

Introduction Computer Systems

Lecture 7

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Types of Network

- There are basically two types of network based on whether the network contains switching elements or not. These are Point-to-Point network and Broadcast network.

- **Point-to-Point**

Network or Switch Network Point-to-Point networks consist of many connections between individual pairs of machines. To go from the source to the destination, a packet on this type of network may have to first visit one or more intermediate machine routers. When a packet is sent from one router to another intermediate router, the entire packet is stored at each intermediate router, till the output line is free and then forwarded. A subnet using this principle is called Point-to-Point or Packet switched network. Some possible topologies for a Point-to-Point subnet are:

Star

- In a star topology, each device has a dedicated Point-to-Point link only to a central controller, usually called a hub. These devices are not linked to each other. If one device wants to send data to another, it sends to the hub which then relays the data to the other connected devices. In a star, each device needs only one link and one I/O Port to connect it to any number of other devices. This factor makes it easy to install and configure. Far less cabling need to be housed and additions, moves and deletions involve only one connection between that device and the hub.

Tree

- A tree topology is a variation of a star. As in a star modes in a tree are linked to a central hub that controls the traffic to the network. However, not every device plugs directly into the central hub. The majority of devices connect to a secondary hub that in turn is connected to the central hub. The advantages and disadvantages of a tree topology are generally the same as those of stars. The addition of secondary hubs, however, brings two further advantages. First, it allows more devices to be attached to a single central hub and can, therefore, increase the distance a signal can travel between devices. Second, it isolates the network and prioritizes communication from different computers.

Ring

- In a ring topology, each device has a dedicated Point-to-Point line configuration only, with the two devices on either side of it. A signal is passed along the ring in one direction from device to device, until it reaches its destination. Each device in the ring incorporates a repeater. When a device receives a signal intended for another device, its repeater regenerates the bits and passes them along. A ring is relatively easy to install and reconfigure. Each device is linked to its immediate neighbours. However, unidirectional traffic can be a disadvantage. In a simple ring, a break in ring can disable the entire network. This weakness can be solved by using a dual ring or switch capable of closing off the break.

Bus

- Bus, unlike other topologies, is a multi-point configuration. One long cable acts as a backbone to link all the devices in the network. Advantages of a bus topology include ease of installation. A disadvantage includes difficult reconfiguration and fault isolation.

Broadcast Networks

- Broadcast networks have a single communication channel that is shared by all the machines on the network. Short messages, called packets, sent by any machine are received by all the others. An address field within the packet specifies for whom it is intended. Upon receiving a packet, a machine checks the address field. If the packet is intended for itself, it processes the packet; if the packet is intended for some other machine, it is just ignored. Broadcast systems generally also allow the possibility of addressing a packet to all destinations by using a special code in the address field. When a packet with this code is transmitted, it is received and processed by every machine on the network, and this mode of operation is called broadcasting.

- Some broadcast systems also support transmission to a subset of the machines, something known as multicasting. One possible scheme is to reserve one bit multicasting. The remaining $(n-1)$ address bits can hold a group number. Each machine can “subscribe” to any or all of the groups. When a packet is sent to a certain group, it is delivered to all machines subscribing to that group.