Lab 7. Basic OSPF Configuration

XARXES I PROTOCOLS

Eloi Egea Rada i Miquel Rodríguez Juvany
TECNOCAMPUS MATARÓ | PERE BARBERAN AGUT

Table of Contents

Task 1. Basic Router Configurations

1. Configure the router hostname

We have changed Router1's hostname via CLI typing **"hostname R1"**.

The same has been done for Router2 with **"hostname R2"** and for Router3 with **"hostname R3"**.

2. Disable DNS lookup

To disable DNS lookup, we have done **"no ip domain-lookup"** in each router's configuration terminal.

Task 2. Configure addresses

Step 1: Configure interfaces on R1, R2, and R3

We have added the interfaces in the addressing table for each router.

R1: one FastEthernet and two Serial.

R2: one FastEthernet and two Serial.

R3: one FastEthernet and two Serial.

Step 2: Verify IP addressing and interfaces

```
R1>show ip interface brief
Interface              IP-Address      OK? Method Status                 Protocol
FastEthernet0/0        172.16.1.17     YES manual up                     up
FastEthernet1/0        unassigned      YES unset  administratively down down
Serial2/0              192.168.10.5    YES manual up                     up
Serial3/0              192.168.10.1    YES manual up                     up
FastEthernet4/0        unassigned      YES unset  administratively down down
FastEthernet5/0        unassigned      YES unset  administratively down down

R2>show ip interface brief
Interface              IP-Address      OK? Method Status                 Protocol
FastEthernet0/0        10.10.10.1      YES manual up                     up
FastEthernet1/0        unassigned      YES unset  administratively down down
Serial2/0              192.168.10.9    YES manual up                     up
Serial3/0              192.168.10.2    YES manual up                     up
FastEthernet4/0        unassigned      YES unset  administratively down down
FastEthernet5/0        unassigned      YES unset  administratively down down

R3>show ip interface brief
Interface              IP-Address      OK? Method Status                 Protocol
FastEthernet0/0        172.16.1.33     YES unset  up                     up
FastEthernet1/0        unassigned      YES unset  administratively down down
Serial2/0              192.168.10.6    YES manual up                     up
Serial3/0              192.168.10.10   YES manual up                     up
FastEthernet4/0        unassigned      YES unset  administratively down down
FastEthernet5/0        unassigned      YES unset  administratively down down
```
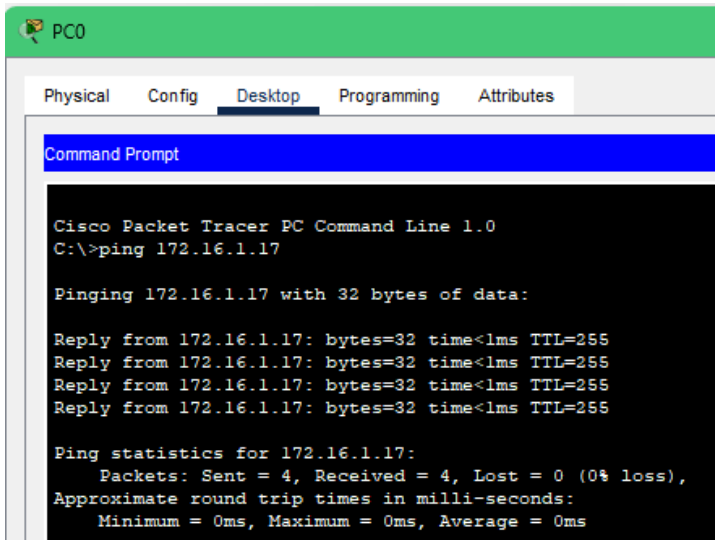
Step 3: Configure Ethernet interfaces of PC1, PC2, and PC3

We have added the IP and subnet masks for each interface of each router as they are assigned in the addressing table under the topology.

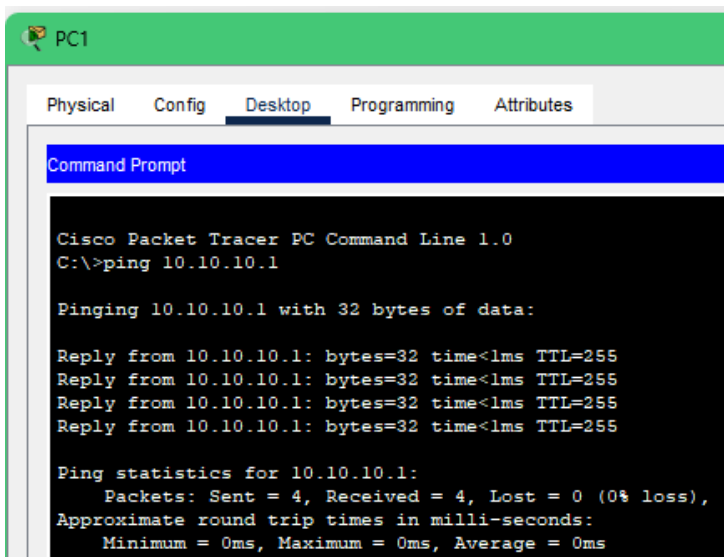## Step 4: Test the PC Configuration by pinging the default gateway from the PC


```
PC0

Physical    Config    Desktop    Programming    Attributes

Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.16.1.17

Pinging 172.16.1.17 with 32 bytes of data:

Reply from 172.16.1.17: bytes=32 time<1ms TTL=255
Reply from 172.16.1.17: bytes=32 time<1ms TTL=255
Reply from 172.16.1.17: bytes=32 time<1ms TTL=255
Reply from 172.16.1.17: bytes=32 time<1ms TTL=255

Ping statistics for 172.16.1.17:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
PC1

Physical    Config    Desktop    Programming    Attributes

Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.10.10.1

Pinging 10.10.10.1 with 32 bytes of data:

Reply from 10.10.10.1: bytes=32 time<1ms TTL=255
Reply from 10.10.10.1: bytes=32 time<1ms TTL=255
Reply from 10.10.10.1: bytes=32 time<1ms TTL=255
Reply from 10.10.10.1: bytes=32 time<1ms TTL=255

Ping statistics for 10.10.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
PC2

Physical    Config    Desktop    Programming    Attributes

Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 172.16.1.33

Pinging 172.16.1.33 with 32 bytes of data:

Reply from 172.16.1.33: bytes=32 time<1ms TTL=255
Reply from 172.16.1.33: bytes=32 time=7ms TTL=255
Reply from 172.16.1.33: bytes=32 time=7ms TTL=255
Reply from 172.16.1.33: bytes=32 time<1ms TTL=255

Ping statistics for 172.16.1.33:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 7ms, Average = 3ms
```
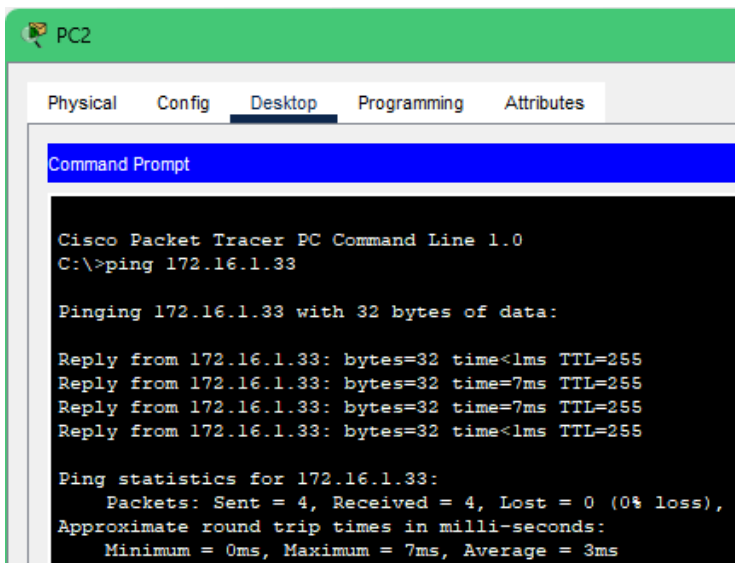
Task 3: Configure OSPF on the R1 Router

Step 1: Use the router ospf command in global configuration mode to enable OSPF on the R1 router

```
R1(config)#router ospf 1
R1(config-router)#
```

Step 2: Configure the network statement for the LAN network.

```
R1(config-router)#network 172.16.1.16 0.0.0.15 area 0
R1(config-router)#
```

Step 3: Configure the router to advertise the 192.168.10.0/30 network attached to the Serial0/0/0 interface

```
R1(config-router)#network 192.168.10.0 0.0.0.3 area 0
R1(config-router)#
```

Step 4: Configure the router to advertise the 192.168.10.4/30 network attached to the Serial 0/0/1 interface

```
R1(config-router)#network 192.168.10.4 0.0.0.3 area 0
R1(config-router)#
```

Task 4: Configure OSPF on the R2 and R3 Routers

Step 1: Configure OSPF on the R2 Router

```
R2(config)#router ospf 1
R2(config-router)#network 10.10.10.0 0.0.0.255 area 0
R2(config-router)#network 192.168.10.0 0.0.0.3 area 0
R2(config-router)#network 192.168.10.8 0.0.0.3 area 0
```

Step 2: Configure OSPF on the R3 Router

```
R3(config)#router ospf 1
R3(config-router)#network 172.16.1.32 0.0.0.7 area 0
R3(config-router)#network 192.168.10.4 0.0.0.3 area 0
R3(config-router)#network 192.168.10.8 0.0.0.3 area 0
```

Task 5: Configure OSPF Router IDs

Step 1: Examine the current router IDs in the topology

What is the router of ID for R1? 192.168.10.5

What is the router of ID for R2? 192.168.10.9

What is the router of ID for R3? 192.168.10.10

Step 2: Use loopback addresses to change the router IDs of the routers in the topology

```
R1>enable
R1#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface loopback 0

R1(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R1(config-if)#ip address 10.1.1.1 255.255.255.255
```

```
R2>enable
R2#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface loopback 0

R2(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R2(config-if)#ip address 10.2.2.2 255.255.255.255

R3>enable
R3#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#interface loopback 0

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up

R3(config-if)#ip address 10.3.3.3 255.255.255.255
```

Step 3: Reload the routers to force the new Router IDs to be used

R1:

```
R1#reload
Proceed with reload? [confirm]
System Bootstrap, Version 12.1(3r)T2, RELEASE SOFTWARE (fc1)
Copyright (c) 2000 by cisco Systems, Inc.
Initializing memory for ECC
..
PT1000 processor with 524288 Kbytes of main memory
Main memory is configured to 64 bit mode with ECC enabled

Readonly ROMMON initialized

Self decompressing the image :
############################################################################ [OK]

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Cisco Internetwork Operating System Software
IOS (tm) PT1000 Software (PT1000-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
Technical Support: http://www.cisco.com/techsupport
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Compiled Wed 27-Apr-04 19:01 by miwang

PT 1001 (PTSC2005) processor (revision 0x200) with 60416K/5120K bytes of memory
.
Processor board ID PT0123 (0123)
PT2005 processor: part number 0, mask 01
Bridging software.
X.25 software, Version 3.0.0.
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)

Press RETURN to get started!


%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

00:00:26: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.10.9 on Serial3/0 from LOADING to FULL,
Loading Done
```

R2:

```
R2#reload
Proceed with reload? [confirm]
System Bootstrap, Version 12.1(3r)T2, RELEASE SOFTWARE (fc1)
Copyright (c) 2000 by cisco Systems, Inc.
Initializing memory for ECC
..
PT1000 processor with 524288 Kbytes of main memory
Main memory is configured to 64 bit mode with ECC enabled

Readonly ROMMON initialized

Self decompressing the image :
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Cisco Internetwork Operating System Software
IOS (tm) PT1000 Software (PT1000-I-M), Version 12.2(28), RELEASE SOFTWARE (fc5)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2005 by cisco Systems, Inc.
Compiled Wed 27-Apr-04 19:01 by miwang

PT 1001 (PTSC2005) processor (revision 0x200) with 60416K/5120K bytes of memory
.
Processor board ID PT0123 (0123)
PT2005 processor: part number 0, mask 01
Bridging software.
X.25 software, Version 3.0.0.
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)

Press RETURN to get started!


%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

00:00:20: %OSPF-5-ADJCHG: Process 1, Nbr 10.1.1.1 on Serial3/0 from LOADING to FULL,
Loading Done
```

R3:

```
R3#reload
System configuration has been modified. Save? [yes/no]:yes
Building configuration...
[OK]
Proceed with reload? [confirm]
System Bootstrap, Version 12.1(3r)T2, RELEASE SOFTWARE (fc1)
Copyright (c) 2000 by cisco Systems, Inc.
Initializing memory for ECC
..
PT1000 processor with 524288 Kbytes of main memory
Main memory is configured to 64 bit mode with ECC enabled

Readonly ROMMON initialized

Self decompressing the image :
################################################################################ [OK]

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PT 1001 (PTSC2005) processor (revision 0x200) with 60416K/5120K bytes of memory
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Processor board ID PT0123 (0123)
PT2005 processor: part number 0, mask 01
Bridging software.
X.25 software, Version 3.0.0.
4 FastEthernet/IEEE 802.3 interface(s)
2 Low-speed serial(sync/async) network interface(s)
32K bytes of non-volatile configuration memory.
63488K bytes of ATA CompactFlash (Read/Write)

Press RETURN to get started!


%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed state to up

00:00:20: %OSPF-5-ADJCHG: Process 1, Nbr 10.2.2.2 on Serial3/0 from LOADING to FULL,
Loading Done

00:00:20: %OSPF-5-ADJCHG: Process 1, Nbr 10.1.1.1 on Serial2/0 from LOADING to FULL,
Loading Done
|
```

When the router is reloaded, what is the router ID for R1? 10.1.1.1

When the router is reloaded, what is the router ID for R2? 10.2.2.2

When the router is reloaded, what is the router ID for R3? 10.3.3.3

Step 4: Use the "show ip ospf neighbors" command to verify that the router IDs have changed


```
R1>show ip ospf neighbors
                      ^
% Invalid input detected at '^' marker.

R1>show ip ospf neighbor


Neighbor ID      Pri   State          Dead Time   Address         Interface
10.3.3.3           0   FULL/  -       00:00:38    192.168.10.6    Serial2/0
10.2.2.2           0   FULL/  -       00:00:32    192.168.10.2    Serial3/0


R2>show ip ospf neighbor


Neighbor ID      Pri   State          Dead Time   Address         Interface
10.3.3.3           0   FULL/  -       00:00:34    192.168.10.10   Serial2/0
10.1.1.1           0   FULL/  -       00:00:36    192.168.10.1    Serial3/0


R3>show ip ospf neighbor


Neighbor ID      Pri   State          Dead Time   Address         Interface
10.2.2.2           0   FULL/  -       00:00:39    192.168.10.9    Serial3/0
10.1.1.1           0   FULL/  -       00:00:39    192.168.10.5    Serial2/0
```


What information does show ip protocols give us?


```
R1>show ip protocols

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 10.1.1.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.16.1.16 0.0.0.15 area 0
    192.168.10.0 0.0.0.3 area 0
    192.168.10.4 0.0.0.3 area 0
    172.168.10.0 0.0.0.3 area 0
    172.168.10.4 0.0.0.3 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    10.1.1.1             110      00:05:59
    10.2.2.2             110      00:05:59
    10.3.3.3             110      00:07:24
    192.168.10.5         110      00:58:23
    192.168.10.9         110      00:31:10
  Distance: (default is 110)
```

```
R2>show ip protocols

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 10.2.2.2
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.10.10.0 0.0.0.255 area 0
    192.168.10.0 0.0.0.3 area 0
    192.168.10.8 0.0.0.3 area 0
  Routing Information Sources:
    Gateway          Distance        Last Update
    10.1.1.1              110         00:06:37
    10.2.2.2              110         00:06:37
    10.3.3.3              110         00:08:02
    192.168.10.5          110         00:59:01
    192.168.10.9          110         00:31:48
  Distance: (default is 110)


R3>show ip protocol

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 10.3.3.3
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.16.1.32 0.0.0.7 area 0
    172.168.10.8 0.0.0.3 area 0
    172.168.10.4 0.0.0.3 area 0
    192.168.10.4 0.0.0.3 area 0
    192.168.10.8 0.0.0.3 area 0
  Routing Information Sources:
    Gateway          Distance        Last Update
    10.1.1.1              110         00:06:58
    10.2.2.2              110         00:06:58
    10.3.3.3              110         00:06:58
    192.168.10.5          110         00:59:22
    192.168.10.9          110         00:32:09
  Distance: (default is 110)
```

Task 6: Examine OSPF Routes in the Routing Tables

Explain the Routing tables. How have the costs been obtained?

```
R1>sh ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.1.1.1/32 is directly connected, Loopback0
O       10.10.10.0/24 [110/65] via 192.168.10.2, 00:30:54, Serial3/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.1.16/28 is directly connected, FastEthernet0/0
O       172.16.1.32/29 [110/65] via 192.168.10.6, 00:07:15, Serial2/0
     192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, Serial3/0
C       192.168.10.4 is directly connected, Serial2/0
O       192.168.10.8 [110/128] via 192.168.10.2, 00:07:15, Serial3/0
                    [110/128] via 192.168.10.6, 00:07:15, Serial2/0


R2>sh ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.2.2.2/32 is directly connected, Loopback0
C       10.10.10.0/24 is directly connected, FastEthernet0/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
O       172.16.1.16/28 [110/65] via 192.168.10.1, 00:31:30, Serial3/0
O       172.16.1.32/29 [110/65] via 192.168.10.10, 00:07:51, Serial2/0
     192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, Serial3/0
O       192.168.10.4 [110/128] via 192.168.10.1, 00:07:51, Serial3/0
                    [110/128] via 192.168.10.10, 00:07:51, Serial2/0
C       192.168.10.8 is directly connected, Serial2/0


R3>sh ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.3.3.3/32 is directly connected, Loopback0
O       10.10.10.0/24 [110/65] via 192.168.10.9, 00:08:12, Serial3/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
O       172.16.1.16/28 [110/65] via 192.168.10.5, 00:08:12, Serial2/0
C       172.16.1.32/29 is directly connected, FastEthernet0/0
     192.168.10.0/30 is subnetted, 3 subnets
O       192.168.10.0 [110/128] via 192.168.10.5, 00:08:12, Serial2/0
                    [110/128] via 192.168.10.9, 00:08:12, Serial3/0
C       192.168.10.4 is directly connected, Serial2/0
C       192.168.10.8 is directly connected, Serial3/0
```

We have used the command "show ip ospf interface brief" to get the costs of each OSPF route on each router.

R1:

- Fa0/0 cost: 1
- Se2/0 cost: 64
- Se3/0 cost: 64

```
R1#show ip ospf interface brief
Interface    PID   Area                IP Address/Mask          Cost  State  Nbrs
F/C
Fa0/0        1     0                   172.16.1.17/255.255.255.240   1      DR   0/0
Se2/0        1     0                   192.168.10.5/255.255.255.252   64   POINT  0/0
Se3/0        1     0                   192.168.10.1/255.255.255.252   64   POINT  0/0
```

R2:

- Fa0/0 cost: 1
- Se2/0 cost: 64
- Se3/0 cost: 64

```
R2#show ip ospf interface brief
Interface    PID   Area                IP Address/Mask          Cost  State  Nbrs
F/C
Fa0/0        1     0                   10.10.10.1/255.255.255.0    1      DR   0/0
Se2/0        1     0                   192.168.10.9/255.255.255.252   64   POINT  0/0
Se3/0        1     0                   192.168.10.2/255.255.255.252   64   POINT  0/0
```

R3:

- Fa0/0 cost: 1
- Se2/0 cost: 64
- Se3/0 cost: 64

```
R3#sh ip ospf interface brief
Interface    PID   Area                IP Address/Mask          Cost  State  Nbrs
F/C
Fa0/0        1     0                   172.16.1.33/255.255.255.248   1      DR   0/0
Se2/0        1     0                   192.168.10.6/255.255.255.252   64   POINT  0/0
Se3/0        1     0                   192.168.10.10/255.255.255.252  64   POINT  0/0
```

Task 7: Redistribute an OSPF Default Route

Step 1: Configure a loopback address on the R1 router to simulate a link to an ISP

```
R1>enable
R1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface loopback1

R1(config-if)#
%LINK-5-CHANGED: Interface Loopback1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback1, changed state to up

R1(config-if)#ip address 172.30.1.1 255.255.255.252
```

Step 2: Configure a static default route on the R1 router

```
R1(config)#ip route 0.0.0.0 0.0.0.0 loopback1
```

Step 3: Use the default-information originate command to include the static route in the OSPF updates that are sent from the R1 router

```
R1(config)#router ospf 1
R1(config-router)#default-information originate
```

Step 4: View the routing table on the R2 router to verify that the static default route is being redistributed via OSPF

```
R2>sh ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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 192.168.10.1 to network 0.0.0.0

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.2.2.2/32 is directly connected, Loopback0
C       10.10.10.0/24 is directly connected, FastEthernet0/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
O       172.16.1.16/28 [110/65] via 192.168.10.1, 00:39:20, Serial3/0
O       172.16.1.32/29 [110/65] via 192.168.10.10, 00:15:41, Serial2/0
     192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, Serial3/0
O       192.168.10.4 [110/128] via 192.168.10.1, 00:15:41, Serial3/0
                     [110/128] via 192.168.10.10, 00:15:41, Serial2/0
C       192.168.10.8 is directly connected, Serial2/0
O*E2 0.0.0.0/0 [110/1] via 192.168.10.1, 00:00:47, Serial3/0
```

Can you change the cost?

Yes, the cost can be changed via router's CLI with the command "ip ospf cost <value>".

Change the bandwidth of the interfaces that connect R1 and R2

We have changed the bandwidth of Serial3/0 of R1 to 1500 and so the cost is now 66 instead of 64 as it used to be.

```
R1(config)#interface S3/0
R1(config-if)#bandwidth 1500
R1(config-if)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console

R1#sh ip ospf interface brief
Interface    PID   Area                  IP Address/Mask          Cost  State  Nbrs
F/C
Fa0/0         1    0                172.16.1.17/255.255.255.240   1      DR   0/0
Se2/0         1    0               192.168.10.5/255.255.255.252   64   POINT  0/0
Se3/0         1    0               192.168.10.1/255.255.255.252   66   POINT  0/0

R1#
```

Task 8: Document the Router Configurations

Most important parameters of the running configuration

We would be considering important parameters on each router its Router ID, Interfaces and OSPF Costs:

- R1
    - ID: 10.1.1.1
    - Interfaces:
        - FastEthernet0/0 – 172.16.1.17
        - Serial2/0 – 192.168.10.5
        - Serial3/0 – 192.168.10.1
        - Loopback0 – 10.1.1.1
        - Loopback1 – 172.30.1.1
    - OSPF Costs:
        - FastEthernet0/0 – 1
        - Serial2/0 – 64
        - Serial3/0 – 66
- R2
    - ID: 10.2.2.2
    - Interfaces:
        - FastEthernet0/0 – 10.10.10.1
        - Serial2/0 – 192.168.10.9
        - Serial3/0 – 192.168.10.2
        - Loopback0 – 10.2.2.2
    - OSPF Costs:
        - FastEthernet0/0 – 1
        - Serial2/0 – 64
        - Serial3/0 – 64
- R3
    - ID: 10.3.3.3
    - Interfaces:
        - FastEthernet0/0 – 172.16.1.33
        - Serial2/0 – 192.168.10.6
        - Serial3/0 – 192.168.10.10
        - Loopback0 – 10.3.3.3
    - OSPF Costs:
        - FastEthernet0/0 – 1
        - Serial2/0 – 64
        - Serial3/0 – 64

Routing tables

```
R1#sh ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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 0.0.0.0 to network 0.0.0.0

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.1.1.1/32 is directly connected, Loopback0
O       10.10.10.0/24 [110/65] via 192.168.10.2, 00:47:02, Serial3/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C       172.16.1.16/28 is directly connected, FastEthernet0/0
O       172.16.1.32/29 [110/65] via 192.168.10.6, 00:23:23, Serial2/0
     172.30.0.0/30 is subnetted, 1 subnets
C       172.30.1.0 is directly connected, Loopback1
     192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, Serial3/0
C       192.168.10.4 is directly connected, Serial2/0
O       192.168.10.8 [110/128] via 192.168.10.2, 00:23:23, Serial3/0
                     [110/128] via 192.168.10.6, 00:23:23, Serial2/0
S*    0.0.0.0/0 is directly connected, Loopback1


R2>sh ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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 192.168.10.1 to network 0.0.0.0

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.2.2.2/32 is directly connected, Loopback0
C       10.10.10.0/24 is directly connected, FastEthernet0/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
O       172.16.1.16/28 [110/65] via 192.168.10.1, 00:39:20, Serial3/0
O       172.16.1.32/29 [110/65] via 192.168.10.10, 00:15:41, Serial2/0
     192.168.10.0/30 is subnetted, 3 subnets
C       192.168.10.0 is directly connected, Serial3/0
O       192.168.10.4 [110/128] via 192.168.10.1, 00:15:41, Serial3/0
                     [110/128] via 192.168.10.10, 00:15:41, Serial2/0
C       192.168.10.8 is directly connected, Serial2/0
O*E2 0.0.0.0/0 [110/1] via 192.168.10.1, 00:00:47, Serial3/0




R3>sh ip route
Codes: C - connected, S - static, I - IGRP, 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, E - EGP
       i - IS-IS, 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 192.168.10.5 to network 0.0.0.0

     10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.3.3.3/32 is directly connected, Loopback0
O       10.10.10.0/24 [110/65] via 192.168.10.9, 00:27:10, Serial3/0
     172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
O       172.16.1.16/28 [110/65] via 192.168.10.5, 00:27:10, Serial2/0
C       172.16.1.32/29 is directly connected, FastEthernet0/0
     192.168.10.0/30 is subnetted, 3 subnets
O       192.168.10.0 [110/128] via 192.168.10.5, 00:27:10, Serial2/0
                     [110/128] via 192.168.10.9, 00:27:10, Serial3/0
C       192.168.10.4 is directly connected, Serial2/0
C       192.168.10.8 is directly connected, Serial3/0
O*E2 0.0.0.0/0 [110/1] via 192.168.10.5, 00:12:17, Serial2/0
```

Multicast addresses used in OSPF

Depending on the device we want to multicast to we have two different multicast addresses, if it is an OSPF router the multicast address will be 255.0.0.5 and if it is a DR/BDR address, the multicast address will be 244.0.0.6.

Taking as an example R1, the multicast address of the Fa0/0 interface would be 244.0.0.6 and for the other two serial links, the multicast address would be 255.0.0.5.

```
R1#show ip ospf interface brief
Interface    PID  Area                IP Address/Mask           Cost  State  Nbrs
F/C
Fa0/0          1    0                172.16.1.17/255.255.255.240  1      DR   0/0
Se2/0          1    0               192.168.10.5/255.255.255.252  64   POINT  0/0
Se3/0          1    0               192.168.10.1/255.255.255.252  64   POINT  0/0
```

Cost of the serial links in the diagram topology

R1:

- Se2/0 cost: 64
- Se3/0 cost: 64

```
R1#show ip ospf interface brief
Interface    PID  Area                IP Address/Mask           Cost  State  Nbrs
F/C
Fa0/0          1    0                172.16.1.17/255.255.255.240  1      DR   0/0
Se2/0          1    0               192.168.10.5/255.255.255.252  64   POINT  0/0
Se3/0          1    0               192.168.10.1/255.255.255.252  64   POINT  0/0
```

R2:

- Se2/0 cost: 64
- Se3/0 cost: 64

```
R2#show ip ospf interface brief
Interface    PID  Area                IP Address/Mask           Cost  State  Nbrs
F/C
Fa0/0          1    0                 10.10.10.1/255.255.255.0   1      DR   0/0
Se2/0          1    0               192.168.10.9/255.255.255.252  64   POINT  0/0
Se3/0          1    0               192.168.10.2/255.255.255.252  64   POINT  0/0
```

R3:

- Se2/0 cost: 64
- Se3/0 cost: 64

```
R3#sh ip ospf interface brief
Interface    PID  Area                IP Address/Mask           Cost  State  Nbrs
F/C
Fa0/0          1    0                172.16.1.33/255.255.255.248  1      DR   0/0
Se2/0          1    0               192.168.10.6/255.255.255.252  64   POINT  0/0
Se3/0          1    0              192.168.10.10/255.255.255.252  64   POINT  0/0
```