceroute 10.20.255.1
R11# traceroute 10.30.255.1
```

Q. Can you reach the routers in other networks?

Now, you need to go back and *remove* all the static routes you've added in the previous lab.

Test connectivity again - does it still work ?

Don't forget to save your configurations!

2 Appendix A - ISP1 Sample Configuration

```
hostname ISP1
aaa new-model
aaa authentication login default local
aaa authentication enable default enable
username nsrc secret nsrc
enable secret nsrc
service password-encryption
line vty 0 4
 transport preferred none
line console 0
 transport preferred none
no logging console
logging buffered 8192 debugging
no ip domain-lookup
ip subnet-zero
ip classless
no ip source-route
ipv6 unicast-routing
!
interface Loopback0
 ip address 10.201.255.1 255.255.255.255
 ipv6 address fd00:201:ff::1/128
!
interface GigabitEthernet1/0
 description Link to IXP
 ip address 10.251.1.1 255.255.255.0
 no ip directed-broadcast
 no ip redirects
 no ip proxy-arp
 ipv6 address fd00:251:1::1/64
 ipv6 nd ra suppress
 no shutdown
!
! Link to group 1 on ISP1 (repeat for groups 2 and 3)
interface GigabitEthernet3/0
 description P2P Link to R12
 ip address 10.201.254.1 255.255.255.252
 no ip directed-broadcast
 no ip redirects
 no ip proxy-arp
 ipv6 address fd00:201:fe::/127
 ipv6 nd ra suppress
 no shutdown
```

```
!
! Routes to group 1 on ISP1 (repeat for groups 2 and 3)
ip route 10.10.0.0 255.255.0.0 10.201.254.2
ipv6 route fd00:10::/32 fd00:201:fe::1
!
! Routes to group 4 on ISP2 (repeat for groups 5 and 6)
ip route 10.40.0.0 255.255.0.0 10.251.1.2
ipv6 route fd00:40::/32 fd00:251:1::2
!
! Route to ISP2 address space
ip route 10.202.0.0 255.255.0.0 10.251.1.2
ipv6 route fd00:202::/32 fd00:251:1::2
!
! Pullup routes for unused address space in ISP1
ip route 10.201.0.0 255.255.0.0 Null0
ipv6 route FD00:201::/32 Null0
```