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Royal University of Phnom Penh

Data Communication I

Chapter 1.2 : Networks

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Outline

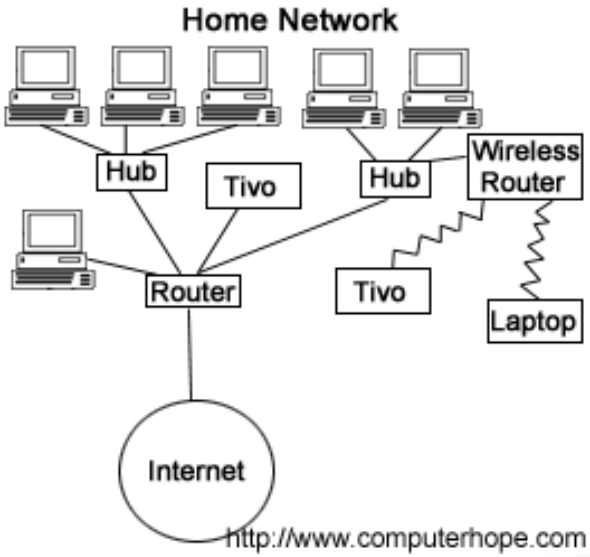
- What is Networks?
- Network Criteria
- Physical Structures
- Network Categories
- NIC
- Router, Hub, Switch
- Mainframes and Supercomputers

Networks

- A **Network** is a group of two or more computing devices that can communicate for the purpose of sharing data.
- Networks are built with a mix of computer hardware and computer software.

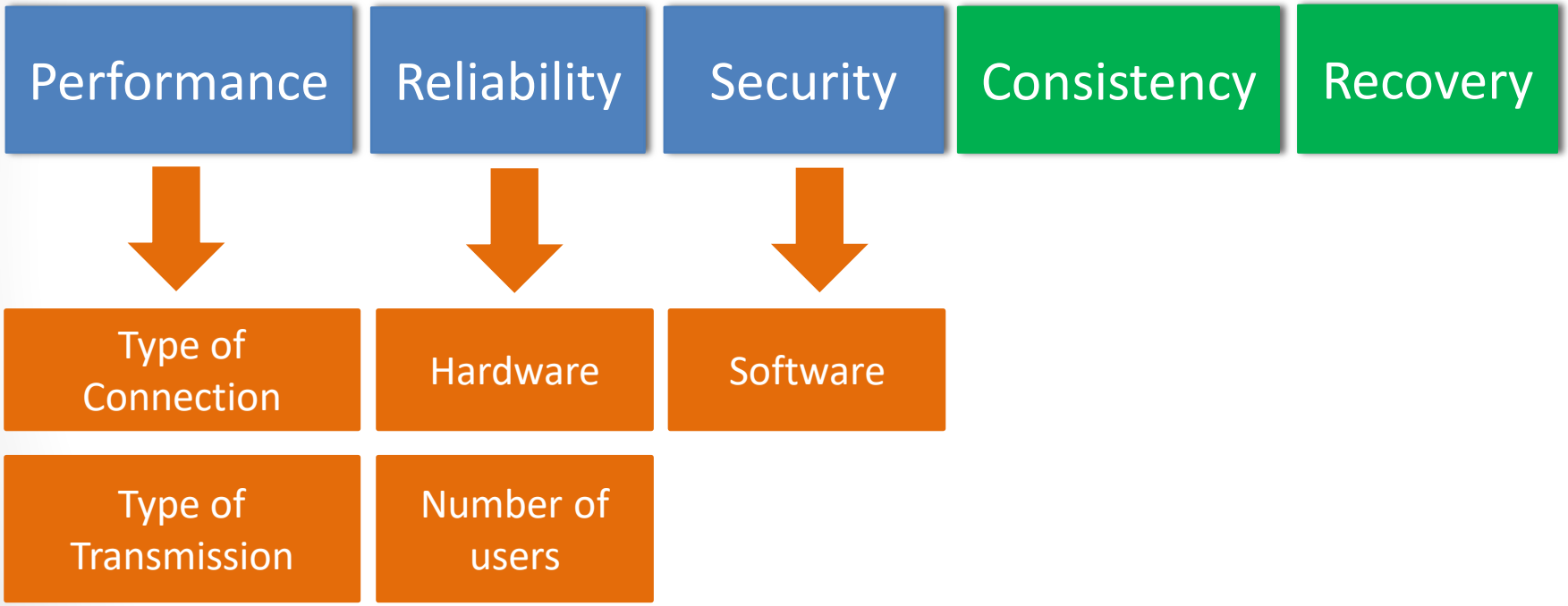
In this section, we will focus on the following:

- ✓ Network Criteria
- ✓ Physical Structures
- ✓ Categories of Networks



Network Criteria

The major criteria of networking are:



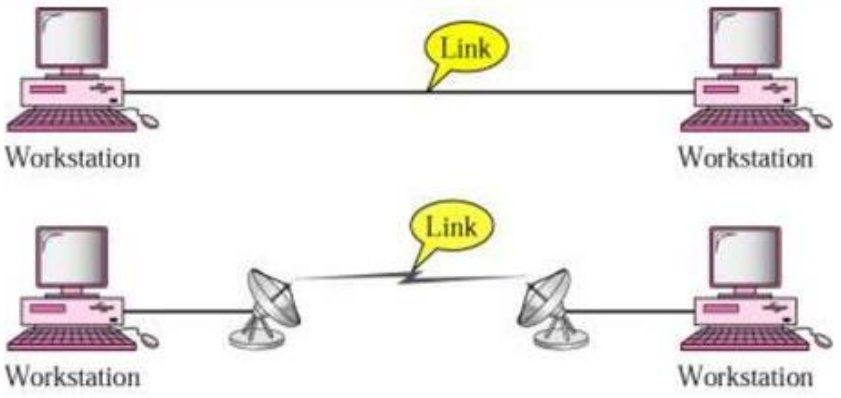
Physical Structures

1. **Type of Connection**
   - Point to Point - single transmitter and receiver
   - Multipoint - multiple recipients of single transmission
2. **Topology**
   - Connection of devices

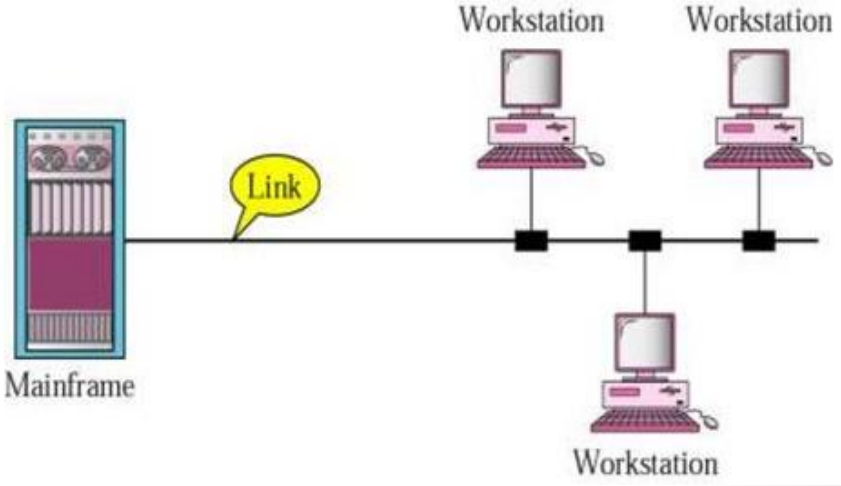
Physical Structures

1. Type of Connection

- Point to point
  - A dedicated link is provided between two devices



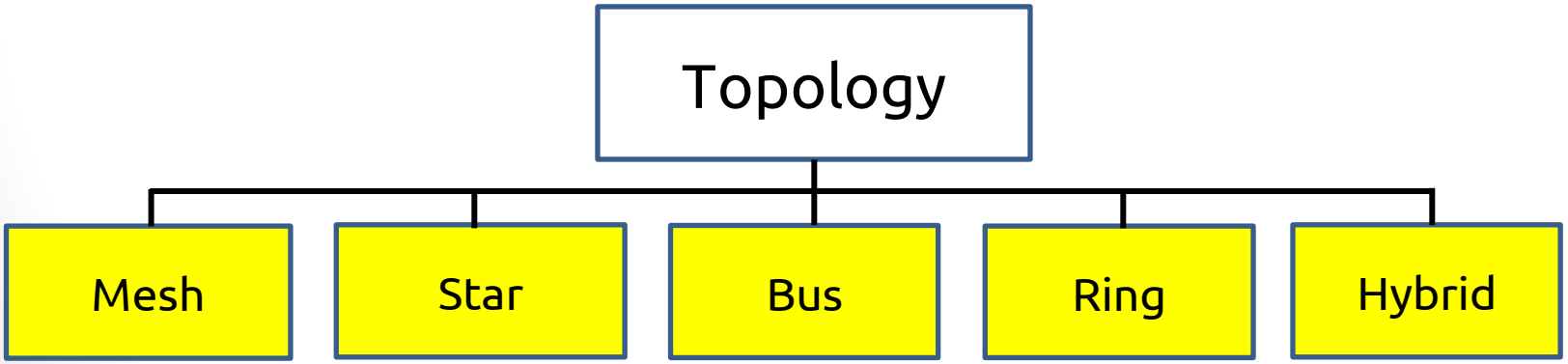
- Multipoint
  - More than two specific devices share a single link



Physical Structures

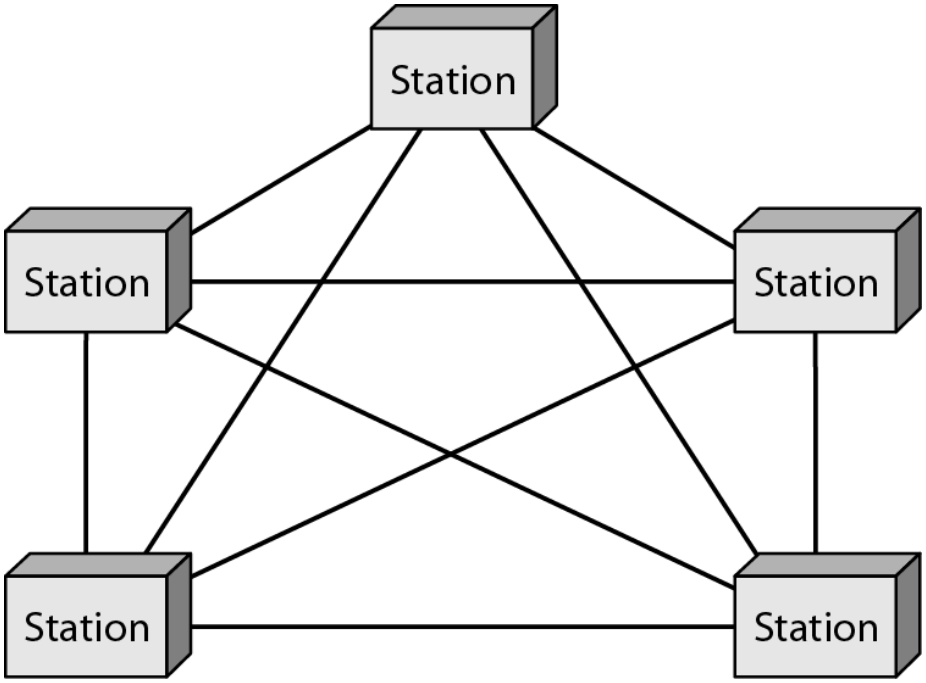
2. Topology

Topology describes the layout or appearance of a network. It's the way in which the wires can be run in the network to link with the computers.



Topology

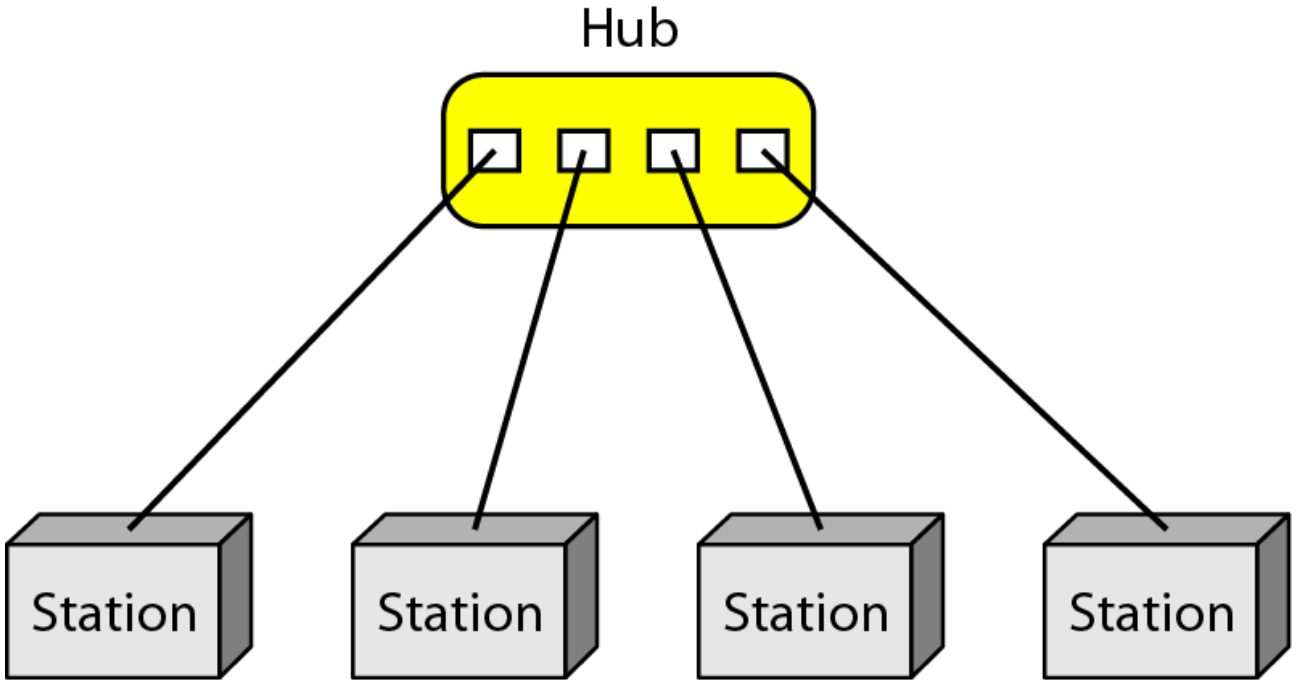
a. Mesh Topology



- A mesh topology has multiple direct connections between each station
- The internet is an example of a Mesh network

Topology

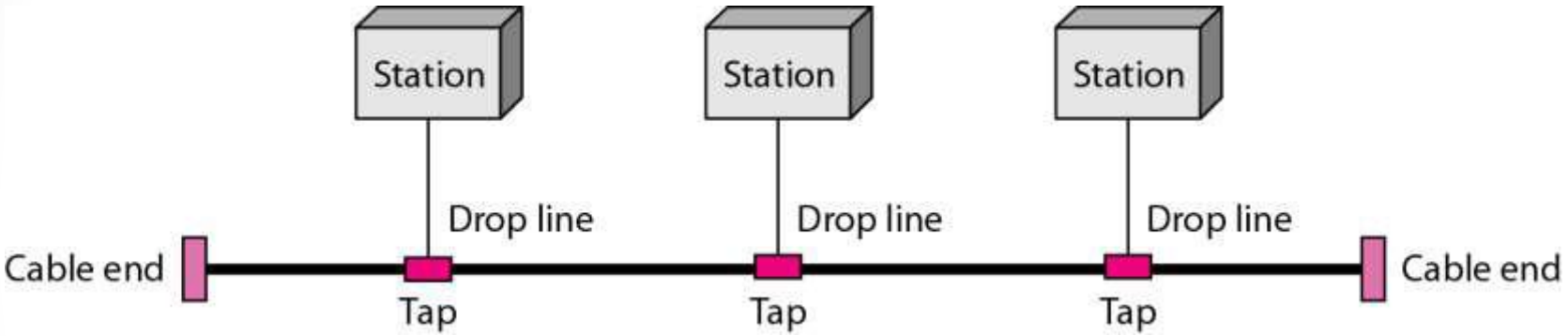
b. Star Topology



- All stations are connected to a central station
- If a station fails, it has no effect on the network
- If central node fails, the whole network is Down

Topology

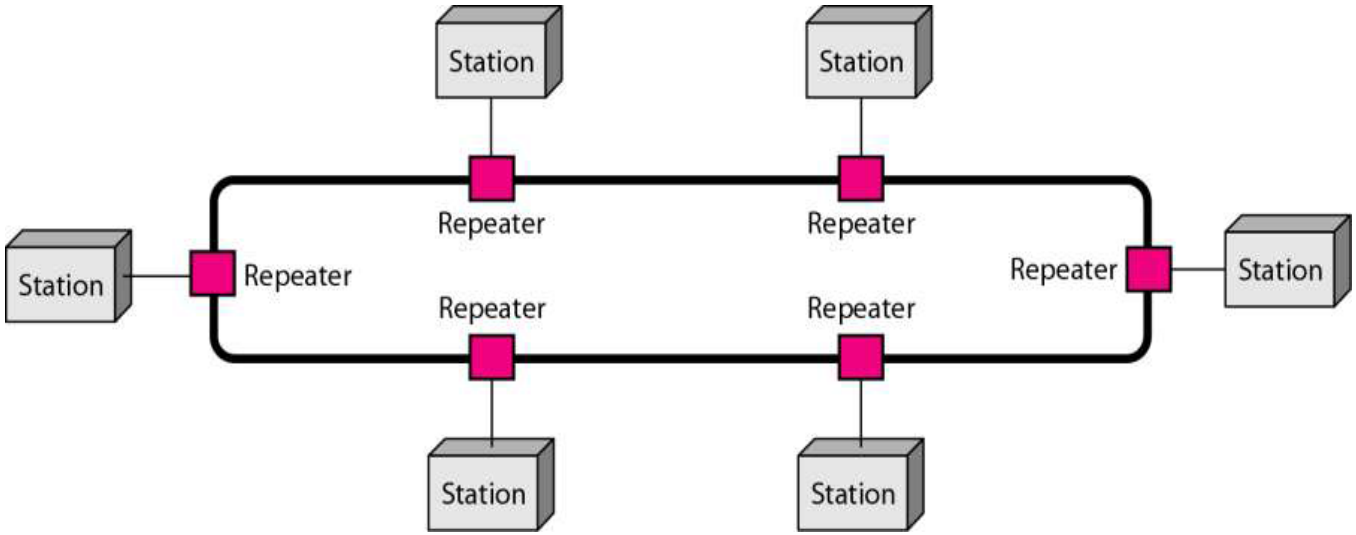
c. Bus Topology



- The bus topology has each station connected to a main communication channel
- If one station is faulty this has no effect on the rest of the network
- If the bus is faulty, the whole network is down.

Topology

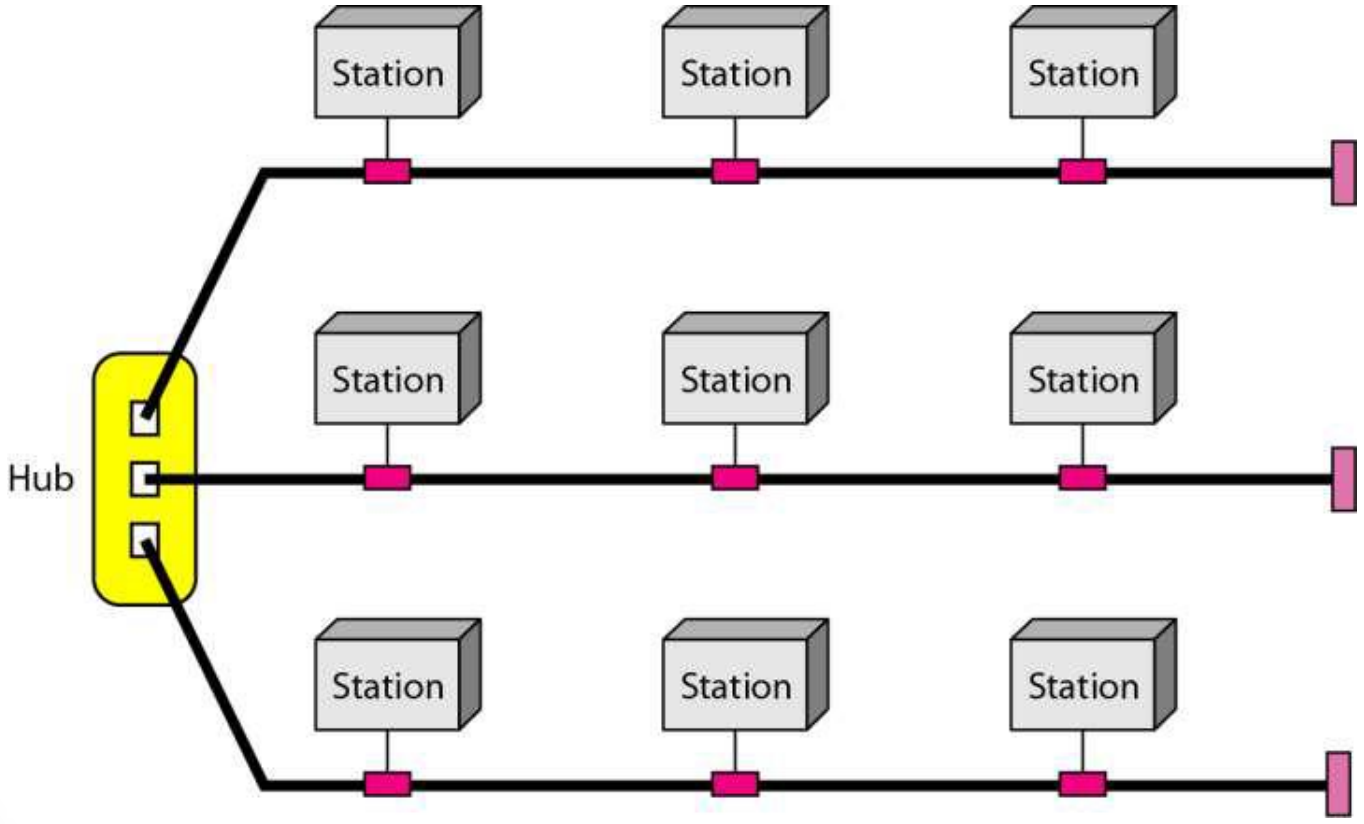
d. Ring Topology



- Signals are sent around the network from station to station
- If a station is faulty, then there must be a method of bypassing the failed station
- If a communications channel fails, the network is fails

Topology

5. Hybrid Topology



Network Categories

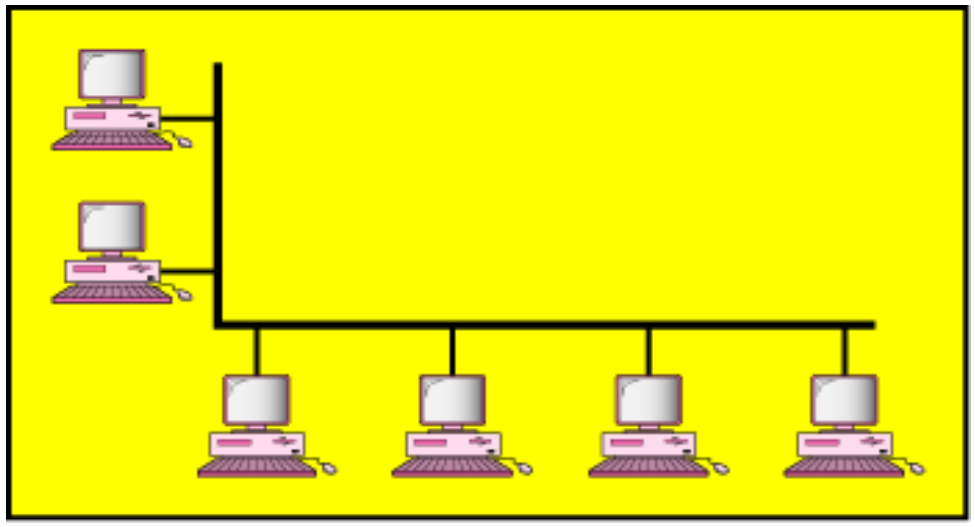
1. Local Area Network (LAN)
   - Short distance
   - Designed to provide local interconnectivity

2. Wide Area Network (WAN)
   - Long distance
   - Provide connectivity over large areas

3. Metropolitan Area Network (MAN)
   - Provide connectivity over areas such as a city a campus

Network Categories

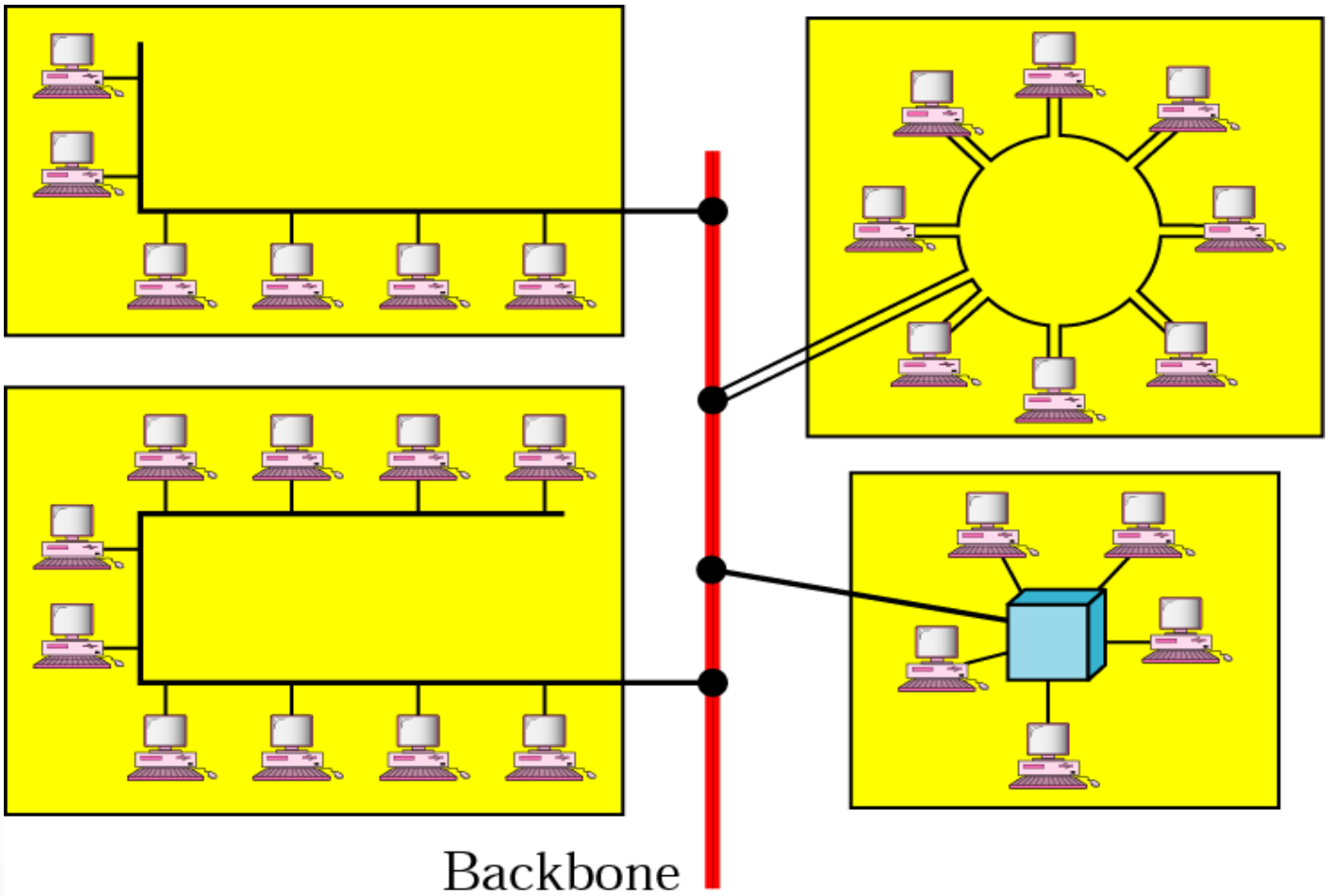
1. LAN



a. Single-building LAN

Network Categories

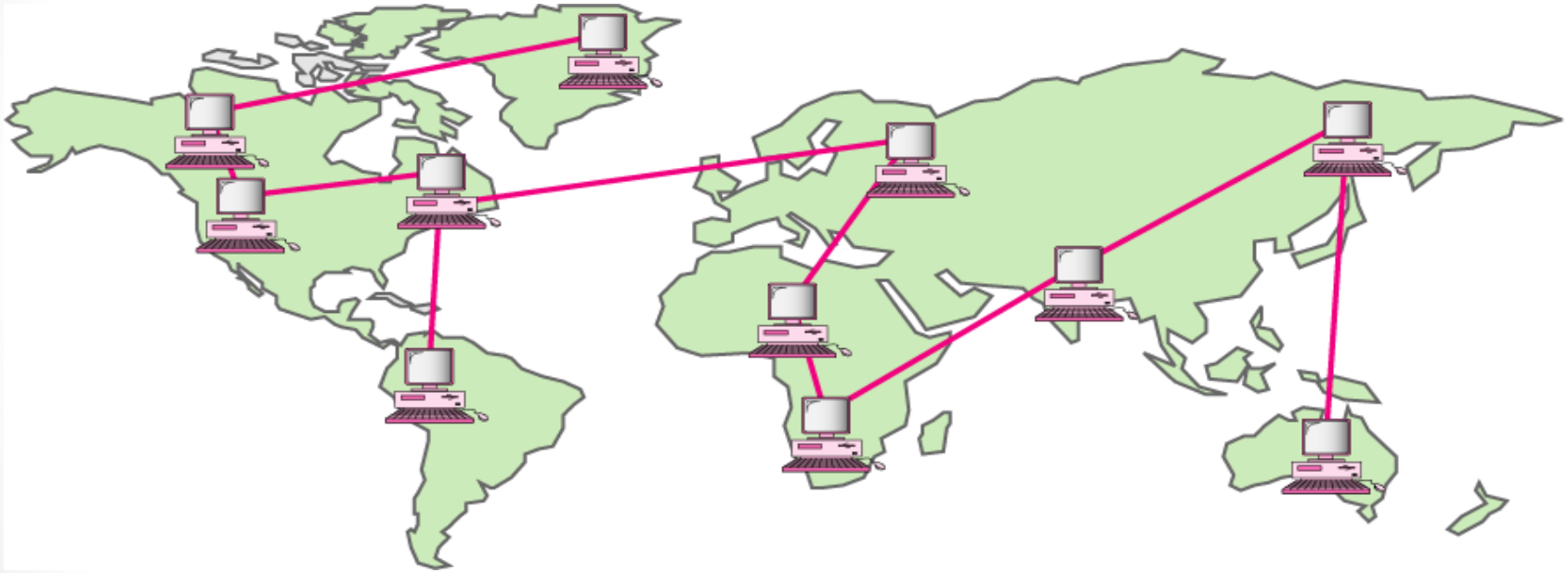
1. LAN



b. Multiple-building LAN

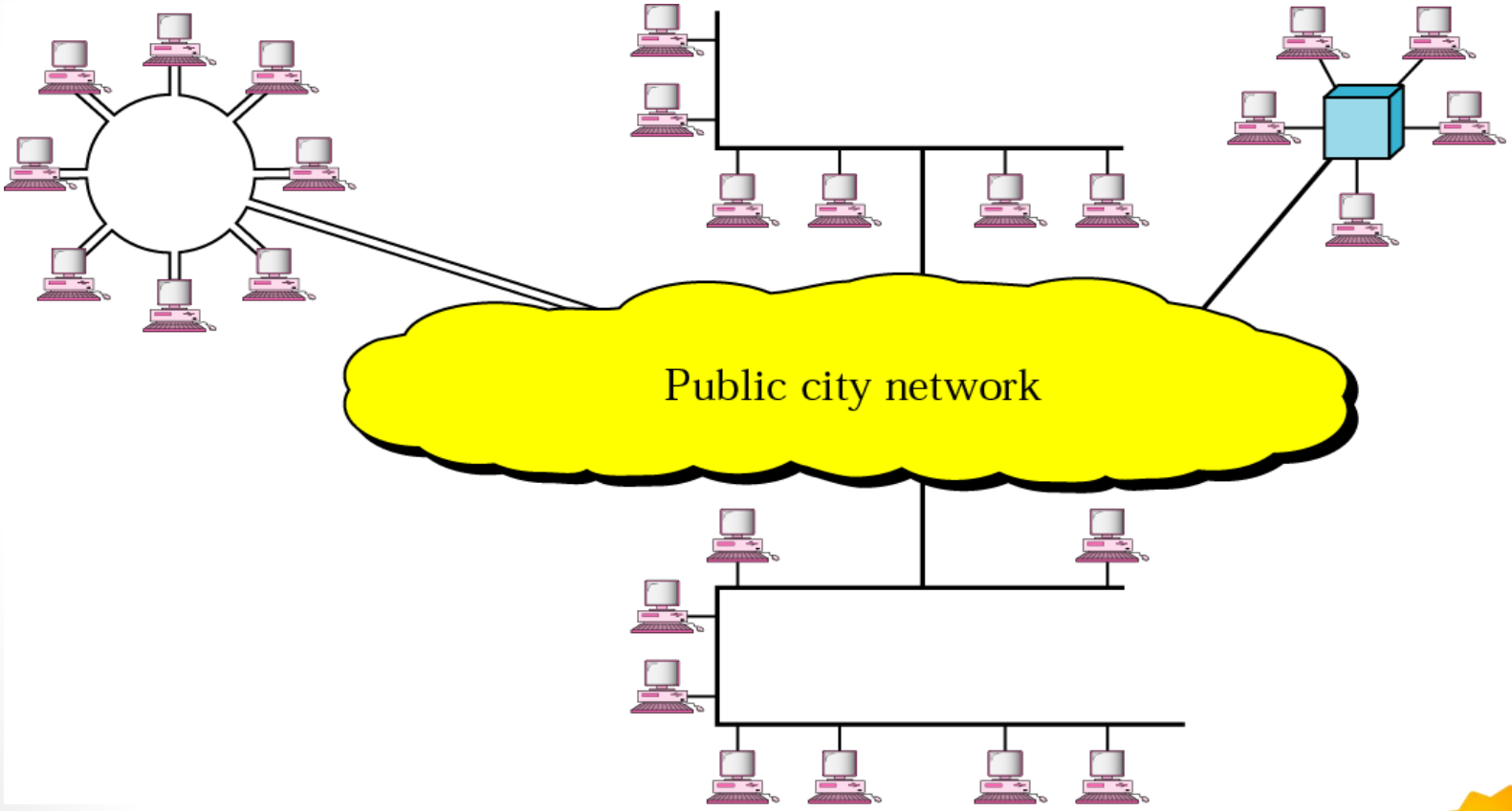
Network Categories

2. WAN



Network Categories

3. MAN



DEMO

Network Categories

LAN vs. MAN vs. WAN

	LAN	MAN	WAN
GEOGRAPHICAL AREA	Small area, 1 to 5 km	City limits, 50 to 60 km	Global, up to 1000s of km
TYPICAL CUSTOMERS	Schools and colleges, offices, small industries and SMBs	Mid-market to large enterprises, city governments, business chains and financial institutions	Large nationwide or global enterprises
TECHNICAL ASPECTS	Ethernet and Ethernet switches; some L3 switching and routing	Ethernet switching on the LAN; Metro Ethernet on the MAN	MPLS, VPLS, SONET and satellite technologies

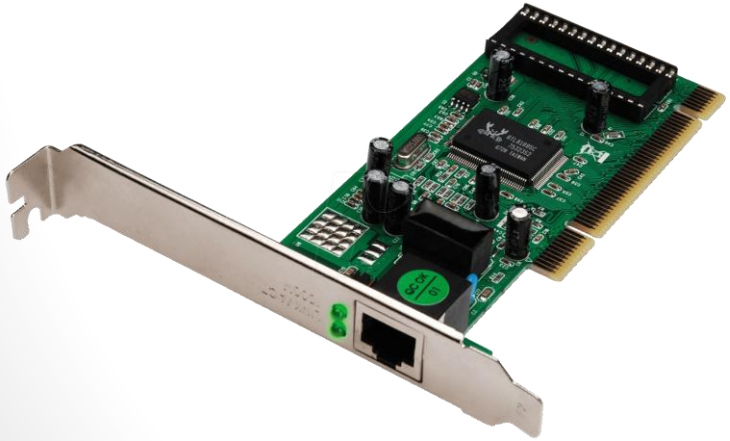
Advantages

What are the advantage of networks?

- Communication
- Data Sharing
- Internet Services
- Video Conferencing
- Broad Casting
- Remote Access
- Flexible
- Reliable

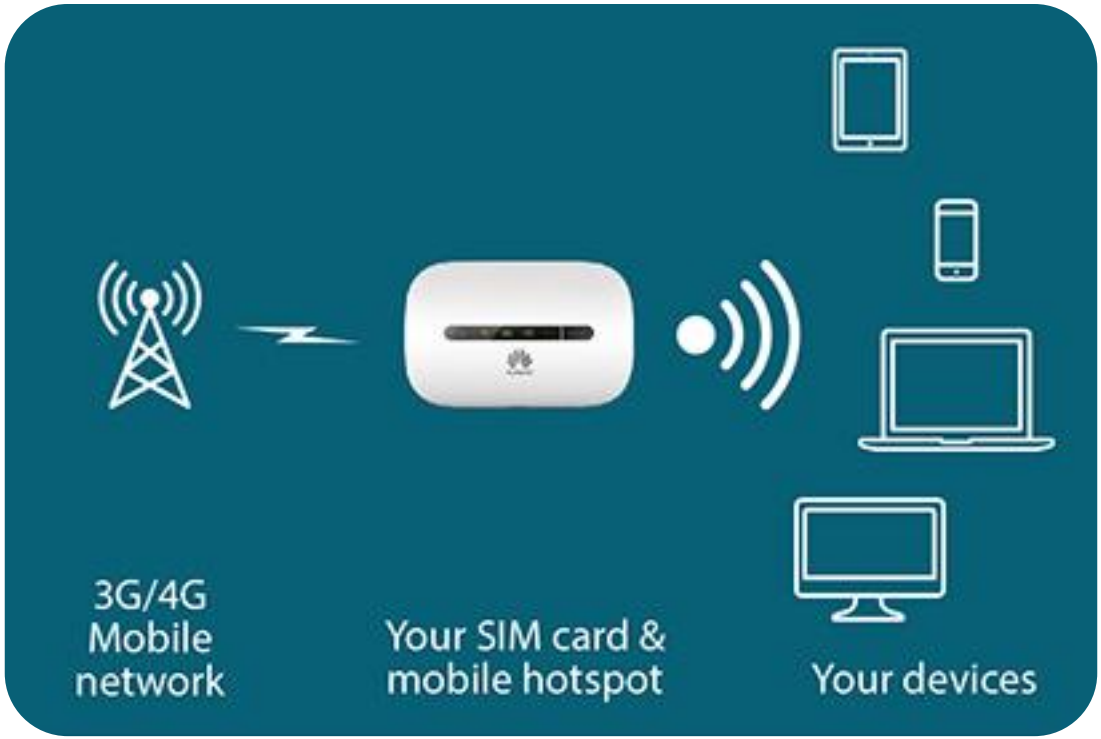
Network Interface Cards (NIC)

- The NIC is a small printed circuit board inside the computer systems allowing it to communicate with the network.
- The NIC provides the computer with a unique Media Access Control (MAC) address made up of 6 bytes.



Hotspots

- An area where network signals may be received
- Usually located in built up areas
- May be deliberate hotspots in a university or business places.

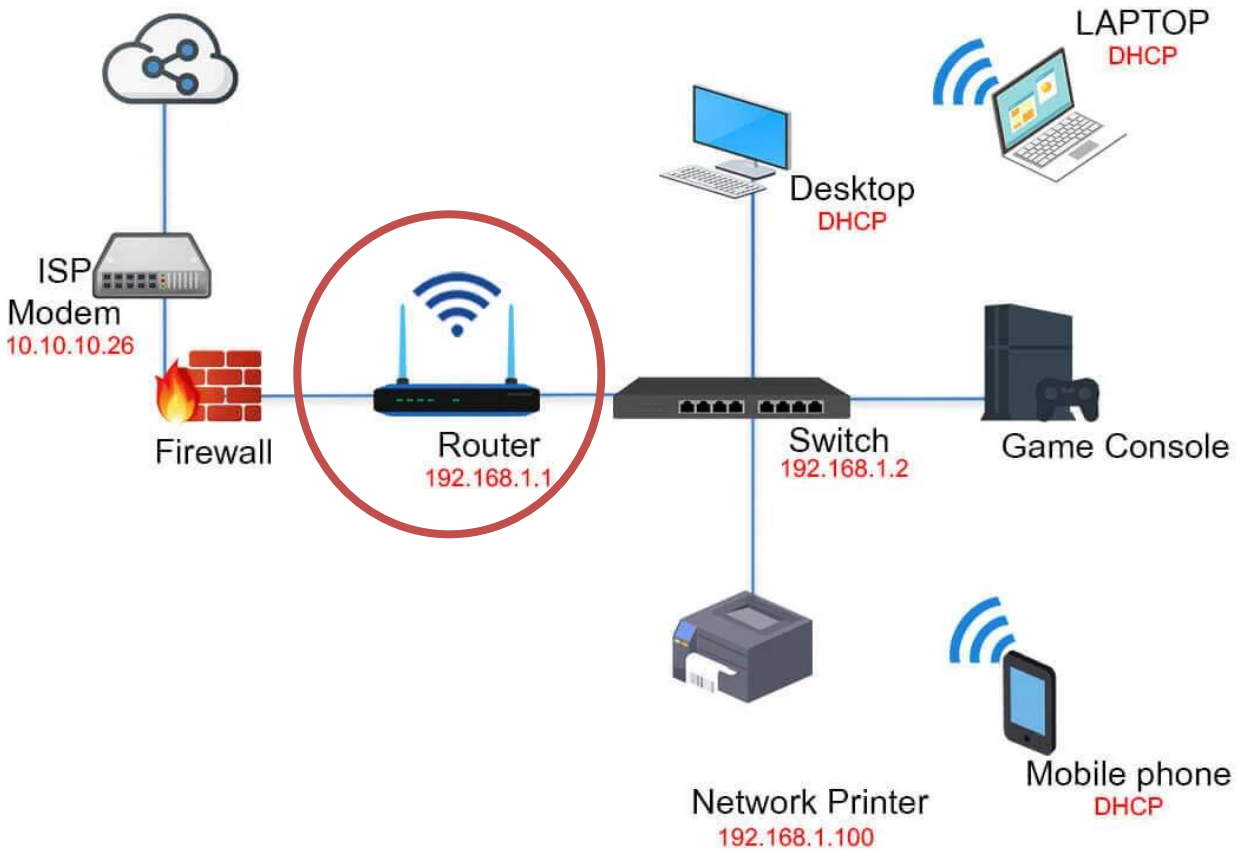


Hotspots vs WiFi

No	Wifi	Hotspot
1	Wifi device can connect to the internet or Local area network using access point	Hotspot device is Wireless Access point (WAP) connects a group of wireless devices
2	Speed and range depending on WAP	less speed and can serve around 20m
3	Connected known AP network using Password	Set Custom Name and Set Password to AP
4	The ISP (Internet Service Provider) of a local area provides WiFi services.	Mainly, phone or cellular corporations largely provide hotspot services to various users.
5	It provides more security than a hotspot	Hotspots are used more in public places, so they are less secure than WiFi

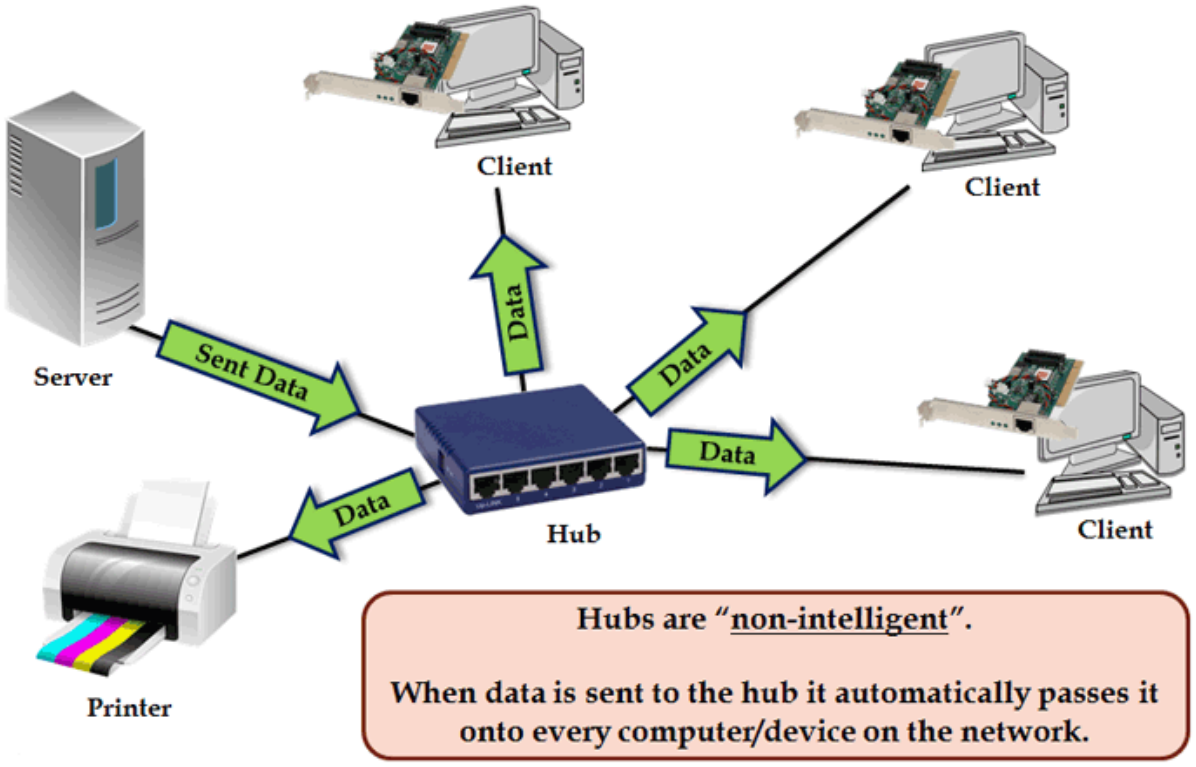
Router

- A router is a device which links 2 or more networks
- The router takes packets of data and decides which route through the network the packet should take



Hub

- A hub is a device which multiple ports which allows more than one device to share the same wire
- The hub will also boost or amplify signals
- Multi-Port repeater



Switch

- A switch operates like a smart hub
- The switch separates the network into segments
- More than one machine can speak at once and only the intended recipients receives the signal

Mainframes and Supercomputers

Mainframes

- A large powerful computer which can process a very large amount of data at a high speed
- May be connect to hundreds of dumb terminals
- Multi-Programming
- Multi-Tasking
- Multi-Processing

Mainframes and Supercomputers

Supercomputers

- More powerful than a mainframe
- Supercomputers are use for intensive mathematical calculations like weather forecasting, aerospace engineering

Q&A