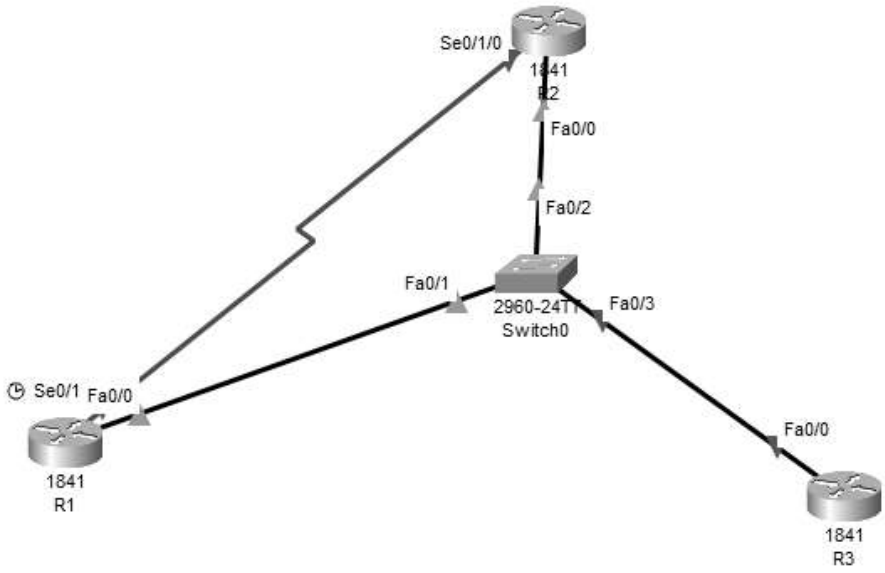
Practical 1: Single Area OSPF link costs and interface priorities




```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R1
R1(config)#
R1(config)#
R1(config)#int lo1

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 add 10.1.1.1 255.255.255.0
R1(config-if)#exit
R1(config)#int fa0/0
R1(config-if)#ip add 10.1.200.1 255.255.255.0
R1(config-if)#no shut

R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R1(config-if)#int Se0/1/0
R1(config-if)#ip add 10.1.100.1 255.255.255.0
R1(config-if)#no shut

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to down
R1(config-if)#
```

Step1

```
R2>enable
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int lo2

R2(config-if)#
%LINK-5-CHANGED: Interface Loopback2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback2, changed state to up

R2(config-if)#ip add 10.1.2.1 255.255.255.0
R2(config-if)#exit
R2(config)#int fa0/0
R2(config-if)#ip add 10.1.200.2 255.255.255.0
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

R2(config-if)#int Se0/1/0
R2(config-if)#ip add 10.1.100.2 255.255.255.0
R2(config-if)#no shut

R2(config-if)#
%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0, changed state to up
```

```
R3>en
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#int lo3

R3(config-if)#
%LINK-5-CHANGED: Interface Loopback3, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback3, changed state to up

R3(config-if)#ip add 10.1.3.1 255.255.255.0
R3(config-if)#exit
R3(config)#int fa0/0
R3(config-if)#ip add 10.1.200.3 255.255.255.0
R3(config-if)#no shut

R3(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
```

Step 2-> Add physical interfaces to OSPF

```
R1>en
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#network 10.1.100.0 0.0.0.255 area 0
R1(config-router)#
R1(config-router)#network 10.1.200.0 0.0.0.255 area 0
R1(config-router)#end
R1#
%SYS-5-CONFIG_I: Configured from console by console
```

```
R2>en
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 10.1.100.0 0.0.0.255 area 0
R2(config-router)#network 10.1.100.0 0.0.0.255 area 0
00:37:27: %OSPF-5-ADJCHG: Process 1, Nbr 10.1.1.1 on Serial0/1/0 from LOADING to FULL,
Loading Done

R2(config-router)#network 10.1.200.0 0.0.0.255 area 0
R2(config-router)#
00:37:53: %OSPF-5-ADJCHG: Process 1, Nbr 10.1.1.1 on FastEthernet0/0 from LOADING to
FULL, Loading Done

R2(config-router)#end
R2#
%SYS-5-CONFIG_I: Configured from console by console
```

```
R3(config-if)#router ospf 1
R3(config-router)#network 10.1.200.0 0.0.0.255 area 0
R3(config-router)#
00:33:16: %OSPF-5-ADJCHG: Process 1, Nbr 10.1.2.1 on FastEthernet0/0 from LOADING to
FULL, Loading Done

00:33:16: %OSPF-5-ADJCHG: Process 1, Nbr 10.1.1.1 on FastEthernet0/0 from LOADING to
FULL, Loading Done
```

Step 3-> Use OSPF show commands

```
R1#sh ip ospf
 Routing Process "ospf 1" with ID 10.1.1.1
 Supports only single TOS(TOS0) routes
 Supports opaque LSA
 SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
 Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
 Number of external LSA 0. Checksum Sum 0x000000
 Number of opaque AS LSA 0. Checksum Sum 0x000000
 Number of DCbitless external and opaque AS LSA 0
 Number of DoNotAge external and opaque AS LSA 0
 Number of areas in this router is 1. 1 normal 0 stub 0 nssa
 External flood list length 0
    Area BACKBONE(0)
        Number of interfaces in this area is 2
        Area has no authentication
        SPF algorithm executed 6 times
        Area ranges are
        Number of LSA 4. Checksum Sum 0x0213c1
        Number of opaque link LSA 0. Checksum Sum 0x000000
        Number of DCbitless LSA 0
        Number of indication LSA 0
        Number of DoNotAge LSA 0
        Flood list length 0
 --More--
```

```
R1#sh ip ospf neighbor


Neighbor ID     Pri   State           Dead Time   Address         Interface
10.1.2.1          0   FULL/  -        00:00:33    10.1.100.2      Serial0/1/0
10.1.2.1          1   FULL/BDR        00:00:39    10.1.200.2      FastEthernet0/0
10.1.3.1          1   FULL/DROTHER    00:00:30    10.1.200.3      FastEthernet0/0
R1#
```

```
R1#sh ip ospf int fa0/0

FastEthernet0/0 is up, line protocol is up
  Internet address is 10.1.200.1/24, Area 0
  Process ID 1, Router ID 10.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 10.1.1.1, Interface address 10.1.200.1
  Backup Designated Router (ID) 10.1.2.1, Interface address 10.1.200.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:05
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 10.1.2.1  (Backup Designated Router)
    Adjacent with neighbor 10.1.3.1
  Suppress hello for 0 neighbor(s)
R1#
```

Step 4-> Add loopback interfaces to OSPF

```
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

     10.0.0.0/24 is subnetted, 3 subnets
C       10.1.1.0 is directly connected, Loopback1
C       10.1.100.0 is directly connected, Serial0/1/0
C       10.1.200.0 is directly connected, FastEthernet0/0
```

```
R1(config)#router ospf 1
R1(config-router)#network 10.1.1.0 0.0.0.255 area 0
R1(config-router)#^Z
R1#
%SYS-5-CONFIG_I: Configured from console by console
```

```
R2>en
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#network 10.1.2.0 0.0.0.255 area 0
R2(config-router)#^Z
R2#
%SYS-5-CONFIG_I: Configured from console by console
```

```
R3>en
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router ospf 1
R3(config-router)#network 10.1.3.0 0.0.0.255 area 0
R3(config-router)#^Z
R3#
%SYS-5-CONFIG_I: Configured from console by console
```

```
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, 5 subnets, 2 masks
C       10.1.1.0/24 is directly connected, Loopback1
O       10.1.2.1/32 [110/2] via 10.1.200.2, 00:02:55, FastEthernet0/0
O       10.1.3.1/32 [110/2] via 10.1.200.3, 00:01:12, FastEthernet0/0
C       10.1.100.0/24 is directly connected, Serial0/1/0
C       10.1.200.0/24 is directly connected, FastEthernet0/0

R1#
```

```
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, 5 subnets, 2 masks
O       10.1.1.1/32 [110/2] via 10.1.200.1, 00:06:26, FastEthernet0/0
C       10.1.2.0/24 is directly connected, Loopback2
O       10.1.3.1/32 [110/2] via 10.1.200.3, 00:02:14, FastEthernet0/0
C       10.1.100.0/24 is directly connected, Serial0/1/0
C       10.1.200.0/24 is directly connected, FastEthernet0/0
```

```
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, 5 subnets, 2 masks
O       10.1.1.1/32 [110/2] via 10.1.200.1, 00:06:51, FastEthernet0/0
O       10.1.2.1/32 [110/2] via 10.1.200.2, 00:04:23, FastEthernet0/0
C       10.1.3.0/24 is directly connected, Loopback3
O       10.1.100.0/24 [110/65] via 10.1.200.2, 00:17:43, FastEthernet0/0
                      [110/65] via 10.1.200.1, 00:17:43, FastEthernet0/0
C       10.1.200.0/24 is directly connected, FastEthernet0/0

R3#
```

```
R1#en
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int lo1
R1(config-if)#ip ospf network point-to-point
R1(config-if)#
```

```
R2#en
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int lo2
R2(config-if)#ip ospf network point-to-point
R2(config-if)#
```

```
R3#en
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#int lo3
R3(config-if)#ip ospf network point-to point
                                        ^
% Invalid input detected at '^' marker.

R3(config-if)#ip ospf network point-to-point
R3(config-if)#
```

```
R1#sh ip ospf int fa0/0

FastEthernet0/0 is up, line protocol is up
  Internet address is 10.1.200.1/24, Area 0
  Process ID 1, Router ID 10.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 10.1.1.1, Interface address 10.1.200.1
  Backup Designated Router (ID) 10.1.2.1, Interface address 10.1.200.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:01
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 10.1.2.1  (Backup Designated Router)
    Adjacent with neighbor 10.1.3.1
  Suppress hello for 0 neighbor(s)
R1#
```

Step 5-> Modify OSPF link cost

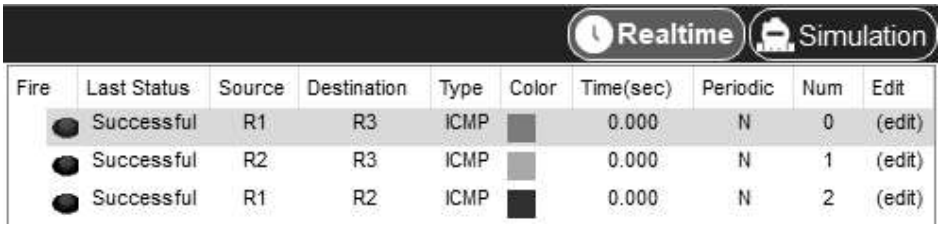
```
R1#en
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int fa0/0
R1(config-if)#ip ospf cost 50
R1(config-if)#
```

```
R2#en
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int lo2
R2(config-if)#ip ospf network point-to-point
R2(config-if)#int fa0/0
R2(config-if)#ip ospf cost 50
R2(config-if)#
```

```
R3#en
R3#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#int fa0/0
R3(config-if)#ip ospf cost 50
R3(config-if)#
```

```
R1#sh ip ospf int fa0/0

FastEthernet0/0 is up, line protocol is up
  Internet address is 10.1.200.1/24, Area 0
  Process ID 1, Router ID 10.1.1.1, Network Type BROADCAST, Cost: 50
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 10.1.1.1, Interface address 10.1.200.1
  Backup Designated Router (ID) 10.1.2.1, Interface address 10.1.200.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:06
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 10.1.2.1  (Backup Designated Router)
    Adjacent with neighbor 10.1.3.1
  Suppress hello for 0 neighbor(s)
R1#
```



Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	R1	R3	ICMP		0.000	N	0	(edit)
	Successful	R2	R3	ICMP		0.000	N	1	(edit)
	Successful	R1	R2	ICMP		0.000	N	2	(edit)

Step 6-> Modify interface priorities

```
R2#sh ip ospf int fa0/0

FastEthernet0/0 is up, line protocol is up
  Internet address is 10.1.200.2/24, Area 0
  Process ID 1, Router ID 10.1.2.1, Network Type BROADCAST, Cost: 50
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 10.1.1.1, Interface address 10.1.200.1
  Backup Designated Router (ID) 10.1.2.1, Interface address 10.1.200.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:08
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 10.1.1.1  (Designated Router)
    Adjacent with neighbor 10.1.3.1
  Suppress hello for 0 neighbor(s)
R2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int fa0/0
R2(config-if)#ip ospf priority 5
```

```
R2#sh ip ospf int fa0/0

FastEthernet0/0 is up, line protocol is up
  Internet address is 10.1.200.2/24, Area 0
  Process ID 1, Router ID 10.1.2.1, Network Type BROADCAST, Cost: 50
  Transmit Delay is 1 sec, State BDR, Priority 5
  Designated Router (ID) 10.1.1.1, Interface address 10.1.200.1
  Backup Designated Router (ID) 10.1.2.1, Interface address 10.1.200.2
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:04
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 2, Adjacent neighbor count is 2
    Adjacent with neighbor 10.1.1.1  (Designated Router)
    Adjacent with neighbor 10.1.3.1
  Suppress hello for 0 neighbor(s)
R2#
```