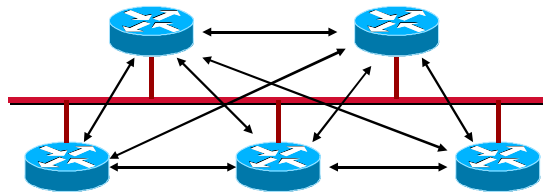# OSPF – Multiaccess Networks

The IETF Routing Master
Part 3

1

# Broadcast Multi-Access Media (1)

- **When several OSPF routers have access to the same Ethernet segment they would create n(n-1)/2 adjacencies**
- **Furthermore, SPF algorithm requires to represent a fully meshed network as tree**

Consider the flooding process after establishment of each adjacency!!! The formation of an adjacency between every attached router would create a lot of unnessesary LSAs. Arouter would flood an LSA to all its adjacent neighbours, creating many copies of the same LSA on the same network.

# Broadcast Multi-Access Media (2)

- **Solution: Elect one "Designated Router" (DR) to represent the whole LAN segment**
  - **Election uses the Hello protocol**
- **DR sends Network LSA**
  - **List of all local routers**
  - **Ensures that every router on the link has the same topology database**
  - **Also contains subnet mask (!)**
- **Each other router establishes an adjacency only to the DR**
  - **Using "All DR" multicast address 224.0.0.6**
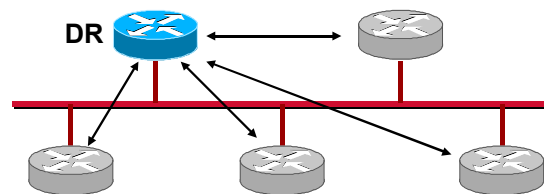
To prevent the problems described in the previous slide, a Designated Router (DR) is elcted on a multi-access network. DR is responsible for representation of the multi-access network and all the routers on it to the rest of network and management of flooding process on a multi-access network. The network itself becomes a "pseudonode" on the graph. The pseudonode is represented by the DR.

All other routers peer with the DR, which informs them of any changes on the segment.

**Note:** For LAN segments, the Router LSA does NOT contain the subnet mask. The subnet mask for this LAN segment is also carried inside the Network LSA.

# Broadcast Multi-Access Media (3)

- **Only the DR will send LSAs to the rest of the network**
- **For backup purposes also a Backup DR is elected (BDR)**
  - **All routers also establish adjacencies to the BDR**
  - **BDR itself also establishes adjacency to DR**
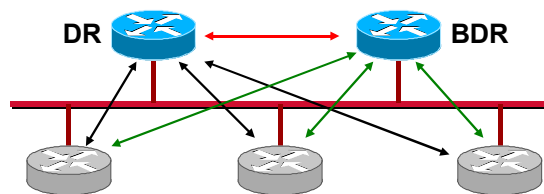
The network itself becomes a "pseudonode" on the graph. The pseudonode is represented by the DR.

Each multi-access interface has a "Router Priority" ranging from 0 to 255 (default 1). Routers with a priority of 0 cannot become DR or BDR. The election process is performed with Hello packets which carry the priority. If some routers have the same priority, the one with the highest numerical Router ID wins. If a DR fails the BDR becomes active immediately (Hello stays out) and a new election for the BDR is started.

Note: After election of DR and BDR, adding a new router with higher priority will not replace them. The first two routers immediately become DR and BDR. The only way to control the election is to set the priority for all other routers ("DROTHER") to zero, so they cannot become DR or BDR.

# Router ID

- **Each router is a node in the graph (link state database) and identified by a Router ID**
- **Automatically selected via hello process**
  - **Choose numerically highest IP address of all loopback interfaces**
  - **If no loopback interfaces then choose highest IP address of physical interfaces**
  - **Optionally, on Cisco routers, a priority value can be configured (0…no DR/BDR, 255…max chance to win, 1… default)**
  - **Hello packet contains DR**

Note that loopback interfaces are more stable than any physical interface. Furthermore it's easier for an administrator to manage the network using loopback addresses for Router-IDs.

If there is more than one router on the segment with the same priority level, the election process picks the router with the highest router ID. The default priority on a Cisco router is 1.

# DR/BDR Election Process

- **Election process starts if no DR/BDR listed in the hello packets during the init state (i. e. when two routers begin to establish an adjacency)**
  - **Note: if already one DR/BDR chosen, any new router in the LAN would not change anything!**
  - **Therefore, the power-on order of routers is critical !!!**
- **Always configure loopback interface in order to "name" your routers**
  - **Loopback interface never goes down**
  - **Ensures stability**
  - **Simple to manage**

It is recommended in OSPF to use the loopback interfaces for router ID. You shold configure a loopback interface first and then start the OSPF process, otherwise the highest ip address from a physical interface will be taken.