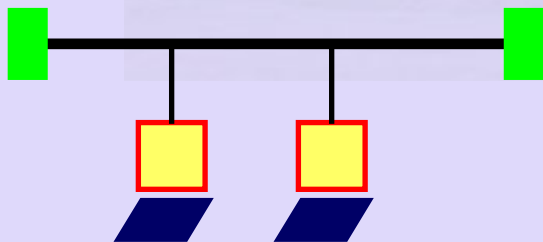# Medium Access Sublayer

- Topology of the Network
  - Bus, Ring, Tree
- Protocols
  - IEEE 802.3 for bus topology
  - IEEE 802.4 for token bus
  - IEEE 802.5 for token ring
  - FDDI – for fibre ring
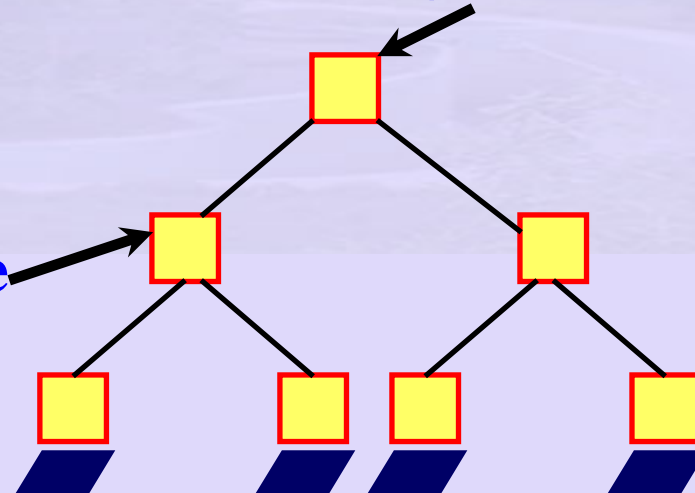 - IEEE 802.11 for wireless networks
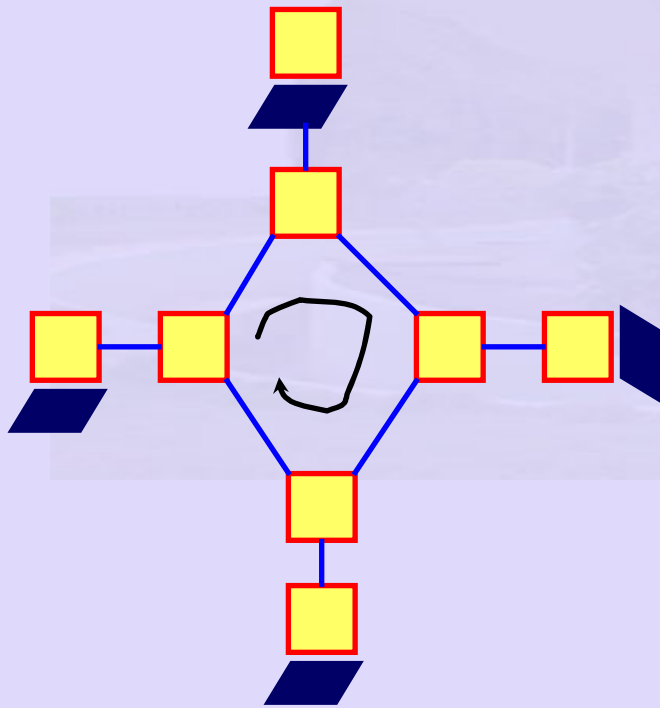
Network Topology

Tree topology:

Hubs/switches

Bus topology
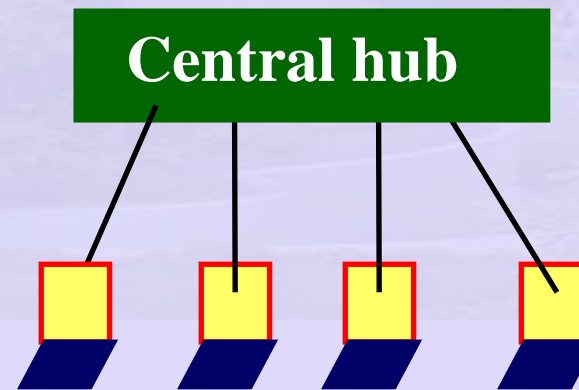
intermediate hubs

Network Topology

Ring topology
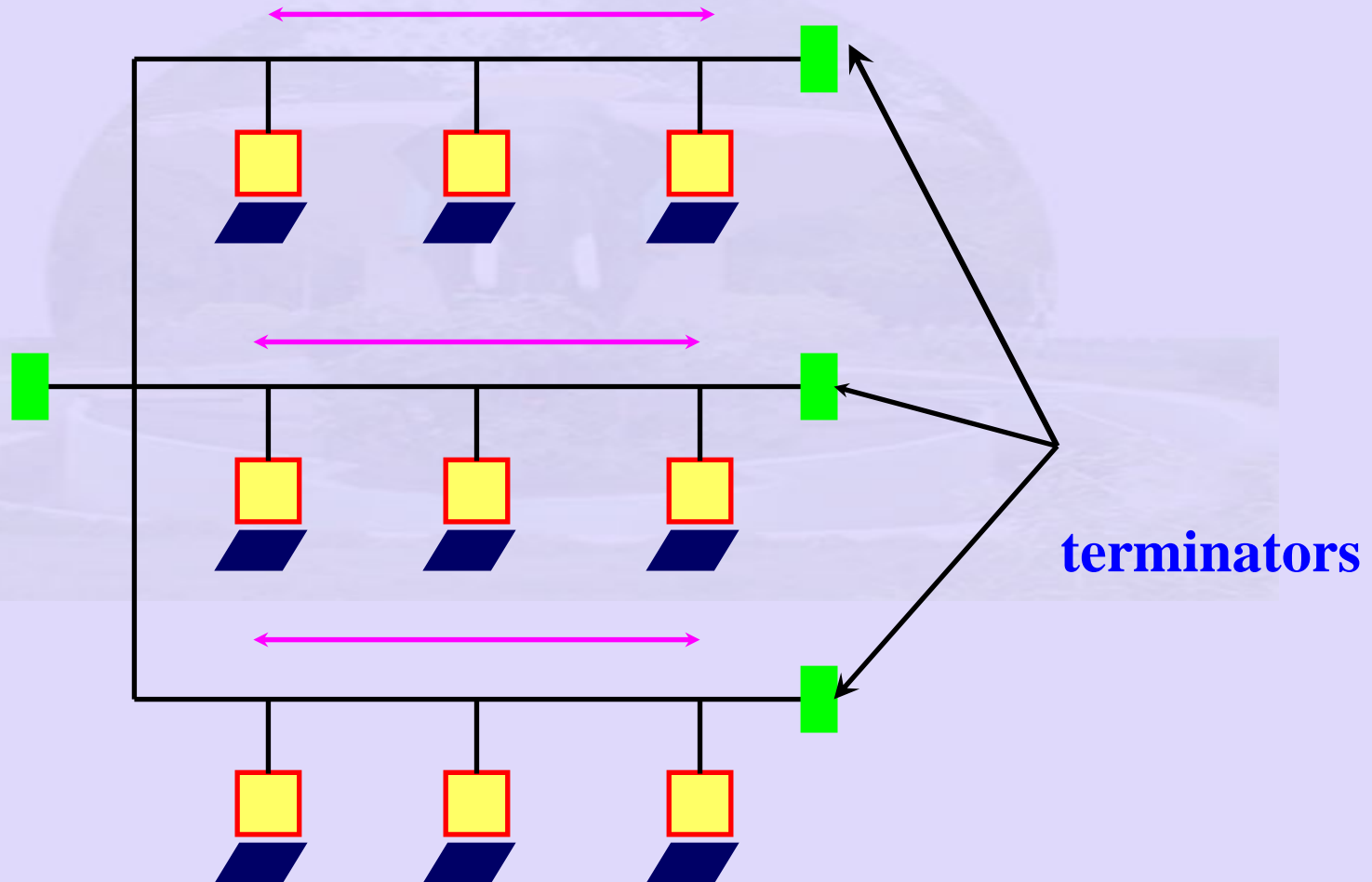
Star topology

Central hub

Network Topology

Multipoint media

terminators

Tree and Bus Topologies

- multipoint medium
  - all stations attach through appropriate hardware interface called tap directly to the medium
  - full duplex operations on the bus
  - data propagates the length of medium in both directions
  - at each end bus terminated
    - absorbs any signal ➔ removes it from the bus
  - tree has a head end
  - since data propagated to all stations – addressing required!

Star Topology

- central node acts as a broadcast

- although physically a star – logically a bus

  - alternatively central node acts as a switch. frame switching – copy frame – send out on destination link

- problem – central point failure

Ring Topology

- Repeaters joined by point to point links in a closed loop.

- no buffering

- unidirectional links

- destination recognises its frames & copies it

- frame removed by source

- In all topologies ONLY one station transmits at a time

Transmission in Networks

- Networks
  - Point-to-Point
  - Broadcast Networks
- Broadcast networks
  - Only one station transmits at a time →competition
    - who gets access to the channel
  - conference calls:
    - between six people – only one channel –
      - Who gets access?
  - multiaccess or random access channels

Broadcast Network-Solutions

- static allocation
    - wasteful of Bandwidth
        - more senders than channels

- Solution: Dynamic allocation of channels!

Key Assumption in Broadcast Networks

- Station model

  - N independent stations

  - Each user generates a frame for transmission

  - Pr[frame generated in time Δt] = $\lambda \Delta t$

  - λ arrival rate for new frame

  - Once frame generated – station blocks

    - does nothing until frame transmitted.

Key Assumption in Broadcast Networks

- Single channel assumptions:
  - Single channel for all communication
  - All stations can transmit and receive on it
  - All stations get a fair share of the channel

Key Assumption in Broadcast Networks

- Collision assumption:
  - Two frame transmit at the same time
    - signal garbled
  - All stations can detect collisions
  - A collided frame is retransmitted
  - Errors only due to collision

Key Assumption in Broadcast Networks

- Continuous time:
  - Frames can begin at any instant of time
  - No master clock dividing time into discrete intervals.
- Slotted time:
  - time divided into slots
  - frames start at the beginning of a slot
  - multiple frame / slot

Key Assumption in Broadcast Networks

- Carrier Sense:
  - Station can tell whether channel is in use
  - If carrier sensed – do not transmit
    - What is carrier sense – an electrical signal

- No carrier sense:
  - Station cannot detect carrier
  - go ahead and transmit
  - Later worry about success or failure