

# FIT9137 Introduction to Computer Architecture and Networks

## Week 7: Local Area Network (LAN)



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# Learning Outcomes

- **Create/design a LAN for organisations**
- **Choose between major components of LANs, and LAN technologies including Ethernet**
- Analyse and Recommend the best practices for LAN design and improve their performance
- **Understand and use Virtual LANs**

# Why LAN?

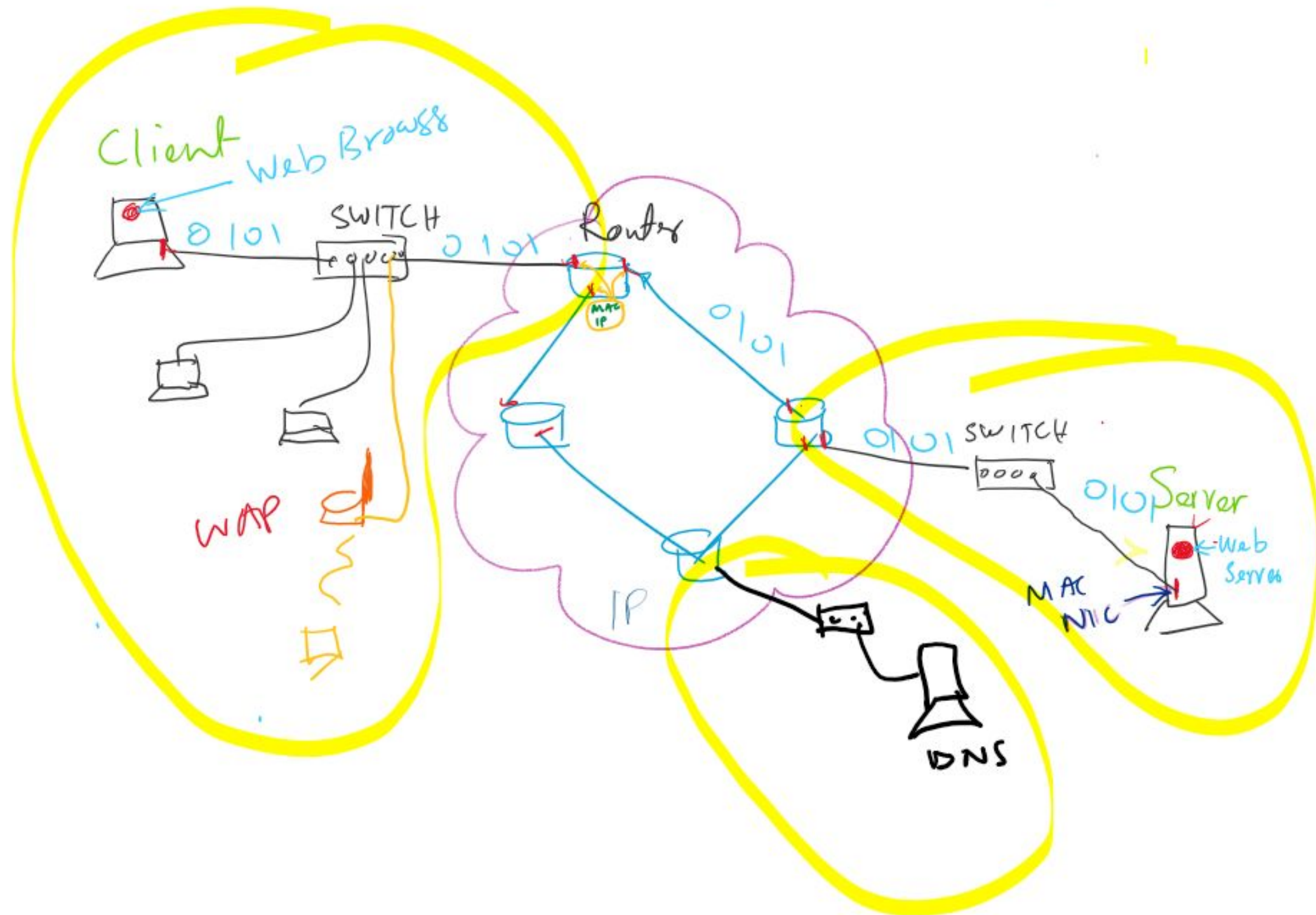
**A network of computers that are directly connected to each other**

- limited area (e.g. one building, or even one room)
- circuits owned by the organisation (not leased e.g. from telecom provider)
- can be operated without obtaining a license

## **Examples**

- a Monash lab
- your home (several computer connected to a WiFi router)
- a public WiFi access point

# Why LAN?

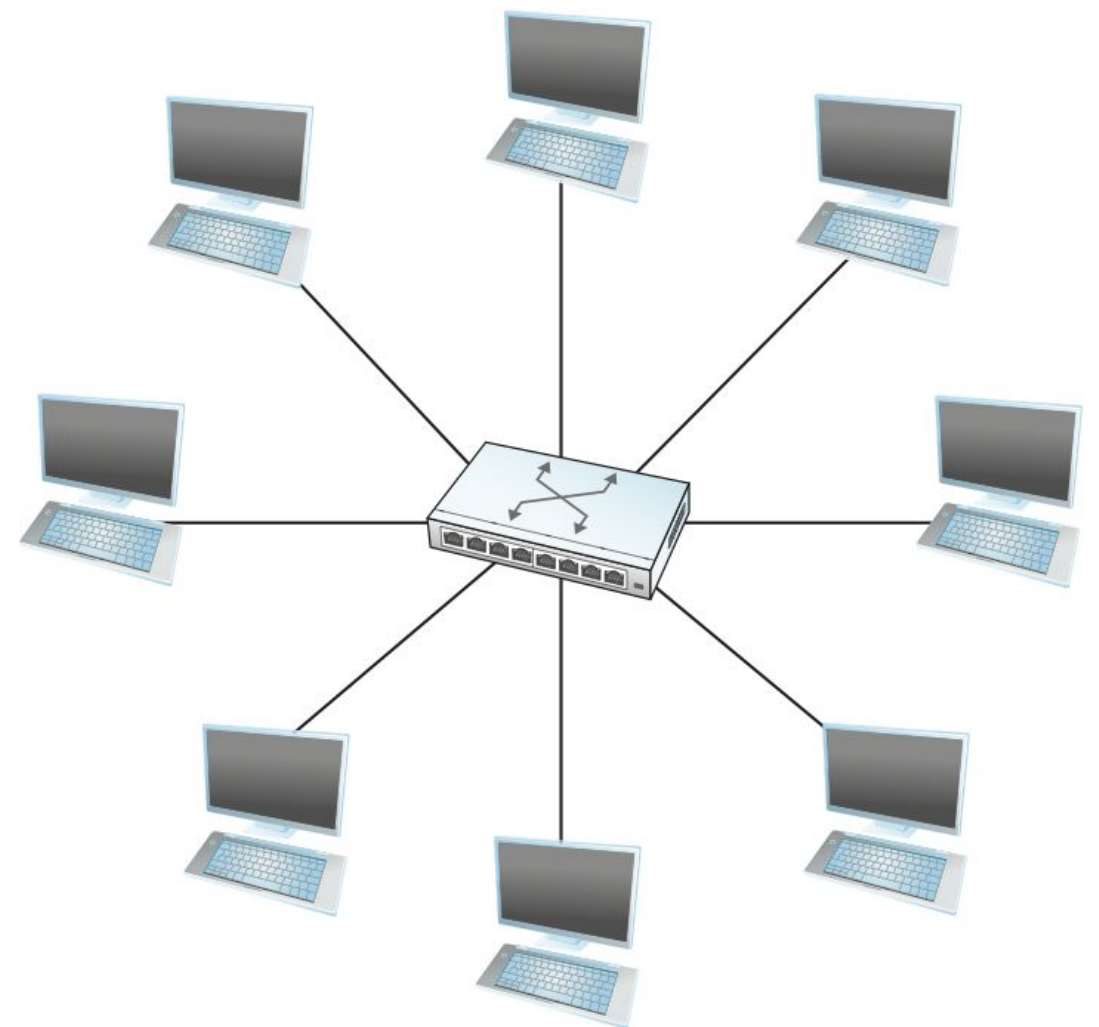




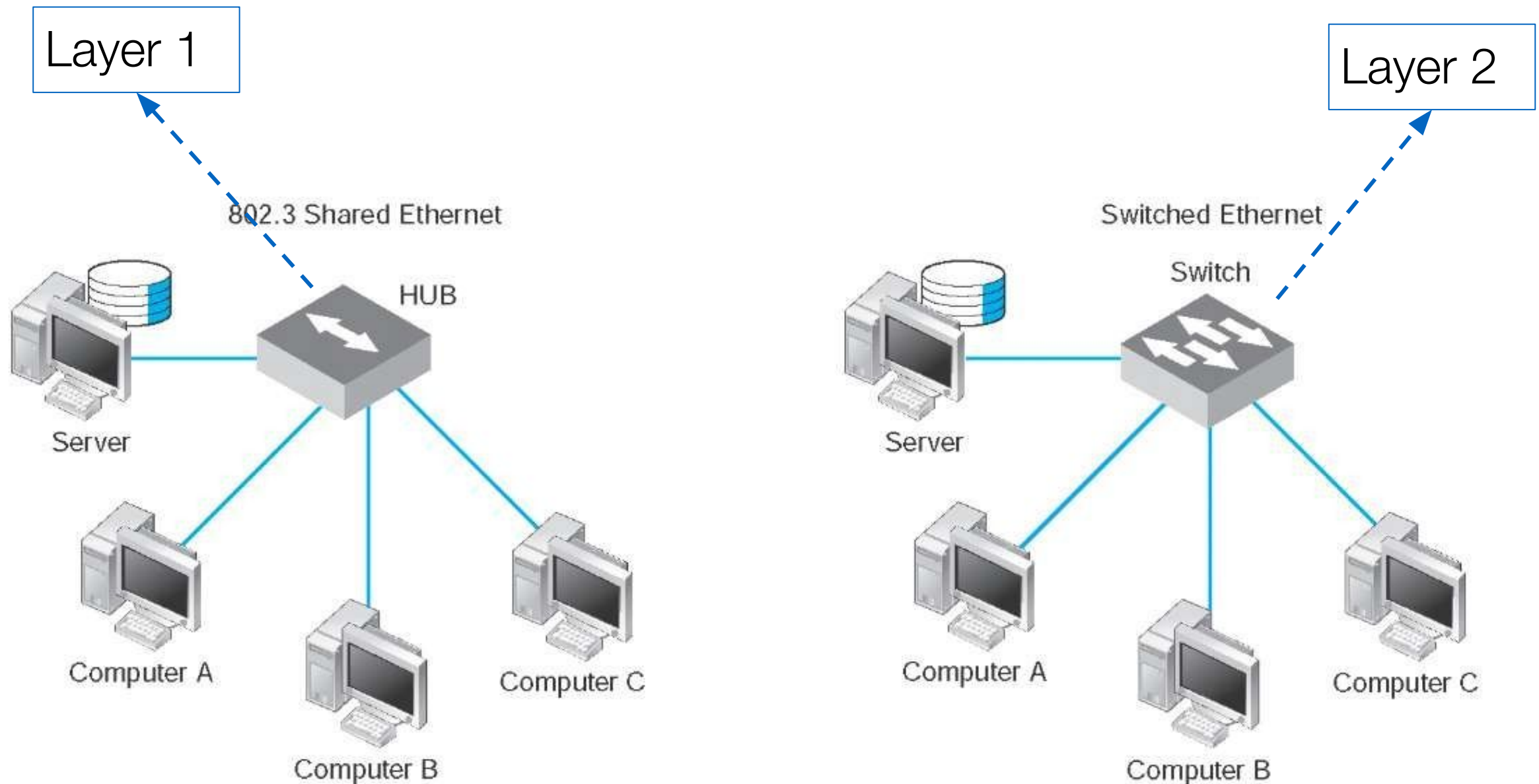
# How to create a LAN?

- **Want to:** connect multiple devices in a limited area
- Each device has a **Network Interface Card (NIC)**
- **Most typical option:** use a Switch

- **Switch:**
  - Layer 2 device
  - inspect L2 header
  - decide on where to forward data
  - Address: MAC/physical/hardware



# Shared vs Switched Ethernet



img source:

<https://what-when-how.com/data-communications-and-networking/switched-ethernet-data-communications-and-networking/>

# Switches and MAC

## Full-duplex circuits

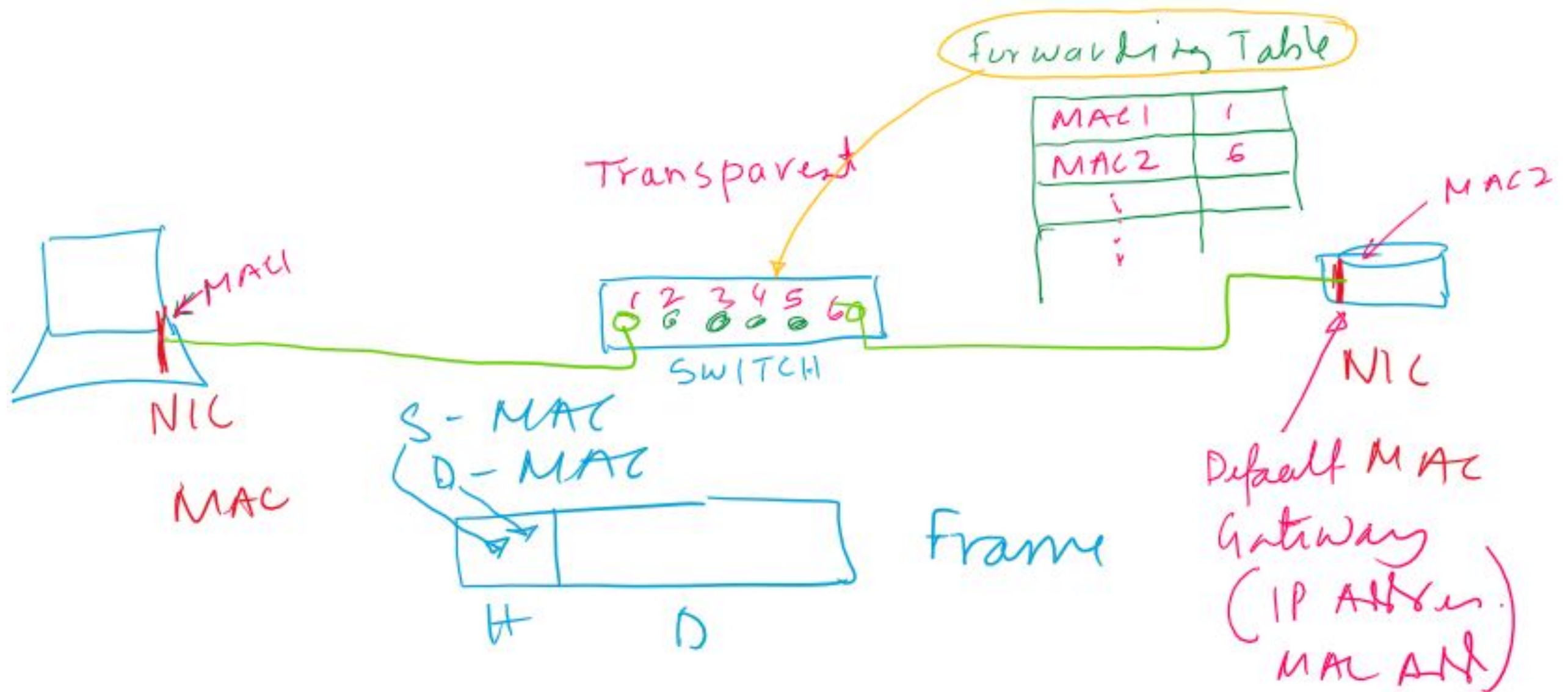
- point-to-point connection between computer and switch
- no collisions possible

## But frames may still be sent at the same time

- e.g. A sends to B while C sends to D
- or A and B both send to C simultaneously
- switch has **memory**: stores second frame until transmission of first frame is finished, then forwards the second - **store and forward**

**Switched Ethernet runs at up to 95% capacity,  
compared to 50% for shared Ethernet!**

# Switches and MAC

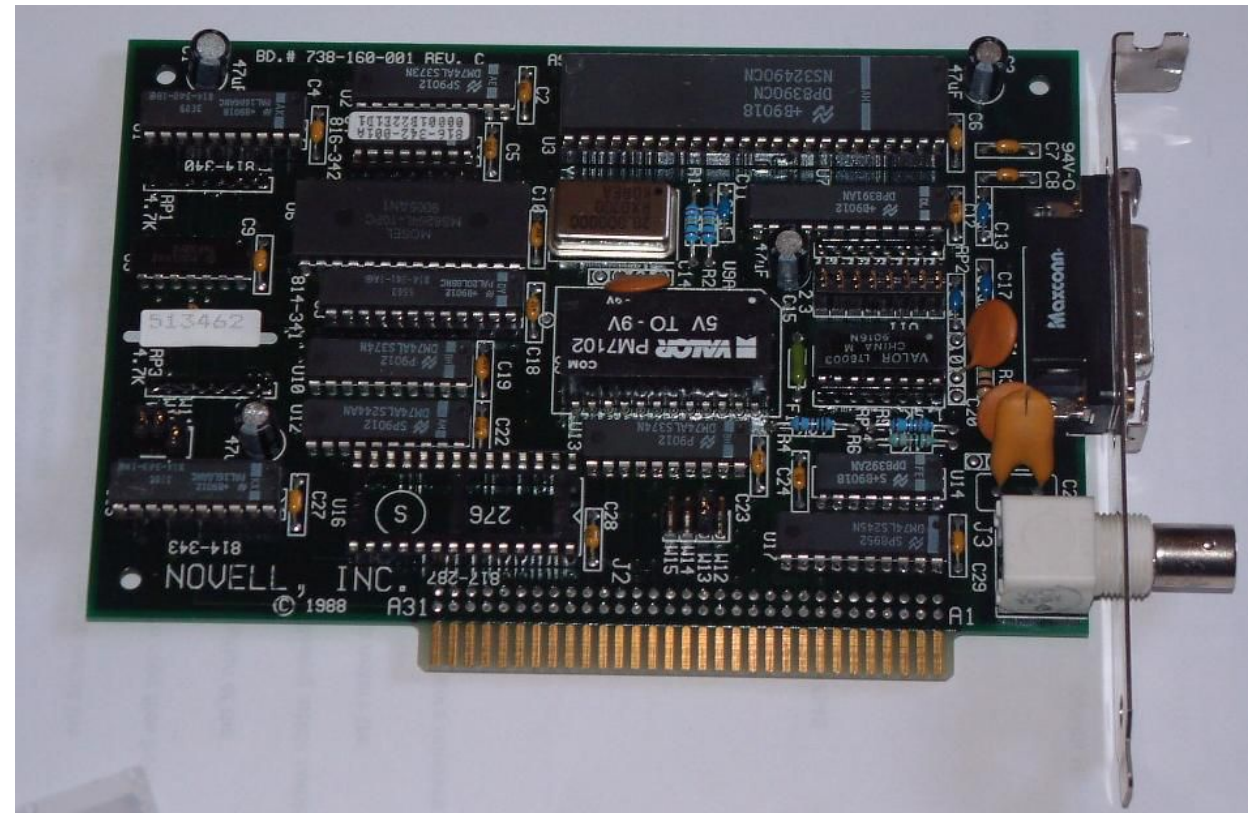




# PollEv question: Newest? Latest Technology?



1



2

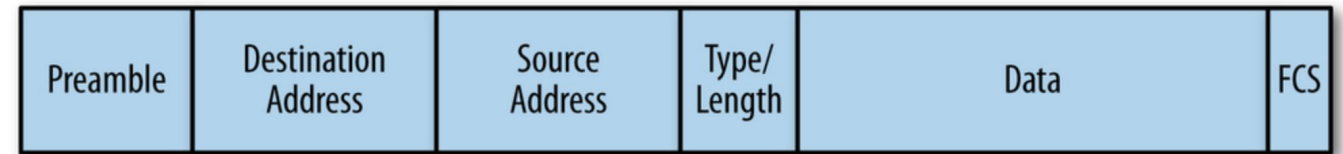


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# Modes of Switch Operations



Ethernet Frame

## Cut through switching

- transmit as soon as destination address has been read
- low latency, but may transmit frames that have errors

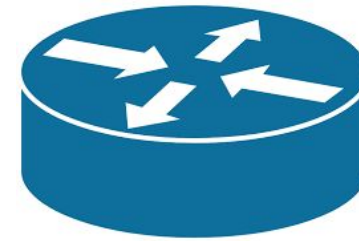
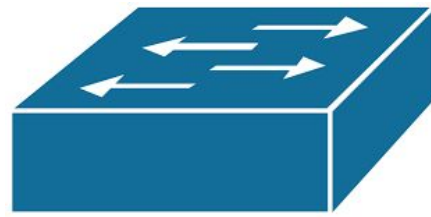
## Store and forward switching

- switch waits until entire frame is received, performs error control, then transmits
- higher latency, but less capacity wasted with errors

## Fragment free switching

- reads first 64 bytes (contains header)
- if OK, begin transmitting
- compromise between the other two approaches

# Switch vs Router



Device	Layer	Purpose	Address	Table used	Ports	Cost
Switch	2	Connect devices <b>within the same</b> network	MAC	MAC address/ Forwarding	Many (48)	Cheaper
Router	3	Connect devices <b>across different</b> networks	IP	Routing	A few (~5)	More expensive

MAC address: used to identify device in LAN; unique for each NIC

IP address: used to identify the network that the device belongs to

# Activity A

<b>Prior week</b>	Intro to networks and TCP/IP Layers
<b>Pre-class materials</b>	LAN and Wireless LAN
<b>Workshop Recap</b>	LAN, WLAN, switch & router
<b>Workshop Activity B</b>	Design a LAN in CORE
<b>Upcoming assessments</b>	Network design & analysis



# Question: Switch vs Router

What is the **difference** between a **forwarding table** and a **routing table**? (multiple correct answers, you can click multiple options)

1. A forwarding table uses the **MAC address**, a routing table uses the **IP address**
2. Forwarding tables can contain **multiple destinations per port**, routing tables only one
3. Routing tables **connect different subnets**
4. Forwarding tables **change when the network changes**, routing tables **don't**
5. Routing tables are set up **by hand**, forwarding is **automatic**