

OSPF Network Types

The three types of networks defined by OSPF are:

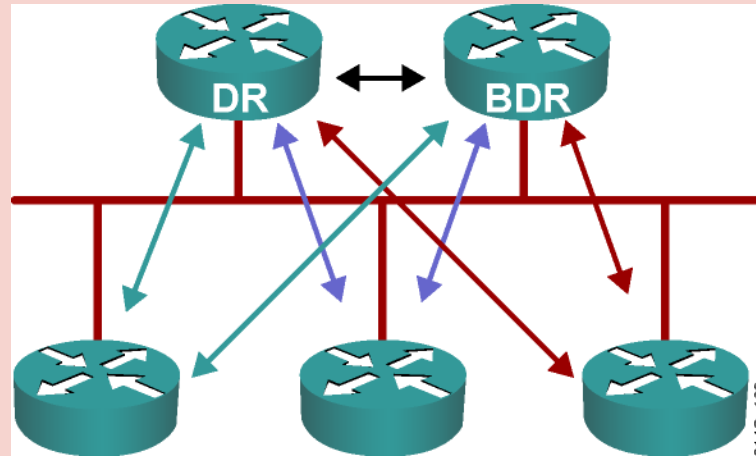
- **Point-to-point: A network that joins a single pair of routers.**
- **Broadcast: A multiaccess broadcast network, such as Ethernet.**
- **Nonbroadcastmultiaccess (also called NBMA): A network that interconnects more than two routers but that has no broadcast capability. Frame Relay, ATM, and X.25 are examples of NBMA networks.**
 - **Five modes of OSPF operation are available for NBMA networks.**

Point-to-Point Links



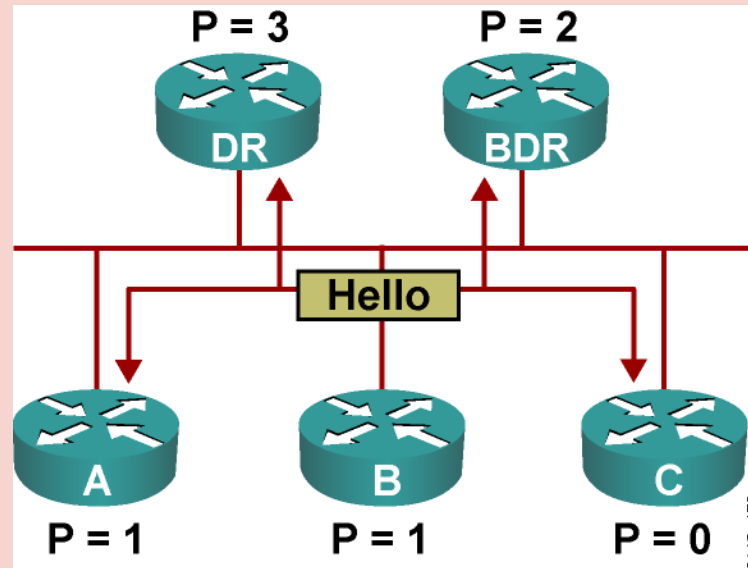
- Usually a serial interface running either PPP or HDLC.
- May also be a point-to-point subinterface running Frame Relay or ATM.
- No DR or BDR election required.
- OSPF autodetects this interface type.
- OSPF packets are sent using multicast 224.0.0.5.

Multiaccess Broadcast Network



- Generally these are, LAN technologies like Ethernet and Token Ring.
- DR and BDR selection are required.
- All neighbor routers form full adjacencies with the DR and BDR only.
- Packets to the DR and the BDR use 224.0.0.6.
- Packets from DR to all other routers use 224.0.0.5.

Electing the DR and BDR



- Hello packets are exchanged via IP multicast.
- The router with the highest OSPF priority is selected as the DR. The router with the second-highest priority value is the BDR.
- Use the OSPF router ID as the tiebreaker.
- The DR election is nonpreemptive.

Setting Priority for DR Election

Router(config-if) #

```
ip ospf priority number
```

- This interface configuration command assigns the OSPF priority to an interface.
- Different interfaces on a router may be assigned different values.
- The default priority is 1. The range is from 0 to 255.
- 0 means the router cannot be the DR or BDR.
- A router that is not the DR or BDR is DROTHER.

NBMA Topology

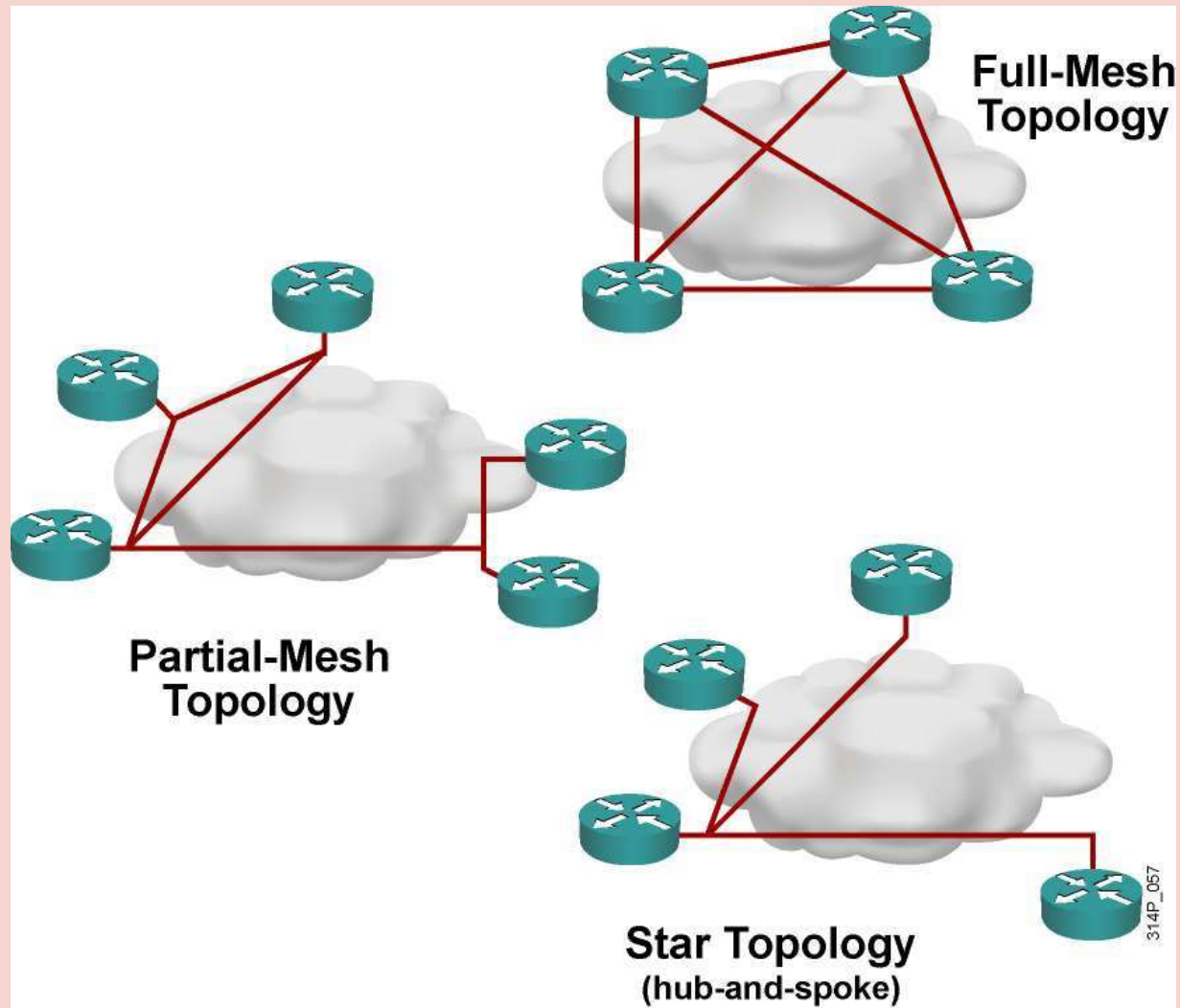


- A single interface interconnects multiple sites.
- NBMA topologies support multiple routers, but without broadcasting capabilities.

DR Election in NBMA Topology

- **OSPF considers NBMA to be like other broadcast media.**
- **The DR and BDR need to have fully meshed connectivity with all other routers, but NBMA networks are not always fully meshed.**
- **The DR and BDR need a list of neighbors.**
- **OSPF neighbors are not automatically discovered by the router.**

Frame Relay Topologies



OSPF over NBMA Topology Modes of Operation

- RFC compliant modes are as follows:
- Nonbroadcast (NBMA)
- Point-to-multipoint
- Additional modes from Cisco are as follows:
- Point-to-multipoint nonbroadcast
- Broadcast
- Point-to-point

Selecting the OSPF Network Type for NBMA Networks

```
Router(config-if)#
```

```
ip ospf network [{broadcast | non-broadcast | point-to-  
multipoint [non-broadcast] | point-to-point}]
```

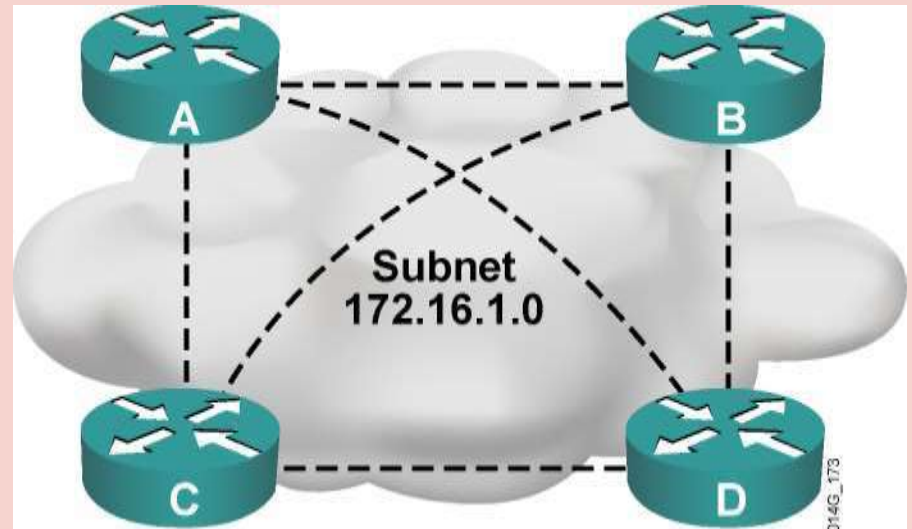
- Defines OSPF network type

Example: Broadcast Mode

```
Router(config)#interface serial 0/0/0  
Router(config-if)#encapsulation frame-relay  
Router(config-if)#ip ospf network broadcast
```

Nonbroadcast Mode (NBMA Mode)

- Treated as a broadcast network by OSPF (acts like a LAN).
- All serial ports are part of the same IP subnet.
- Frame Relay, X.25, and ATM networks default to nonbroadcast mode.
- Neighbors must be statically configured.
- Duplicates LSA updates.
- Complies with RFC 2328



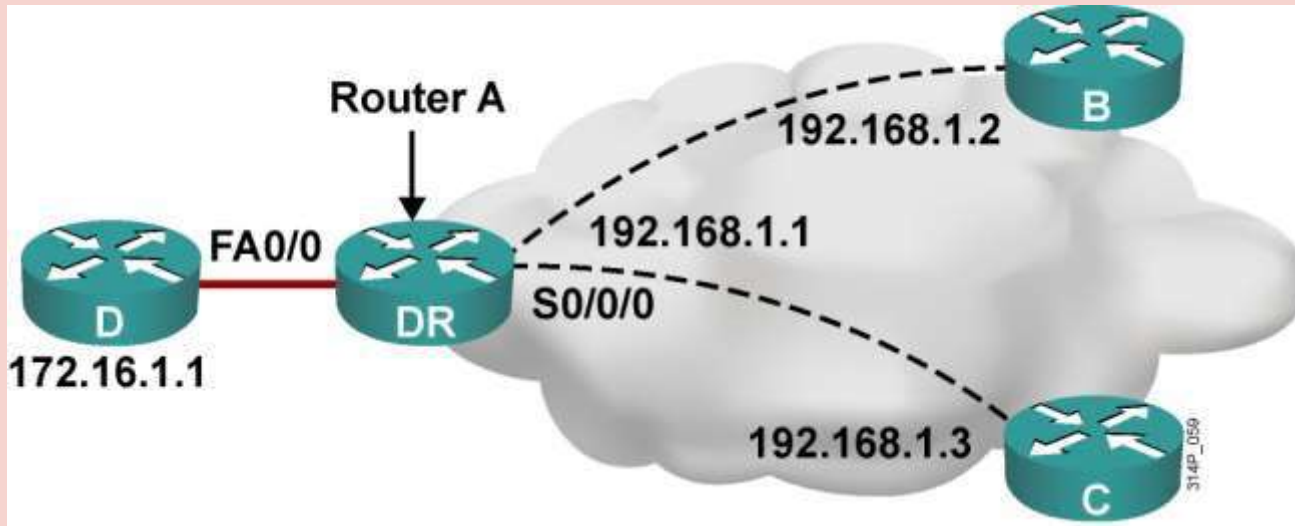
Using the neighbor Command

Router (config-router) #

```
neighbor ip-address [priority number] [poll-interval  
number] [cost number] [database-filter all]
```

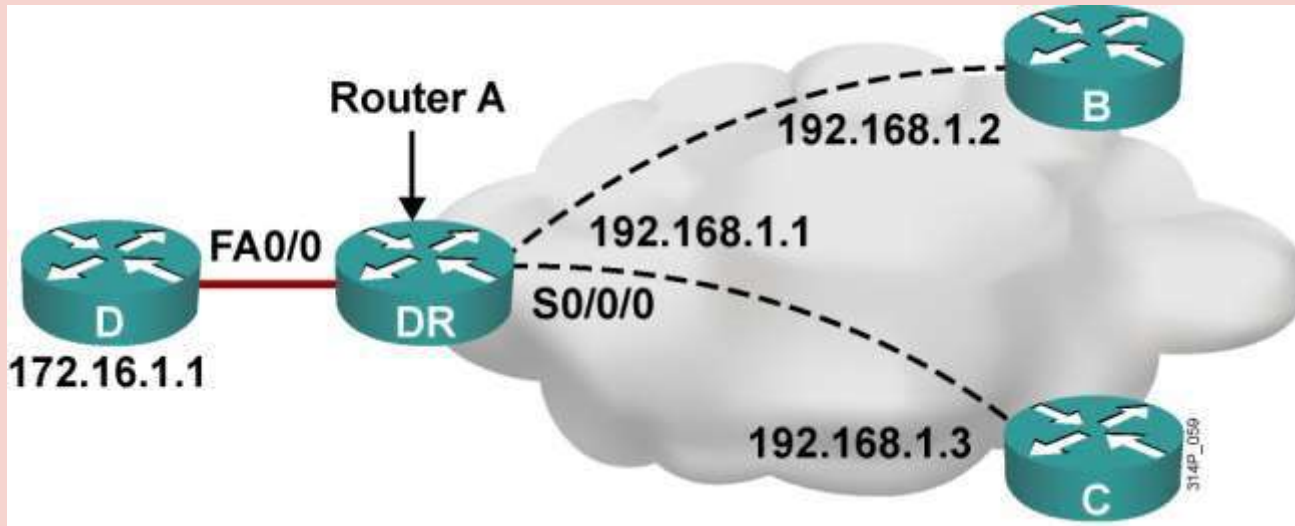
- Used to statically define neighbor relationships in an NBMA network

neighbor Command Example



```
RouterA(config)# router ospf 100
RouterA(config-router)# network 192.168.0.0 0.0.255.255 area 0
RouterA(config-router)# neighbor 192.168.1.2 priority 0
RouterA(config-router)# neighbor 192.168.1.3 priority 0
RouterA(config-router)# network 172.16.0.0 0.0.255.255 area 0
```

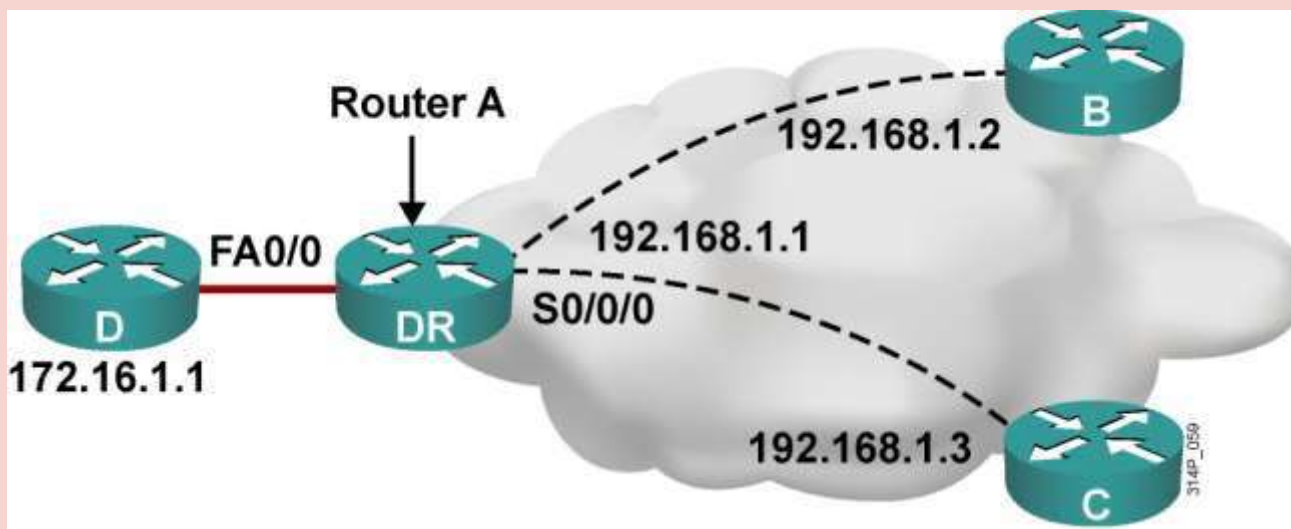
The show ip ospf neighbor Command



```
RouterA# show ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
192.168.1.3	0	FULL/DROTHER	00:01:57	192.168.1.3	Serial0/0/0
192.168.1.2	0	FULL/DROTHER	00:01:33	192.168.1.2	Serial0/0/0
172.16.1.1	1	FULL/BDR	00:00:34	172.16.1.1	FastEthernet0/0

Point-to-Multipoint Mode



- The point-to-multipoint mode allows for NBMA networking.
- The point-to-multipoint mode fixes partial-mesh and star topologies.
- No DR is required and only a single subnet is used.
- A 30-second hello is used.
- This mode is RFC compliant.

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