

Local Area Networks

- ◆ These are private communications networks:
 - They are used to interconnect the computing resources within an organisation.
- ◆ All devices attach to a shared transmission medium.
 - They can provide data rates up to 1 Gbps:
- ◆ The rationale for interconnecting devices:
 - Proliferation of computing devices,
 - Growth in multimedia applications,
 - Increased in client/server applications.

Local Area Networks

- ◆ LANs can be classified according to:
 - Their topology/layout e.g. ring, star, bus...,
 - The type of transmission medium used e.g. ThickNet, Thinnet...
 - How they access the shared Tx medium (aka as Access Control) e.g. CSMA, Token...
- ◆ There are three broad types of LANs:
 - PC LANs (aka the Access Layer):
 - Used to connect low-cost devices e.g. PCs, small server devices etc.
 - Used in most organisations,
 - These LANs are cheap to implement and maintain and consequently their performance and speed is low.

Typical Applications for LANs

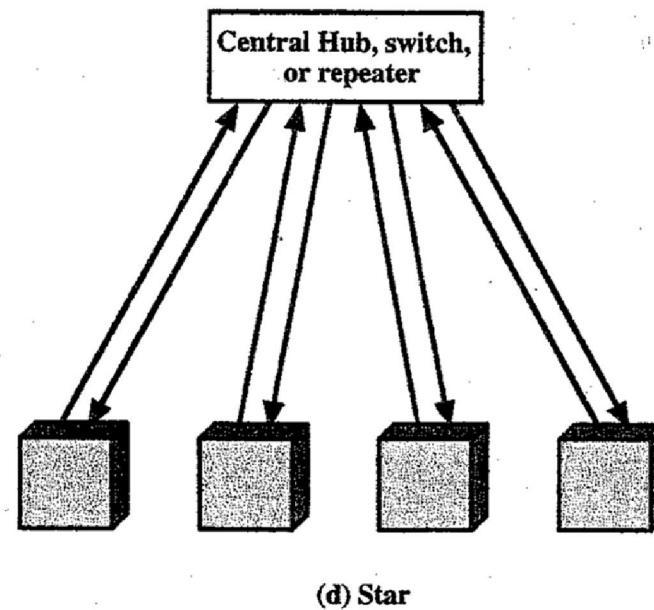
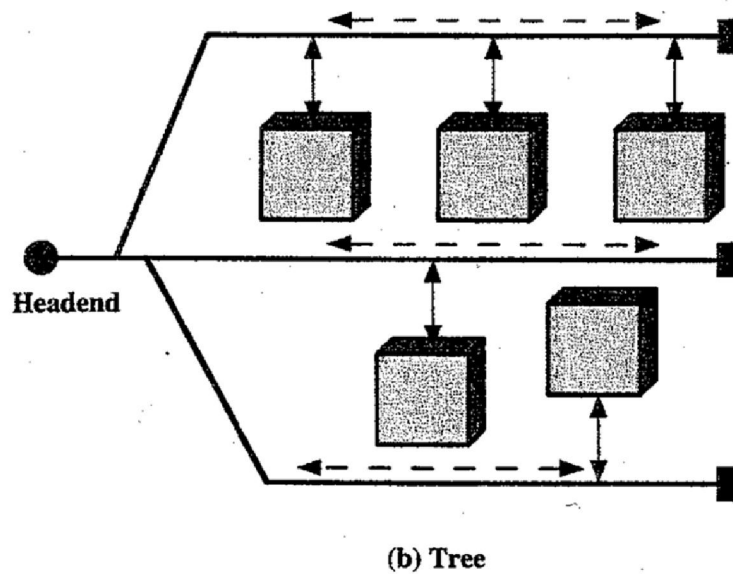
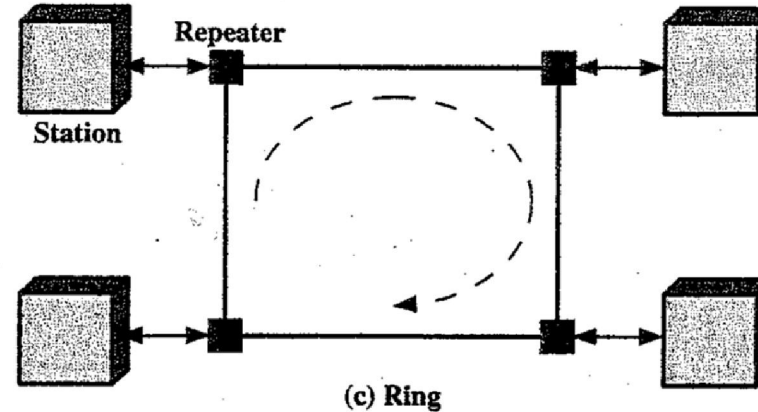
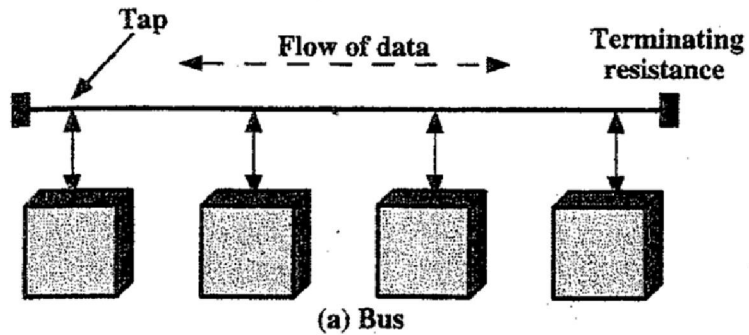
◆ Backend LANs (aka The Core Layer):

- Used to connect high-cost devices e.g. Mainframes, Supercomputers, mass storage devices,
- Mainly used for the bulk transfer of data,
- Used in large organisations,
- These LANs are costly to implement and maintain and consequently their performance and speed is high.

Typical Applications for LANs

- ◆ Backbone LANs (aka The Distribution Layer):
 - Used to provide connectivity between PC LANs and Backend LANs,
- ◆ The use of single LAN is not desirable because:
 - Reliability. If the single LAN develops a fault the effects can be devastating,
 - Capacity. More devices connecting to a LAN reduces its performance,
 - Cost. Connecting Low cost PC devices using the same type of LAN used to connect High cost server devices would be impractical.

LAN Topologies



LAN Topologies

- ◆ There are three LAN topologies to consider: ***Bus***, ***Ring*** and ***Star***.
- ◆ *Bus* LAN characteristics:
 - A *linear* transmission medium is used.
 - Each station attaches to the *bus* using a tap.
 - There are no closed loops.
 - Transmissions travel in both directions i.e. *bi-directional*, and can be seen by every attached device.
 - The bus is terminated by a *terminator* device which removes the transmission signal.
 - Example of a bus LAN is *Ethernet*.

LAN Topologies – contd.

- ◆ *Ring* LAN characteristics:
 - Consists of a set of interconnected *repeaters* (using point-to-point links) in a *ring* configuration.
 - Repeaters receive data on one link and transmit them *bit-by-bit* onto another link.
 - The links are *uni-directional*.
 - Each station attaches at a ***Repeater***.
 - The transmission signal must be physically removed from the network.
 - Example of a ring LAN is the *IBM Token Ring*.

LAN Topologies – contd.

◆ *Star* LAN characteristics:

- Consists of a central *hub* component of which there are two types:
 - *Shared-medium* hub.
 - *Switched-LAN* hub.
- Each station is attached by two links (*transmit* and *receive*).
- All transmissions travel via the Hub device.
- Example of a star LAN is an ATM.

LAN Topologies – contd.

- ◆ Common characteristics of LANs:
 - Data is transmitted in small blocks known as *frames*
 - Each frame contains Data plus Control Information (similar to HDLC).
 - Stations must gain access to the shared transmission medium:
 - Access must be provided on a fair and equitable basis i.e. there must be some controlling mechanism employed.