

Preparation

Task 1. Create the config file required to start the network depicted in Figure 1. You will use the IPv6 blocks defined below.

Answer:

X = 2 Y = 14 (E in hex)

Check again:

```
#####  
####  
#GLOBAL CONFIG  
#####  
####  
# config that starts up a router setup w/ ripng  
  
[global]  
session_path = /tmp  
tcpdump_path= /tmp  
hubs = 10  
  
#section name = device hostname  
[router1]  
role= router  
eth1 = 0,,2001:0db8:0e02:0001::1/64  
eth123 = 6,,2001:0db8:0e02:0029::1/64  
eth14 = 7,,2001:0db8:0e02:0009::1/64  
pass_quaggadir="/root/pogo/configurations/ospf/router1/"  
  
[router2]  
role = router  
eth2 = 1,,2001:0db8:0e02:0002::2/64  
eth123 = 6,,2001:0db8:0e02:0029::2/64  
pass_quaggadir="/root/pogo/configurations/ospf/router2/"  
  
[router3]  
role = router  
eth3 = 2,,2001:0db8:0e02:0003::3/64  
eth123 = 6,,2001:0db8:0e02:0029::3/64  
eth35 = 8,,2001:0db8:0e02:0012::3/64
```

```
pass_quaggadir="/root/pogo/configurations/ospf/router3/"
```

```
[router4]
role = router
eth4 = 3,,2001:0db8:0e02:0004::4/64
eth14 = 7,,2001:0db8:0e02:0009::4/64
eth456 = 9,,2001:0db8:0e02:0021::4/64
pass_quaggadir="/root/pogo/configurations/ospf/router4/"
```

```
[router5]
role = router
eth5 = 4,,2001:0db8:0e02:0005::5/64
eth35 = 8,,2001:0db8:0e02:0012::5/64
eth456 = 9,,2001:0db8:0e02:0021::5/64
pass_quaggadir="/root/pogo/configurations/ospf/router5/"
```

```
[router6]
role = router
eth6 = 5,,2001:0db8:0e02:0006::6/64
eth456 = 9,,2001:0db8:0e02:0021::6/64
pass_quaggadir="/root/pogo/configurations/ospf/router6/"
```

```
root@Guest-02:~/pogo/configurations/ospf# python /root/pogo/pogo.py start
ospf.cfg
```

```
INFO: Starting sniffer on ogo-ovs0 switch
INFO: Starting sniffer on ogo-ovs1 switch
INFO: Starting sniffer on ogo-ovs2 switch
INFO: Starting sniffer on ogo-ovs3 switch
INFO: Starting sniffer on ogo-ovs4 switch
INFO: Starting sniffer on ogo-ovs5 switch
INFO: Starting sniffer on ogo-ovs6 switch
INFO: Starting sniffer on ogo-ovs7 switch
INFO: Starting sniffer on ogo-ovs8 switch
INFO: Starting sniffer on ogo-ovs9 switch
INFO: Starting host router1.
INFO: Starting host router2.
INFO: Starting host router3.
INFO: Starting host router4.
INFO: Starting host router5.
INFO: Starting host router6.
```

```
There are screens on:
```

8239.router6	(11/29/17 22:49:47)	(Detached)
7556.router5	(11/29/17 22:49:43)	(Detached)
7120.router4	(11/29/17 22:49:39)	(Detached)
6671.router3	(11/29/17 22:49:35)	(Detached)
6253.router2	(11/29/17 22:49:31)	(Detached)
5880.router1	(11/29/17 22:49:28)	(Detached)

```
6 Sockets in /run/screen/S-root.
```

Task 2. Draw a diagram of the network that shows the IP addressing for each router interface.

Answer:



Task 3. Configure OSPFv2 on each router in such a way that the network is stable and operational (any point is reachable from any point). All routers are in the same area.

Answer:

First, we have to change the daemons file in each router to:

```
zebra=yes
bgpd=no
ospfd=no
ospf6d=yes
ripd=no
ripngd=nl
isisd=no
```

Check interfaces:

```
root@Guest-02:~/pogo/configurations/ospf# lxc list
+-----+-----+-----+-----+-----+-----+
+-----+
| NAME   | STATE | IPV4 | IPV6 | TYPE | SNAPSHOTS |
+-----+-----+-----+-----+-----+-----+
| ogobase | STOPPED |      |      | PERSISTENT | 0 |
|         |         |      |      |            |   |
+-----+-----+-----+-----+-----+-----+
+-----+
| router1 | RUNNING |      | 2001:db8:e02:9::1 (eth14) | PERSISTENT | 0 |
|         |         |      | 2001:db8:e02:29::1 (eth123) |            |   |
|         |         |      | 2001:db8:e02:1::1 (eth1)   |            |   |
|         |         |      |                               |            |   |
+-----+-----+-----+-----+-----+-----+
+-----+
| router2 | RUNNING |      | 2001:db8:200:e29::2 (eth123) | PERSISTENT | 0 |
|         |         |      | 2001:db8:200:e02::2 (eth2)   |            |   |
|         |         |      |                               |            |   |
+-----+-----+-----+-----+-----+-----+
```

```

|
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
-----+
| router3 | RUNNING |      | 2001:db8:200:e29::3 (eth123) | PERSISTENT | 0
|
|      |      |      | 2001:db8:200:e0f::3 (eth35) |      |
|
|      |      |      | 2001:db8:200:e03::3 (eth3) |      |
|
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
-----+
| router4 | RUNNING |      | 2001:db8:200:e1f::4 (eth45) | PERSISTENT | 0
|
|      |      |      | 2001:db8:200:e07::4 (eth14) |      |
|
|      |      |      | 2001:db8:200:e04::4 (eth4) |      |
|
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
-----+
| router5 | RUNNING |      | 2001:db8:200:e1f::5 (eth45) | PERSISTENT | 0
|
|      |      |      | 2001:db8:200:e0f::5 (eth35) |      |
|
|      |      |      | 2001:db8:200:e05::5 (eth5) |      |
|
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
-----+
| router6 | RUNNING |      | 2001:db8:e02:6::6 (eth6) | PERSISTENT | 0
|
|      |      |      | 2001:db8:e02:21::6 (eth456) |      |
|
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
-----+

```

Now, we do the same for each router (we change router name, Id, and interfaces):

```

!
hostname router1
password 1
log stdout
!
!debug ospf6 events
!debug ospf6 packet
!
router ospf6
  router-id 1.1.1.1
  interface eth1 area 0.0.0.0
  interface eth123 area 0.0.0.0
  interface eth14 area 0.0.0.0
  redistribute connected
!

```

```
line vty
!  
end
```

Test Ping from router1 to router6:

```
root@router1:~# ping6 2001:db8:e02:6::6  
PING 2001:db8:e02:6::6(2001:db8:e02:6::6) 56 data bytes  
64 bytes from 2001:db8:e02:6::6: icmp_seq=1 ttl=62 time=2.30 ms  
64 bytes from 2001:db8:e02:6::6: icmp_seq=2 ttl=62 time=0.201 ms  
64 bytes from 2001:db8:e02:6::6: icmp_seq=3 ttl=62 time=0.196 ms  
64 bytes from 2001:db8:e02:6::6: icmp_seq=4 ttl=62 time=0.180 ms  
64 bytes from 2001:db8:e02:6::6: icmp_seq=5 ttl=62 time=0.196 ms  
64 bytes from 2001:db8:e02:6::6: icmp_seq=6 ttl=62 time=0.219 ms  
^C  
--- 2001:db8:e02:6::6 ping statistics ---  
6 packets transmitted, 6 received, 0% packet loss, time 5102ms  
rtt min/avg/max/mdev = 0.180/0.549/2.305/0.785 ms
```

OSPF

Task 4. For router5 display the following:

- the router ID
- the routing table
- the OSPF routing table
- the OSPF interface table
- the OSPF neighbors

Are there any differences between the OSPF table and the routing table? (Hints: telnet, ip, show) Why?

Answer:

- the router ID:

```
router5# show ipv6 ospf6  
OSPFv3 Routing Process (0) with Router-ID 5.5.5.5  
Running 00:03:58  
Initial SPF scheduling delay 200 millisec(s)  
Minimum hold time between consecutive SPF's 1000 millisecond(s)  
Maximum hold time between consecutive SPF's 10000 millisecond(s)  
Hold time multiplier is currently 1  
SPF algorithm has not been run$  
SPF timer is inactive  
Number of AS scoped LSAs is 16
```

Number of areas in this router is 1

Area 0.0.0.0

Number of Area scoped LSAs is 20

Interface attached to this area: eth5 eth35 eth456

- the routing table

```
router5# show ipv6 route
```

```
Codes: K - kernel route, C - connected, S - static, R - RIPng,  
       O - OSPFv6, I - IS-IS, B - BGP, A - Babel,  
       > - selected route, * - FIB route
```

```
C>* ::1/128 is directly connected, lo
```

```
O>* 2001:db8:e02:1::/64 [110/30] via fe80::216:3eff:fede:2f67, eth456,  
00:03:41
```

```
O>* 2001:db8:e02:2::/64 [110/30] via fe80::216:3eff:feb1:10c5, eth35,  
00:03:46
```

```
O>* 2001:db8:e02:3::/64 [110/20] via fe80::216:3eff:feb1:10c5, eth35,  
00:03:46
```

```
O>* 2001:db8:e02:4::/64 [110/20] via fe80::216:3eff:fede:2f67, eth456,  
00:03:41
```

```
O 2001:db8:e02:5::/64 [110/10] is directly connected, eth5, 00:03:46
```

```
C>* 2001:db8:e02:5::/64 is directly connected, eth5
```

```
O>* 2001:db8:e02:6::/64 [110/20] via fe80::216:3eff:fe49:f920, eth456,  
00:03:41
```

```
O>* 2001:db8:e02:9::/64 [110/20] via fe80::216:3eff:fede:2f67, eth456,  
00:03:41
```

```
O 2001:db8:e02:12::/64 [110/10] is directly connected, eth35, 00:03:49
```

```
C>* 2001:db8:e02:12::/64 is directly connected, eth35
```

```
O 2001:db8:e02:21::/64 [110/10] is directly connected, eth456, 00:03:41
```

```
C>* 2001:db8:e02:21::/64 is directly connected, eth456
```

```
O>* 2001:db8:e02:29::/64 [110/20] via fe80::216:3eff:feb1:10c5, eth35,  
00:03:46
```

```
C * fe80::/64 is directly connected, eth5
```

```
C * fe80::/64 is directly connected, eth456
```

```
C>* fe80::/64 is directly connected, eth35
```

- the OSPF routing table

```
router5# show ipv6 ospf6 route
```

```
*N IA 2001:db8:e02:1::/64          fe80::216:3eff:feb1:10c5    eth35  
00:03:59
```

```
      N E1 2001:db8:e02:1::/64      fe80::216:3eff:fede:2f67    eth456  
00:03:59      fe80::216:3eff:feb1:10c5    eth35
```

```
      N E1 2001:db8:e02:2::/64      fe80::216:3eff:fede:2f67    eth456  
00:04:04      fe80::216:3eff:feb1:10c5    eth35
```

```
      N E1 2001:db8:e02:2::/64      fe80::216:3eff:feb1:10c5    eth35  
00:04:04
```

```
*N IA 2001:db8:e02:3::/64          fe80::216:3eff:feb1:10c5    eth35
```

```

00:04:04
  N E1 2001:db8:e02:3::/64          fe80::216:3eff:feb1:10c5    eth35
00:04:04
*N IA 2001:db8:e02:4::/64          fe80::216:3eff:fede:2f67    eth456
00:03:59
  N E1 2001:db8:e02:4::/64          fe80::216:3eff:fede:2f67    eth456
00:03:59
*N IA 2001:db8:e02:5::/64          ::                            eth5
00:04:04
*N IA 2001:db8:e02:6::/64          fe80::216:3eff:fe49:f920    eth456
00:03:59
  N E1 2001:db8:e02:6::/64          fe80::216:3eff:fe49:f920    eth456
00:03:59
*N IA 2001:db8:e02:9::/64          fe80::216:3eff:fede:2f67    eth456
00:03:59
  N E1 2001:db8:e02:9::/64          fe80::216:3eff:fede:2f67    eth456
00:03:59
  N E1 2001:db8:e02:9::/64          fe80::216:3eff:feb1:10c5    eth35
00:03:59
                                fe80::216:3eff:fede:2f67    eth456
                                fe80::216:3eff:feb1:10c5    eth35
  N E1 2001:db8:e02:9::/64
00:04:04
*N IA 2001:db8:e02:12::/64         ::                            eth35
00:04:08
  N E1 2001:db8:e02:12::/64         fe80::216:3eff:feb1:10c5    eth35
00:04:04
*N IA 2001:db8:e02:21::/64         ::                            eth456
00:03:59
  N E1 2001:db8:e02:21::/64         fe80::216:3eff:fede:2f67    eth456
00:03:59
  N E1 2001:db8:e02:21::/64         fe80::216:3eff:fe49:f920    eth456
00:03:59
*N IA 2001:db8:e02:29::/64         fe80::216:3eff:feb1:10c5    eth35
00:04:04
  N E1 2001:db8:e02:29::/64         fe80::216:3eff:feb1:10c5    eth35
00:04:04
  N E1 2001:db8:e02:29::/64         fe80::216:3eff:feb1:10c5    eth35
00:03:59
                                fe80::216:3eff:fede:2f67    eth456
                                fe80::216:3eff:feb1:10c5    eth35
  N E1 2001:db8:e02:29::/64
00:04:04

```

- the OSPF interface table

```

router5# show ipv6 ospf6 interface
eth5 is up, type BROADCAST
  Interface ID: 135
  Internet Address:
    inet6: 2001:db8:e02:5::5/64
    inet6: fe80::216:3eff:fefc:a08b/64
  Instance ID 0, Interface MTU 1500 (autodetect: 1500)

```

```

MTU mismatch detection: enabled
Area ID 0.0.0.0, Cost 10
State DR, Transmit Delay 1 sec, Priority 1
Timer intervals configured:
  Hello 10, Dead 40, Retransmit 5
DR: 5.5.5.5 BDR: 0.0.0.0
Number of I/F scoped LSAs is 1
  0 Pending LSAs for LSUpdate in Time 00:00:00 [thread off]
  0 Pending LSAs for LSAck in Time 00:00:00 [thread off]
eth35 is up, type BROADCAST
Interface ID: 131
Internet Address:
  inet6: 2001:db8:e02:12::5/64
  inet6: fe80::216:3eff:fef6:5900/64
Instance ID 0, Interface MTU 1500 (autodetect: 1500)
MTU mismatch detection: enabled
Area ID 0.0.0.0, Cost 10
State DR, Transmit Delay 1 sec, Priority 1
Timer intervals configured:
  Hello 10, Dead 40, Retransmit 5
DR: 5.5.5.5 BDR: 3.3.3.3
Number of I/F scoped LSAs is 2
  0 Pending LSAs for LSUpdate in Time 00:00:00 [thread off]
  0 Pending LSAs for LSAck in Time 00:00:00 [thread off]
eth456 is up, type BROADCAST
Interface ID: 133
Internet Address:
  inet6: 2001:db8:e02:21::5/64
  inet6: fe80::216:3eff:fe45:f1a8/64
Instance ID 0, Interface MTU 1500 (autodetect: 1500)
MTU mismatch detection: enabled
Area ID 0.0.0.0, Cost 10
State BDR, Transmit Delay 1 sec, Priority 1
Timer intervals configured:
  Hello 10, Dead 40, Retransmit 5
DR: 6.6.6.6 BDR: 5.5.5.5
Number of I/F scoped LSAs is 3
  0 Pending LSAs for LSUpdate in Time 00:00:00 [thread off]
  0 Pending LSAs for LSAck in Time 00:00:00 [thread off]
lo is up, type LOOPBACK
Interface ID: 1
OSPF not enabled on this interface

```

- the OSPF neighbors

```

router5# show ipv6 ospf6 neighbor
Neighbor ID      Pri    DeadTime  State/IfState      Duration I/F[State]
3.3.3.3          1      00:00:37   Full/BDR           00:04:45 eth35[DR]
4.4.4.4          1      00:00:40   Full/DR0ther       00:04:41 eth456[BDR]
6.6.6.6          1      00:00:39   Full/DR             00:04:41 eth456[BDR]

```


- Are there any differences between the OSPF table and the routing table?

Yes, in the routing table we can see the routing time stamp and the administrative distance although they all have the same. However, in OSPF table it explains in which area the route is located. Also in routing table it also show routing from sources other than OSPF (for example directly connected and so on).

Task 5. Identify the DR and BDR roles in one network segment, as follows: Pick a network segment with both a DR and a BDR and explain how this was established. Shutdown the DR's interface that connects to that segment. Explain what happens, and what are the new roles.

Answer:

I will choose segment L456. DR = Designated Router (router6) (router with highest priority) BDR = Backup Designated Router (router5) (router with second highest priority)

According to RFC (RFC 2328 - OSPF Version 2) According to the RFC, the BDR is actually elected first, followed by the DR. The RFC explains why:

"The reason behind the election algorithm's complexity is the desire for an orderly transition from Backup Designated Router to Designated Router, when the current Designated Router fails. This orderly transition is ensured through the introduction of hysteresis: no new Backup Designated Router can be chosen until the old Backup accepts its new Designated Router responsibilities."

```
router6# show ipv6 ospf6 neighbor
```

Neighbor ID	Pri	DeadTime	State/IfState	Duration	I/F[State]
4.4.4.4	1	00:00:32	Full/DR0ther	00:36:48	eth456[DR]
5.5.5.5	1	00:00:38	Full/BDR	00:36:43	eth456[DR]

Shutdown interface:

```
router6(config)# interface eth456
router6(config-if)# shutdown
```

AS we see below, the BDR became DR and router4 become and router4 become the BDR (next highest router ID):

Old output from previous question:

```
router5# show ipv6 ospf6 neighbor
```

Neighbor ID	Pri	DeadTime	State/IfState	Duration	I/F[State]
3.3.3.3	1	00:00:37	Full/BDR	00:04:45	eth35[DR]
4.4.4.4	1	00:00:40	Full/DR0ther	00:04:41	eth456[BDR]
6.6.6.6	1	00:00:39	Full/DR	00:04:41	eth456[BDR]

</code>

Now:

```
router5# show ipv6 ospf6 neighbor
Neighbor ID      Pri    DeadTime  State/IfState      Duration I/F[State]
3.3.3.3          1      00:00:36  Full/BDR           00:40:25 eth35[DR]
4.4.4.4          1      00:00:39  Full/BDR           00:40:21 eth456[DR]
```

Task 6. Perform and explain all configurations required such that all traffic from router1 to router6 goes always via router3. Do not shutdown OSPF processes or interfaces ...

Answer:

Make it up again:

```
router6(config)# interface eth456
router6(config-if)# no shutdown
```

Since the all router1 traffic can go either from router3 or router4 so I will change the cost of router4 (before they are all the same) so it will always send the traffic to the lower cost which is router3:

```
router1# conf t
router1(config)# interface eth14
router1(config-if)# ipv6 ospf6 cost 50
```

Check:

```
router1(config-if)# do show run
Building configuration...
```

Current configuration:

```
!
hostname Router
hostname router1
log stdout
!
debug ospf6 lsa unknown
!
password 1
enable password 1
!
interface eth1
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast
  no link-detect
!
interface eth14
  ipv6 nd suppress-ra
```

```

ipv6 ospf6 cost 50
ipv6 ospf6 network broadcast
no link-detect
!
interface eth123
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast
  no link-detect
!
interface lo
  no link-detect
!
router ospf6
  router-id 1.1.1.1
  redistribute connected
  interface eth1 area 0.0.0.0
  interface eth123 area 0.0.0.0
  interface eth14 area 0.0.0.0
!
ip forwarding
ipv6 forwarding
!
line vty
!
end

```

As we see above the cost of the interface has been changed. so now all traffic will go from router3.

Feedback received: Please show that it works.

Answer:

I destroyed everything and I started from the beginning:

Routeing table before:

```

router1# show ipv6 route
Codes: K - kernel route, C - connected, S - static, R - RIPng,
       O - OSPFv6, I - IS-IS, B - BGP, A - Babel,
       > - selected route, * - FIB route

C>* ::1/128 is directly connected, lo
O   2001:db8:e02:1::/64 [110/10] is directly connected, eth1, 00:01:29
C>* 2001:db8:e02:1::/64 is directly connected, eth1
O>* 2001:db8:e02:2::/64 [110/20] via fe80::216:3eff:fedb:cf35, eth123,
00:01:27
O>* 2001:db8:e02:3::/64 [110/20] via fe80::216:3eff:feac:80e1, eth123,
00:01:27

```

```

O>* 2001:db8:e02:4::/64 [110/20] via fe80::216:3eff:fef5:57cb, eth14,
00:01:23
O>* 2001:db8:e02:5::/64 [110/20] via fe80::216:3eff:fef5:57cb, eth14,
00:01:16
O>* 2001:db8:e02:6::/64 [110/20] via fe80::216:3eff:fef5:57cb, eth14,
00:01:16
O 2001:db8:e02:9::/64 [110/10] is directly connected, eth14, 00:01:28
C>* 2001:db8:e02:9::/64 is directly connected, eth14
O>* 2001:db8:e02:12::/64 [110/20] via fe80::216:3eff:fef5:57cb, eth14,
00:01:16
O>* 2001:db8:e02:21::/64 [110/10] via fe80::216:3eff:fef5:57cb, eth14,
00:01:23
O 2001:db8:e02:29::/64 [110/10] is directly connected, eth123, 00:01:32
C>* 2001:db8:e02:29::/64 is directly connected, eth123
C * fe80::/64 is directly connected, eth14
C * fe80::/64 is directly connected, eth123
C>* fe80::/64 is directly connected, eth1

```

Task 7. Configure router2 such that it behaves as a default gateway for all the other routers

Answer:

I will add a static route on router2 and distribute it to other routers:

```

router2# conf t
router2(config)# ipv6 route ::/0 eth2
router2(config)# router ospf6
router2(config-ospf6)# redistribute static

```

Redistribution is the process of advertising the routes learned by a routing protocol to another routing protocol. It includes advertising your static routes and default routes also.

Check:

```

router5# show ipv6 route
Codes: K - kernel route, C - connected, S - static, R - RIPng,
       O - OSPFv6, I - IS-IS, B - BGP, A - Babel,
       > - selected route, * - FIB route

O>* ::/0 [110/20] via fe80::216:3eff:feb1:10c5, eth35, 00:02:15
C>* ::1/128 is directly connected, lo
O>* 2001:db8:e02:1::/64 [110/30] via fe80::216:3eff:fede:2f67, eth456,
00:22:12
O>* 2001:db8:e02:2::/64 [110/30] via fe80::216:3eff:feb1:10c5, eth35,
01:06:39
O>* 2001:db8:e02:3::/64 [110/20] via fe80::216:3eff:feb1:10c5, eth35,
01:06:39

```

```

O>* 2001:db8:e02:4::/64 [110/20] via fe80::216:3eff:fede:2f67, eth456,
00:26:31
O 2001:db8:e02:5::/64 [110/10] is directly connected, eth5, 01:06:39
C>* 2001:db8:e02:5::/64 is directly connected, eth5
O>* 2001:db8:e02:6::/64 [110/20] via fe80::216:3eff:fe49:f920, eth456,
00:22:12
O>* 2001:db8:e02:9::/64 [110/20] via fe80::216:3eff:fede:2f67, eth456,
00:26:31
O 2001:db8:e02:12::/64 [110/10] is directly connected, eth35, 01:06:42
C>* 2001:db8:e02:12::/64 is directly connected, eth35
O 2001:db8:e02:21::/64 [110/10] is directly connected, eth456, 00:26:38
C>* 2001:db8:e02:21::/64 is directly connected, eth456
O>* 2001:db8:e02:29::/64 [110/20] via fe80::216:3eff:feb1:10c5, eth35,
01:06:39
O fe80::/64 [110/10] via fe80::216:3eff:fe49:f920, eth456, 00:22:12
C * fe80::/64 is directly connected, eth5
C * fe80::/64 is directly connected, eth456
C>* fe80::/64 is directly connected, eth35

```

As we see above (in router 5 for example) static (default) route is exist in Link-State Database.

Areas

Task 8. Configure OSPF on each router in such a way that the network is stable and operational (any point is reachable from any point)

Answer:

When I was trying in this question, I faced a problem when quagga crashed and gave me this error when I was configuring the OSPF areas:

Warning: closing connection to ospf6d because of an I/O error!

So what I did is destroy the configuration and add these command to the ospfd.cfg file for each router. Then, build it and start it you will see all the configuration up and running.

THIS is a sample file:

```

root@Guest-02:~/pogo/configurations/ospf# cat
router1/ospf6d.conf
hostname router1
password 1
log stdout
!
!debug ospf6 events
!debug ospf6 packet
!
router ospf6
  router-id 1.1.1.1
  redistribute connected
  area 0.0.0.0 range 2001:db8:e02:1::/64
  area 0.0.0.0 range 2001:db8:e02:9::/64
  area 1.1.1.1 range 2001:db8:e02:29::/64
  interface eth1 area 0.0.0.0
  interface eth14 area 0.0.0.0
  interface eth123 area 1.1.1.1
!
line vty
!
end

```

- **router1:**

```

router1(config)# router ospf6
router1(config-ospf6)# router-id 1.1.1.1
router1(config-ospf6)# area 0.0.0.0 range 2001:0db8:0e02:0009::/64
router1(config-ospf6)# area 0.0.0.0 range 2001:0db8:0e02:0001::/64
router1(config-ospf6)# area 1.1.1.1 range 2001:0db8:0e02:0029::/64
router1(config-ospf6)# interface eth1
router1(config-if)# router ospf6
router1(config-ospf6)# interface eth1 area 0.0.0.0
eth1 already attached to Area 0.0.0.0
router1(config-ospf6)# interface eth14 area 0.0.0.0
eth14 already attached to Area 0.0.0.0
router1(config-ospf6)# interface eth123 area 1.1.1.1

router1# show run
Building configuration...

Current configuration:
!
hostname Router
hostname router1
log stdout
!
debug ospf6 lsa unknown
!

```

```

password 1
enable password 1
!
interface eth1
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast
  no link-detect
!
interface eth14
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast
  no link-detect
!
interface eth123
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast
  no link-detect
!
interface lo
  no link-detect
!
router ospf6
  router-id 1.1.1.1
  redistribute connected
  area 0.0.0.0 range 2001:db8:e02:1::/64
  area 0.0.0.0 range 2001:db8:e02:9::/64
  area 1.1.1.1 range 2001:db8:e02:29::/64
  interface eth1 area 0.0.0.0
  interface eth14 area 0.0.0.0
  interface eth123 area 1.1.1.1
!
ip forwarding
ipv6 forwarding
!
line vty
!
end

```

- **router2:**

```

router2# conf t
router2(config)# router ospf6
router2(config-ospf6)# router-id 2.2.2.2
router2(config-ospf6)# area 1.1.1.1 range 2001:0db8:0e02:0002::/64
router2(config-ospf6)# area 1.1.1.1 range 2001:0db8:0e02:0029::/64
router2(config-ospf6)# interface eth2 area 1.1.1.1
router2(config-ospf6)# interface eth123 area 1.1.1.1

router2# sho run
Building configuration...

```

Current configuration:

```
!  
hostname Router  
hostname router2  
log stdout  
!  
debug ospf6 lsa unknown  
!  
password 1  
enable password 1  
!  
interface eth2  
    ipv6 nd suppress-ra  
    ipv6 ospf6 network broadcast  
    no link-detect  
!  
interface eth123  
    ipv6 nd suppress-ra  
    ipv6 ospf6 network broadcast  
    no link-detect  
!  
interface lo  
    no link-detect  
!  
router ospf6  
    router-id 2.2.2.2  
    redistribute connected  
    area 1.1.1.1 range 2001:db8:e02:2::/64  
    area 1.1.1.1 range 2001:db8:e02:29::/64  
    interface eth2 area 1.1.1.1  
    interface eth123 area 1.1.1.1  
!  
ip forwarding  
ipv6 forwarding  
!  
line vty  
!  
end
```

- **router3:**

```
router3# conf t  
router3(config)# router ospf6  
router3(config-ospf6)# router-id 3.3.3.3  
router3(config-ospf6)# area 1.1.1.1 range 2001:0db8:0e02:0003::/64  
router3(config-ospf6)# area 1.1.1.1 range 2001:0db8:0e02:0029::/64  
router3(config-ospf6)# area 1.1.1.1 range 2001:0db8:0e02:0012::/64  
router3(config-ospf6)# interface eth3 area 1.1.1.1  
router3(config-ospf6)# interface eth123 area 1.1.1.1  
router3(config-ospf6)# interface eth35 area 1.1.1.1
```



```
router2# sho run
Building configuration...
```

```
Current configuration:
```

```
!
hostname Router
hostname router2
log stdout
!
debug ospf6 lsa unknown
!
password 1
enable password 1
!
interface eth2
    ipv6 nd suppress-ra
    ipv6 ospf6 network broadcast
    no link-detect
!
interface eth123
    ipv6 nd suppress-ra
root@router3:~# vtysh
```

```
Hello, this is Quagga (version 0.99.24.1).
Copyright 1996-2005 Kunihiro Ishiguro, et al.
```

```
router3# show run
Building configuration...
```

```
Current configuration:
```

```
!
hostname Router
hostname router3
log stdout
!
debug ospf6 lsa unknown
!
password 1
enable password 1
!
interface eth3
    ipv6 nd suppress-ra
    ipv6 ospf6 network broadcast
    no link-detect
!
interface eth35
    ipv6 nd suppress-ra
    ipv6 ospf6 network broadcast
    no link-detect
!
interface eth123
```

```

ipv6 nd suppress-ra
ipv6 ospf6 network broadcast
no link-detect
!
interface lo
  no link-detect
!
router ospf6
  router-id 3.3.3.3
  redistribute connected
  area 1.1.1.1 range 2001:db8:e02:3::/64
  area 1.1.1.1 range 2001:db8:e02:12::/64
  area 1.1.1.1 range 2001:db8:e02:29::/64
  interface eth3 area 1.1.1.1
  interface eth123 area 1.1.1.1
  interface eth35 area 1.1.1.1
!
ip forwarding
ipv6 forwarding
!
line vty
!
end

```

- **router4:**

```

router4# conf t
router4(config)# router ospf6
router4(config-ospf6)# router-id 4.4.4.4
router4(config-ospf6)# area 0.0.0.0 range 2001:0db8:0e02:0004::/64
router4(config-ospf6)# area 0.0.0.0 range 2001:0db8:0e02:0009::/64
router4(config-ospf6)# area 2.2.2.2 range 2001:0db8:0e02:0021::/64
router4(config-ospf6)# interface eth456 area 2.2.2.2
router4(config-ospf6)# interface eth14 area 0.0.0.0
router4(config-ospf6)# interface eth4 area 0.0.0.0

router4# show run
Building configuration...

Current configuration:
!
hostname Router
hostname router4
log stdout
!
debug ospf6 lsa unknown
!
password 1
enable password 1
!
interface eth4

```

```

ipv6 nd suppress-ra
ipv6 ospf6 network broadcast
no link-detect
!
interface eth14
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast
  no link-detect
!
interface eth456
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast
  no link-detect
!
interface lo
  no link-detect
!
router ospf6
  router-id 4.4.4.4
  redistribute connected
  area 0.0.0.0 range 2001:db8:e02:4::/64
  area 0.0.0.0 range 2001:db8:e02:9::/64
  area 2.2.2.2 range 2001:db8:e02:21::/64
  interface eth4 area 0.0.0.0
  interface eth14 area 0.0.0.0
  interface eth456 area 2.2.2.2
!
ip forwarding
ipv6 forwarding
!
line vty
!
end

```

- **router5:**

```

router5(config)# router ospf6
router5(config-ospf6)# router-id 5.5.5.5
router5(config-ospf6)# area 2.2.2.2 range 2001:0db8:0e02:0005::/64
router5(config-ospf6)# area 2.2.2.2 range 2001:0db8:0e02:0012::/64
router5(config-ospf6)# area 2.2.2.2 range 2001:0db8:0e02:0021::/64
router5(config-ospf6)# interface eth5 area 2.2.2.2
router5(config-ospf6)# interface eth35 area 2.2.2.2
router5(config-ospf6)# interface eth456 area 2.2.2.2

```

```

router5# show run
Building configuration...

```

```

Current configuration:
!

```

```

hostname Router
hostname router5
log stdout
!
debug ospf6 lsa unknown
!
password 1
enable password 1
!
interface eth5
    ipv6 nd suppress-ra
    ipv6 ospf6 network broadcast
    no link-detect
!
interface eth35
    ipv6 nd suppress-ra
    ipv6 ospf6 network broadcast
    no link-detect
!
interface eth456
    ipv6 nd suppress-ra
    ipv6 ospf6 network broadcast
    no link-detect
!
interface lo
    no link-detect
!
router ospf6
    router-id 5.5.5.5
    redistribute connected
    area 2.2.2.2 range 2001:db8:e02:5::/64
    area 2.2.2.2 range 2001:db8:e02:12::/64
    area 2.2.2.2 range 2001:db8:e02:21::/64
    interface eth5 area 2.2.2.2
    interface eth35 area 2.2.2.2
    interface eth456 area 2.2.2.2
!
ip forwarding
ipv6 forwarding
!
line vty
!
end

```

- **router6:**

```

router6# conf t
router6(config)# router ospf6
router6(config-ospf6)# router-id 6.6.6.6
router6(config-ospf6)# area 2.2.2.2 range 2001:0db8:0e02:0006::/64
router6(config-ospf6)# area 2.2.2.2 range 2001:0db8:0e02:0021::/64

```

```
router6(config-ospf6)# interface eth6 area 2.2.2.2
router6(config-ospf6)# interface eth456 area 2.2.2.2

router6# show run
Building configuration...

Current configuration:
!
hostname Router
hostname router6
log stdout
!
debug ospf6 lsa unknown
!
password 1
enable password 1
!
interface eth6
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast
  no link-detect
!
interface eth456
  ipv6 nd suppress-ra
  ipv6 ospf6 network broadcast
  no link-detect
!
interface lo
  no link-detect
!
router ospf6
  router-id 6.6.6.6
  redistribute connected
  area 2.2.2.2 range 2001:db8:e02:6::/64
  area 2.2.2.2 range 2001:db8:e02:21::/64
  interface eth6 area 2.2.2.2
  interface eth456 area 2.2.2.2
!
ip forwarding
ipv6 forwarding
!
line vty
!
end
```

Test ping from router6 to router1:

```
root@router6:~# ping6 2001:db8:e02:9::1
PING 2001:db8:e02:9::1(2001:db8:e02:9::1) 56 data bytes
64 bytes from 2001:db8:e02:9::1: icmp_seq=1 ttl=63 time=1.80 ms
64 bytes from 2001:db8:e02:9::1: icmp_seq=2 ttl=63 time=0.159 ms
```

```
64 bytes from 2001:db8:e02:9::1: icmp_seq=3 ttl=63 time=0.154 ms
64 bytes from 2001:db8:e02:9::1: icmp_seq=4 ttl=63 time=0.157 ms
^C
--- 2001:db8:e02:9::1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3051ms
rtt min/avg/max/mdev = 0.154/0.567/1.800/0.711 ms
```

Feedback received: Explain the area...range command. Router3 contains "are" statements. L35 is in two areas..

Answer:

Explain the area...range command:

To consolidate and summarize routes at an Open Shortest Path First (OSPF) area boundary, use the area range command. To disable this function, use the no form of this command.

```
area area-id range ip-prefix [ not-advertise ]
no area area-id range ip-prefix [ not-advertise ]
```

Syntax Description

- area-id: Identifier for the OSPF area where you want to summarize routes. The area ID can be from 0 to 4294967295 or an IP address.
- ip-prefix: IP prefix specified as IP address/subnet mask length (A . B . C . D / LEN).
- not-advertise: (Optional) Sets the address range status to DoNotAdvertise. The Type 3 summary LSA is suppressed, and the component networks remain hidden from other networks.

Router3 contains "are" statements: the reason is that I type it fast (are is area "are also works, it accept appreviation").

L35 is in two areas:

Source:

1-
https://www.cisco.com/c/m/en_us/techdoc/dc/reference/cli/nxos/commands/ospf/area-range-ospf.html

Task 9. From router3 perform a traceroute to L5. Explain the output.

Answer:

```
router3# traceroute 2001:0db8:0e02:0005::5
traceroute to 2001:0db8:0e02:0005::5 (2001:db8:e02:5::5), 30 hops max, 80
```

byte packets

1	2001:db8:e02:29::1 (2001:db8:e02:29::1)	1.727 ms	2.882 ms	1.127 ms
2	2001:db8:e02:9::4 (2001:db8:e02:9::4)	2.546 ms	2.537 ms	2.586 ms
3	* * *			
4	* 2001:db8:e02:5::5 (2001:db8:e02:5::5)	2.859 ms	2.813 ms	

As we see above it goes from router1 and router4 to router5. The reason for that is that all inter traffic should go from the backbone router and these routers are (ABR) of both areas 1 and 2.