

OSPF Configuration – Process ID



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

- Different interfaces on a router can run in different instances of OSPF.
- Different instances have different Link State Databases
- Only one instance is typically configured on OSPF routers – multiple Process IDs are very rarely used
- The Process ID is locally significant. It does not have to match on the neighbour router to form an adjacency

OSPF Configuration – Process ID

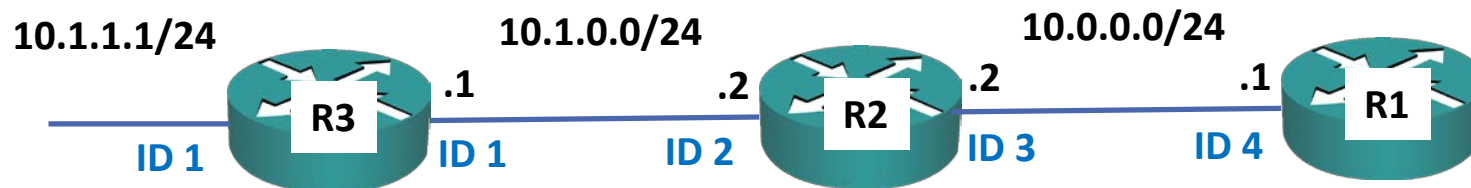
- In the example below, R2 will form adjacencies with both R1 and R3 (even though the Process ID does not match on both sides)
- R1 and R3 will not learn each others routes because they are in different Process IDs on R2
- **This is NOT a normal configuration**

```
R2(config)#router ospf 2
```

```
R2(config-router)#network 10.0.0.0 0.0.0.255 area 0
```

```
R2(config)#router ospf 3
```

```
R2(config-router)#network 10.1.0.0 0.0.0.255 area 0
```



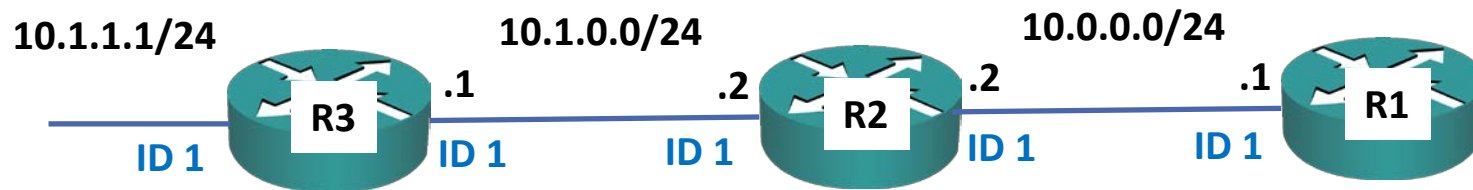
OSPF Configuration – Process ID

- This is a normal configuration. All routers will learn all routes

```
R2(config)#router ospf 1
```

```
R2(config-router)#network 10.0.0.0 0.0.0.255 area 0
```

```
R2(config-router)#network 10.1.0.0 0.0.0.255 area 0
```



OSPF Configuration - network



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

```
R1(config-router)#network 10.0.0.0 0.0.255.255 area 0
```

- The network command uses a wildcard mask which is the inverse of a subnet mask.
- Subtract each octet in the subnet mask from 255 to calculate the wildcard mask
- A subnet mask of 255.255.0.0 equals a wildcard mask of 0.0.255.255
- A subnet mask of 255.255.255.252 equals a wildcard mask of 0.0.0.3

OSPF Configuration - network



```
R1(config)#router ospf 1
R1(config-router)#network 10.0.0.0
% Incomplete command.
```

- The command does not default to using the classful boundary
- You must enter a wildcard mask

OSPF Configuration - network



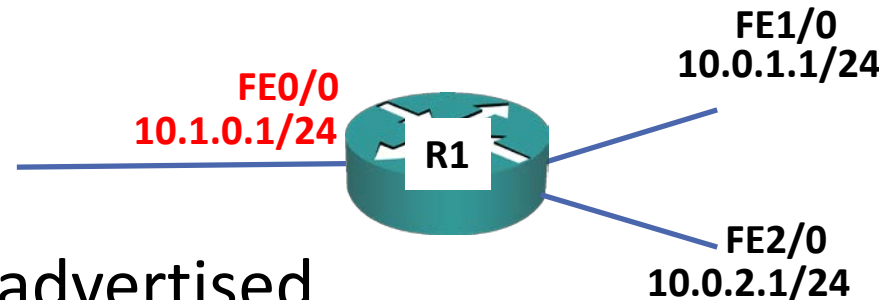
```
R1(config-router)# network 10.0.0.0 0.0.255.255 area 0
```

- The network command means:
 - Look for interfaces with an IP address which falls within this range.
 - Enable OSPF on those interfaces – send out and listen for OSPF hello messages, and peer with adjacent OSPF routers.
 - Advertise the network and mask which is configured on those interfaces.

OSPF Configuration Example - network

```
R1(config-router)# network 10.0.0.0 0.0.255.255 area 0
```

- Interface FE1/0 and FE2/0 fall within this range, FE0/0 does not
- OSPF will be enabled on FE1/0 and FE2/0 and the router will peer with adjacent OSPF routers
- Networks advertised:
 - 10.0.1.0/24
 - 10.0.2.0/24
 - 10.1.0.0/24 is NOT advertised
 - 10.0.0.0/16 is NOT advertised



OSPF Verification – show run | section ospf

```
R1#sh run | section ospf
router ospf 1
  network 10.0.0.0 0.255.255.255 area 0
```


OSPF Verification – show ip protocols

```
R1#show ip protocols
*** IP Routing is NSF aware ***
```



```
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 10.0.3.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.0.0.0 0.0.255.255 area 0
  Routing Information Sources:
    Gateway          Distance      Last Update
    10.1.1.2          110          00:00:33
    10.1.0.2          110          00:01:12
    10.1.3.2          110          00:00:21
    203.0.113.1      110          00:00:11
  Distance: (default is 110)
```

OSPF Verification – show ip ospf interface brief

```
R2#show ip ospf interface brief
```

Interface F/C	PID	Area	IP Address/Mask	Cost	State	Nbrs
Fa0/0	1	0	10.0.0.2/24	1	DR	1/1

OSPF Operations

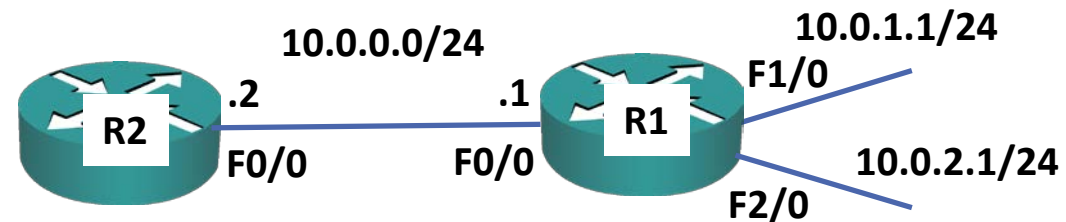


- 1. Discover neighbours**
- 2. Form adjacencies**
3. Flood Link State Database (LSDB)
4. Compute Shortest Path
5. Install best routes in routing table
6. Respond to network changes

OSPF Verification - show ip ospf neighbor

```
R2#show ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
10.0.2.1	1	FULL/BDR	00:00:35	10.0.0.1	FastEthernet0/0



OSPF Operations



1. Discover neighbours
2. Form adjacencies
- 3. Flood Link State Database (LSDB)**
4. Compute Shortest Path
5. Install best routes in routing table
6. Respond to network changes

OSPF Verification - show ip ospf database

```
R2#show ip ospf database
```

```
OSPF Router with ID (10.1.0.2) (Process ID 1)
```

```
Router Link States (Area 0)
```

Link ID	ADV Router	Age	Seq#	Checksum	Link count
10.0.3.1	10.0.3.1	102	0x80000004	0x009015	4
10.1.0.2	10.1.0.2	109	0x80000004	0x00AA37	2
203.0.113.1	203.0.113.1	463	0x80000003	0x000846	3

```
Net Link States (Area 0)
```

Link ID	ADV Router	Age	Seq#	Checksum
10.0.0.2	10.1.0.2	550	0x80000001	0x00A065
10.1.1.1	203.0.113.1	495	0x80000001	0x00EEB3
10.1.3.1	203.0.113.1	463	0x80000001	0x00F2AB

OSPF Operations



1. Discover neighbours
2. Form adjacencies
3. Flood Link State Database (LSDB)
4. **Compute Shortest Path**
5. **Install best routes in routing table**
6. Respond to network changes

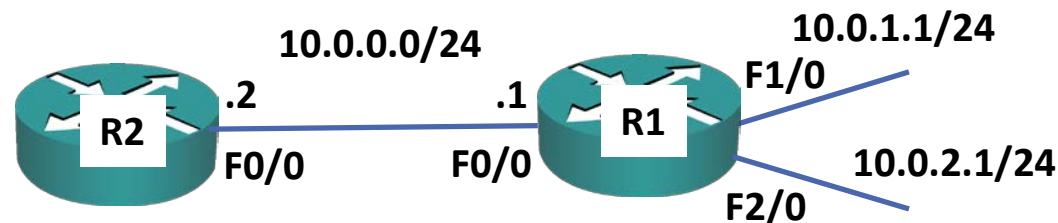
OSPF Verification - show ip route

```
R2#show ip route
```

```
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  
+ - replicated route, % - next hop override
```

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

```
10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks  
C      10.0.0.0/24 is directly connected, FastEthernet0/0  
L      10.0.0.2/32 is directly connected, FastEthernet0/0  
O      10.0.1.0/24 [110/2] via 10.0.0.1, 00:07:11, FastEthernet0/0  
O      10.0.2.0/24 [110/2] via 10.0.0.1, 00:07:11, FastEthernet0/0
```



Lab

