

Class 10

03/04/2025

DLL

- Hardware Device
 - Network Switch
 - Act as an n-dimensional cable
 - Added a CPU and Memory
- Network switch obseleted the network hub
- Memory allows the network switch to queue up messages
 - Ex. A and C try to send to D at the same time
 - A sends first and when done C starts sending
 - Can alternate the data
- Switch can detect the header and make the correct decisions
- Switch is a passive device
 - Will not send messages out on its own
 - Only fowards messages out on behalf of other devices
 - How does the switch know about the topology of the network?
 - * Switch knows it is connected to something but doesn't know what they are
 - * Uses the Switch Device Discovery Algorithm

Switch Device Discovery Algorithm

- Upon receiving a message, record SRC MAX + PHYS PORT into FIB
- Check DEST MAC for a matching record exists in FIB, FOWARDS message out on matching PHYSICAL PORT
 - else (if no record exists) fallback to hub mode, foward message to all other ports, except receiving port
- Nothing else happens

FIB = Forwarding Information Base

- Over time the network switch learns where the devices are located and records their MAC addresses and their respective port
- Will eventually map out the entire network

Switches do not have MAC addresses, doesn't need it.
Cannot assume that the last device resides on the last port.
Expiration field used to ensure that the memory is not monopolized by a MAC address that no longer exists.
Header remains the same when transmitted through multiple switches.
Two or more devices can be mapped to the same port.

WiFi

- Ethernet has a simple data and header protocol
- WiFi needs a complex protocol because of its physical properties
- Most of the messages are helper messages that deal with encryption, ensuring that you can connect, etc.

3 Major Categories:

- Management Frames
- Control Frames
- Data Frames (Traditional data and header)

Management Frame:

- Connection and disconnection with a particular network
- Beacon
 - Router constantly emits a beacon sending information for a device to connect
- Probe
 - Probing for a network that was connected to previously, to reconnect to it
- Authentication
- Association
 - After connection, allows us to interact with the network to get network resources or provide resources to other devices through the network

Control Frames

- Deals with the lossy nature of WiFi
- Acknowledgement
 - WiFi does provides reliable delivery

- Sends an acknowledgement message
 - If ethernet sends an acknowledgement the time it would take would double
- Block Ack
 - Acknowledge multiple messages with a single acknowledgement
- RTS + CTS
 - Request to send, clear to send
 - Solves hidden node problem
 - Ugly solution in contrast to CSMA
 - * Sender sends request to send
 - * Receiver sends clear to send
 - Signals to devices outside of the senders range to wait and switch to RTC + CTS
 - * CSMA is faster, the extra messages cost bandwidth and doesn't send actual data