

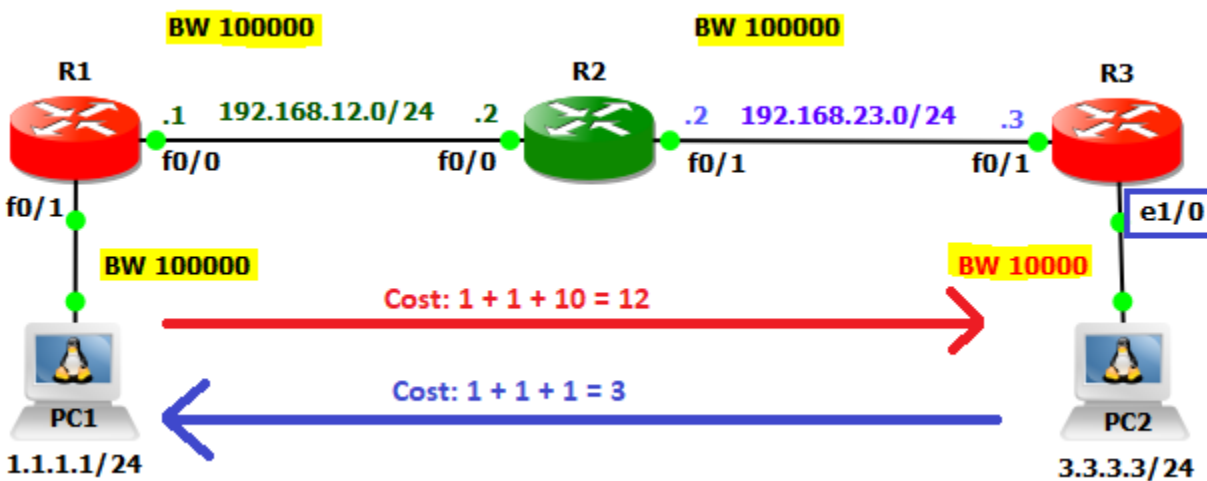
OSPF Metric:

OSPF uses a metric called **cost**, which is based on the bandwidth of an interface.

Cost = Reference Bandwidth / Interface Bandwidth

the reference bandwidth is a default value on Cisco routers which is a **100Mbit (10⁸)** interface. Which is equal of 100 Mbps. Divide the reference bandwidth by the bandwidth of the interface and get the cost. The lower the cost the better the path is. In route, that has lowest cumulative cost value between source and destination will be selected for routing table. If two paths are equal cost, OSPF will use both paths and will load balance among them 50/50.

Default Cost of Interfaces			
Interface Type	Bandwidth	Metric Calculation	Cost
Ethernet Link	10Mbps	$100000000/10000000 = 10$	10
FastEthernet Link	100Mbps	$100000000/100000000 = 1$	1
Serial Link	1544Kbps	$100000000/1544000 = 64.76$	64
Gigabyte Link	1 Gbps		1
10 Gigabit Link	10 Gbps		1
40 Gigabit Link	40 Gbps		1
100 Gigabit Link	100 Gbps		1



From PC1 to PC2 total OSPF cost is **12** because in the way one Ethernet link which is connected between R3 to PC2. **Cost is counting from outgoing interfaces to reach destination**. Therefore, from PC1 to PC2 OSPF total cost is cost is 12 of R1, R2 and R3 outgoing interfaces.

```
R1#show ip route ospf
```

```
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP  
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
```

```
Gateway of last resort is not set
```

```
3.0.0.0/24 is subnetted, 1 subnets  
O 3.3.3.0 [110/12] via 192.168.12.2, 00:12:49, FastEthernet0/0  
O 192.168.23.0/24 [110/2] via 192.168.12.2, 00:12:49, FastEthernet0/0
```

```
R1#show ip ospf int f0/0 | sec Cost
```

```
Process ID 1, Router ID 192.168.12.1, Network Type BROADCAST, Cost: 1  
Topology-MTID Cost Disabled Shutdown Topology Name  
0 1 no no Base
```

```
R2#show ip ospf interface f0/1 | sec Cost
```

```
Process ID 1, Router ID 192.168.23.2, Network Type BROADCAST, Cost: 1  
Topology-MTID Cost Disabled Shutdown Topology Name  
0 1 no no Base
```

```
R3#show ip ospf interface e1/0 | sec Cost
```

```
Process ID 1, Router ID 192.168.23.3, Network Type BROADCAST, Cost: 10  
Topology-MTID Cost Disabled Shutdown Topology Name  
0 10 no no Base
```

From PC2 to PC1 total OSPF cost is 3 as all link are FastEthernet. Cost is counting from outgoing interfaces to reach destination. Therefore, from PC2 to PC1 OSPF total cost is cost is 3 of R3, R2 and R1 outgoing interfaces.

```
R3#show ip route ospf
```

```
Codes: L - local, C - connected, S - static, 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  
i - IS-IS, su - IS-IS summary, 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, + - replicated route
```

```
Gateway of last resort is not set
```

```
1.0.0.0/24 is subnetted, 1 subnets  
O 1.1.1.0 [110/3] via 192.168.23.2, 00:25:43, FastEthernet0/1  
O 192.168.12.0/24 [110/2] via 192.168.23.2, 00:25:43, FastEthernet0/1
```

```
R3#show ip ospf interface f0/1 | sec Cost
```

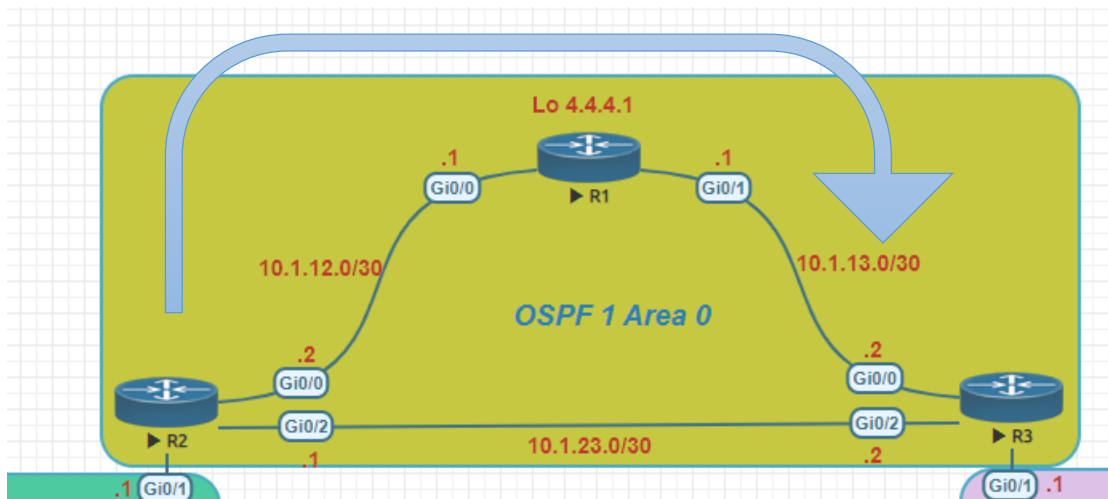
```
Process ID 1, Router ID 192.168.23.3, Network Type BROADCAST, Cost: 1  
Topology-MTID Cost Disabled Shutdown Topology Name  
0 1 no no Base
```

```
R2#show ip ospf interface f0/0 | sec Cost
```

```
Process ID 1, Router ID 192.168.23.2, Network Type BROADCAST, Cost: 1  
Topology-MTID Cost Disabled Shutdown Topology Name  
0 1 no no Base
```

```
R1#show ip ospf int f0/1 | sec Cost
```

```
Process ID 1, Router ID 192.168.12.1, Network Type BROADCAST, Cost: 1  
Topology-MTID Cost Disabled Shutdown Topology Name  
0 1 no no Base
```



```
R2#show ip route ospf
Codes: L - local, C - connected, S - static, 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
       i - IS-IS, su - IS-IS summary, 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, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override, p - overrides from Pfr
```

Gateway of last resort is not set

```
10.0.0.0/8 is variably subnetted, 8 subnets, 2 masks
O       10.1.13.0/30 [110/2] via 10.1.23.2, 01:09:24, GigabitEthernet0/2
O IA    10.1.35.0/30 [110/2] via 10.1.23.2, 01:09:24, GigabitEthernet0/2
```

```
R2#show ip ospf interface g0/0 | sec Cost
Process ID 1, Router ID 2.2.2.2, Network Type BROADCAST, Cost: 1
Topology-MTID      Cost      Disabled      Shutdown      Topology Name
0                  1         no           no           Base
```

```
R1#show ip ospf interface g0/1 | sec Cost
Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
Topology-MTID      Cost      Disabled      Shutdown      Topology Name
0                  1         no           no           Base
```

```
R2#show interfaces g0/0 | sec BW
MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
reliability 255/255, txload 1/255, rxload 1/255
```

```
R1#show interfaces g0/1 | sec BW
MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
reliability 255/255, txload 1/255, rxload 1/255
```

To find out Reference bandwidth type the command Show ip ospf

```
R1#show ip ospf
Routing Process "ospf 1" with ID 1.1.1.1
Start time: 00:03:58.437, Time elapsed: 00:01:14.254
Supports only single TOS(TOS0) routes
Supports opaque LSA
Supports Link-local Signaling (LLS)
Supports area transit capability
Supports NSSA (compatible with RFC 3101)
Supports Database Exchange Summary List Optimization (RFC 5243)
Event-log enabled, Maximum number of events: 1000, Mode: cyclic
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msec
Minimum hold time between two consecutive SPFs 10000 msec
Maximum wait time between two consecutive SPFs 10000 msec
Incremental-SPF disabled
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msec
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msec
Retransmission pacing timer 66 msec
EXCHANGE/LOADING adjacency limit: initial 300, process maximum 300
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
Number of areas transit capable is 0
External flood list length 0
IETF NSF helper support enabled
Cisco NSF helper support enabled
Reference bandwidth unit is 100 mbps
Area BACKBONE(0) (Inactive) ..
```

