NETWORK DEVICES

Computer Networking

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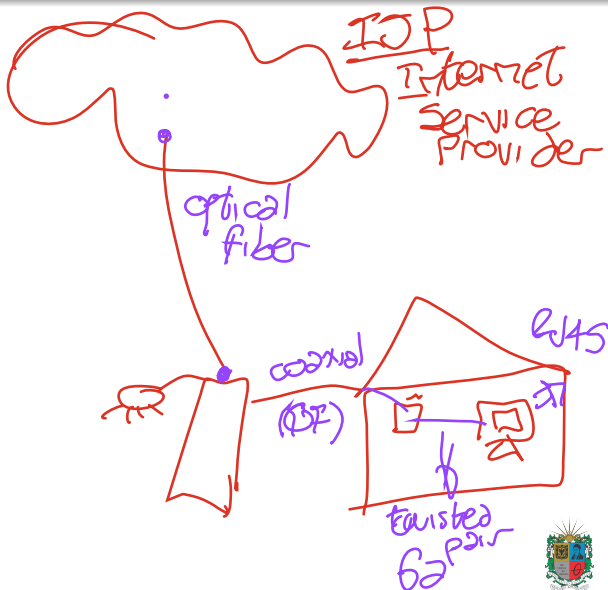1. Cables $\longrightarrow$ *transmit*

2. Devices $\longrightarrow$ *decisions (setup)*

Outline

1. Cables

2. Devices

Cables
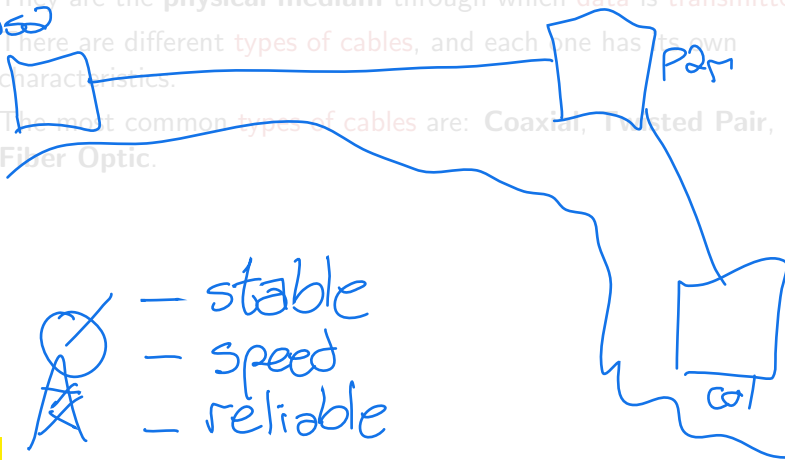
- **Cables** are the most important part of a network.

- They are the **physical medium** through which data is transmitted.

- There are different types of cables, and each one has its own characteristics.

- The most common types of cables are: **Coaxial**, **Twisted Pair**, and **Fiber Optic**.

USB

P2P

COX

- stable
- speed
- reliable

Cables

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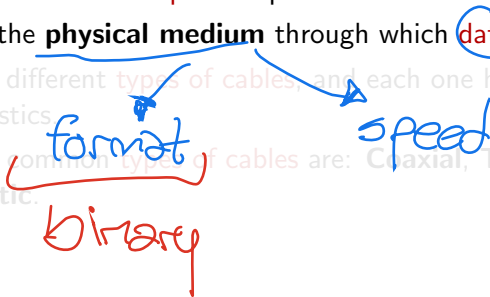- The most common types of cables are: **Coaxial**, **Twisted Pair**, and **Fiber Optic**.

Cables

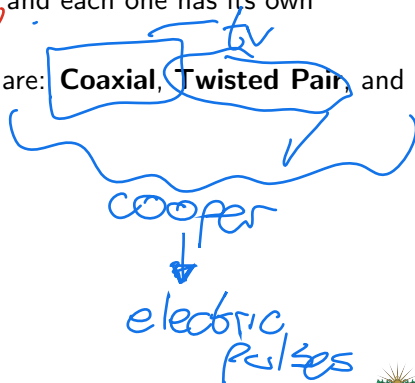- **Cables** are the most important part of a network.
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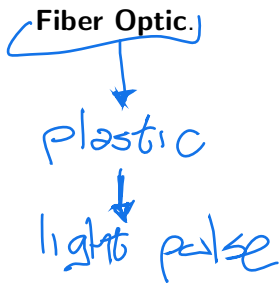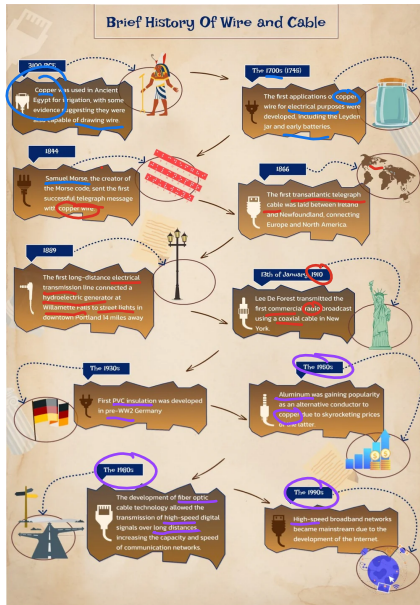*(handwritten annotations)*

tv

cooper

plastic → light pulse

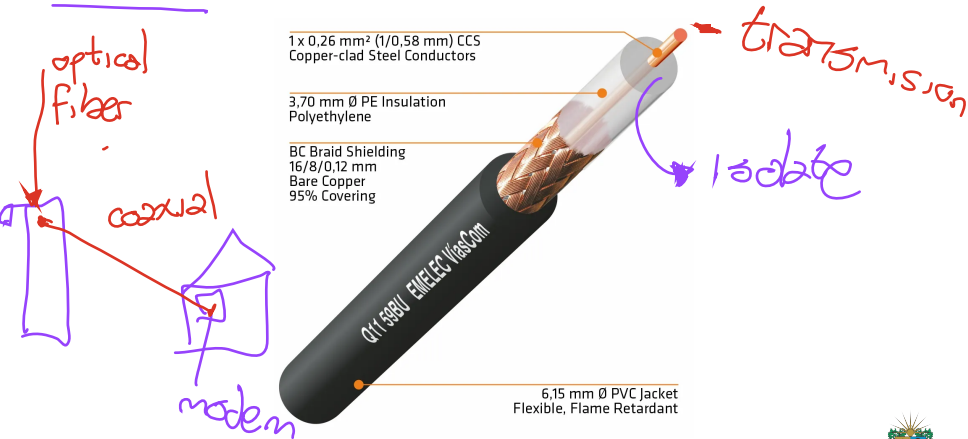electric pulses

History of Wire and Cable

Coaxial Cables I

- **Coaxial cables** are used in cable television systems, telephone companies, and the Internet.
- They are used for **long-distance** communication, and can carry **high**-**speed** data.
- They are more **expensive** than twisted pair cables, but they are more **reliable** and have a longer **lifespan**.

Coaxial Cables II

They are made of a **copper** core, surrounded by a **plastic** insulator, and a **metal** shield.

1 x 0,26 mm² (1/0,58 mm) CCS
Copper-clad Steel Conductors

3,70 mm Ø PE Insulation
Polyethylene

BC Braid Shielding
16/8/0,12 mm
Bare Copper
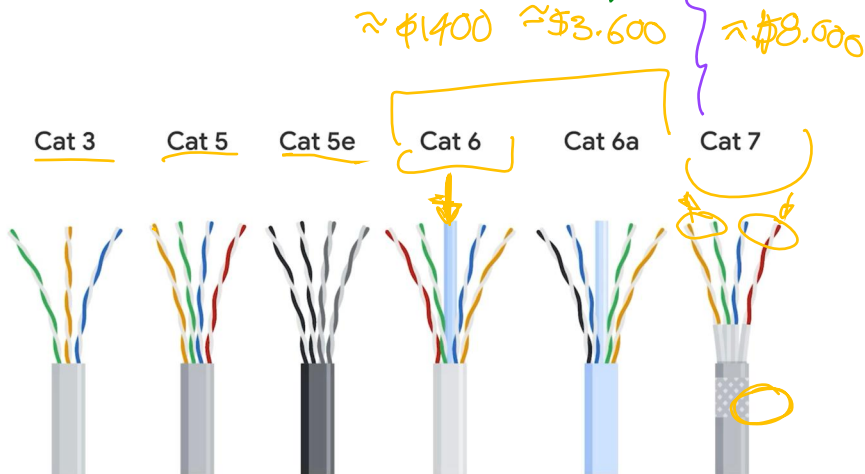95% Covering

6,15 mm Ø PVC Jacket
Flexible, Flame Retardant

Twisted Pair Cables

- **Twisted pair cables** are the most common type of cable used in computer networks.
- They are made of two **copper** wires twisted together, and are used for **short-distance** communication.
- They are used in **Ethernet** networks, and can carry **high-speed** data.
- They are **inexpensive**, **easy** to install, and **flexible**.

Individual shielding of each pair

Tinned copper braiding

Insulation

Outer sheath

Polyester film

Copper wires

Separator

Overall aluminum foil shield

Drain wire

Twister Pair Cables Categories I

≈ $1400   ≈ $3.600   ≈ $8.600

| Cat 3 | Cat 5 | Cat 5e | Cat 6 | Cat 6a | Cat 7 |

Cat 8 => $ 11.900
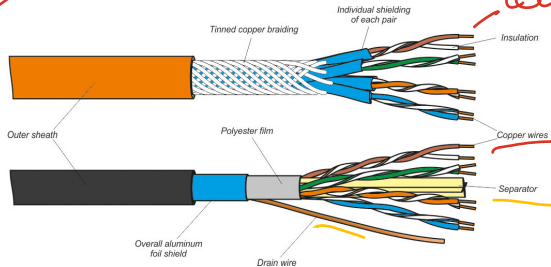
Twister Pair Cables Categories II

Category	Maximum Speed	Max. Length	Frequency	SHIELDING	Application
CAT 1	Up to 1Mbps(Carry only Voice)	--	1MHz	Unshielded	Old telephone cabling
CAT 2	Up to 4Mbps	--	4MHz	Unshielded	Token Ring Network
CAT 3	Up to 10Mbps	100m	16MHz	Unshielded	Token Ring & 10BASE-T Network
CAT 4	Up to 16Mbps	100m	20MHz	Unshielded	Token Ring Network
CAT 5	Up to 100Mbps	100m	100MHz	Unshielded	Ethernet, Fast ethernet and Token Ring
CAT 5e	Up to 1Gbps	100m	100MHz	Unshielded or Shielded	Ethernet, Fast ethernet & Gigabit ethernet
CAT 6	Up to 10Gbps	100m	250MHz	Unshielded or Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 10G Ethernet(37 - 55 meter)
CAT 6a	Up to 10Gbps	100m	500MHz	Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 10G Ethernet(37 - 55 meter)
CAT 7	Up to 10Gbps	100m	600MHz	Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 10G Ethernet(100 meter)
CAT 8	Up to 40Gbps	100m	2000MHz	Shielded	Ethernet, Fast ethernet, Gigabit ethernet & 25G-40G Ethernet(30 meter)

# Fiber Optic Cables

- **Fiber optic cables** are used in high-speed networks, such as the internet and cable television systems.
- They are used for **long-distance** communication, and can carry **high-speed** data.
- They are more **expensive** than coaxial and twisted pair cables, but they are more **reliable** and have a longer **lifespan**.
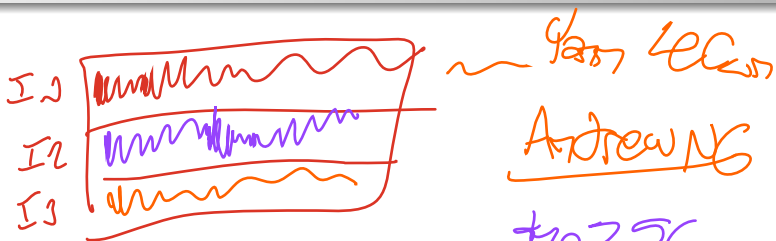
Fiber Optic Cables Conponents

They are made of **glass** or **plastic** fibers, and use **light** to transmit data
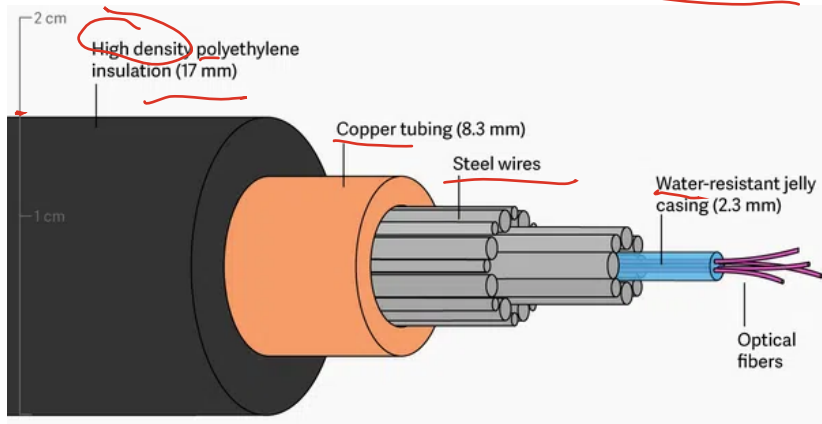
Outline

1 Cables

2 Devices

Network Devices

- **Network devices** are the hardware components that make up a network.

- They are used to connect computers, printers, and other devices to the network.

- There are different types of network devices, such as **routers**, **switches**, and **hubs**.

- Each **device** has its own function, and is used to perform specific tasks on the network.

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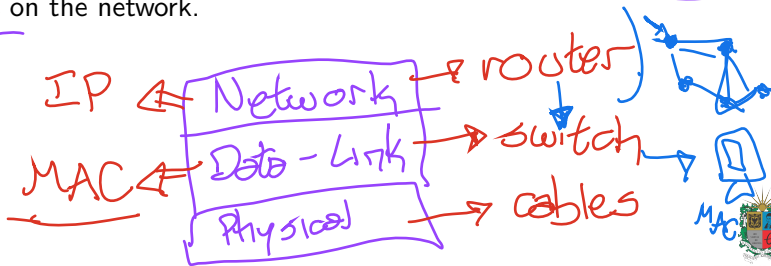
Routers

JS bytes   JS bytes   64 bytes

- **Routers** are used to connect different networks together.
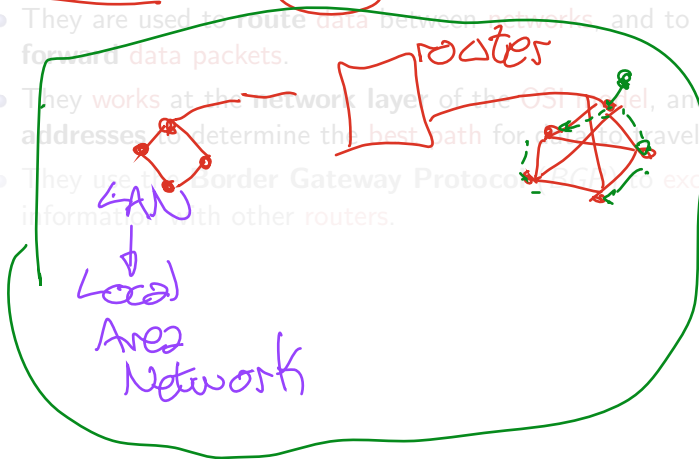- They are used to route data between networks, and to filter and forward data packets.
- They works at the network layer of the OSI model, and use IP addresses to determine the best path for data to travel.
- They use the Border Gateway Protocol (BGP) to exchange routing information with other routers.

routers

PAN
→ Personal
Area
Network

WAN
Widely
Area
Network

LAN
→
Local
Area
Network

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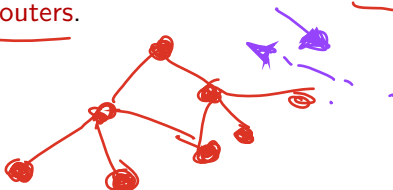# Routers

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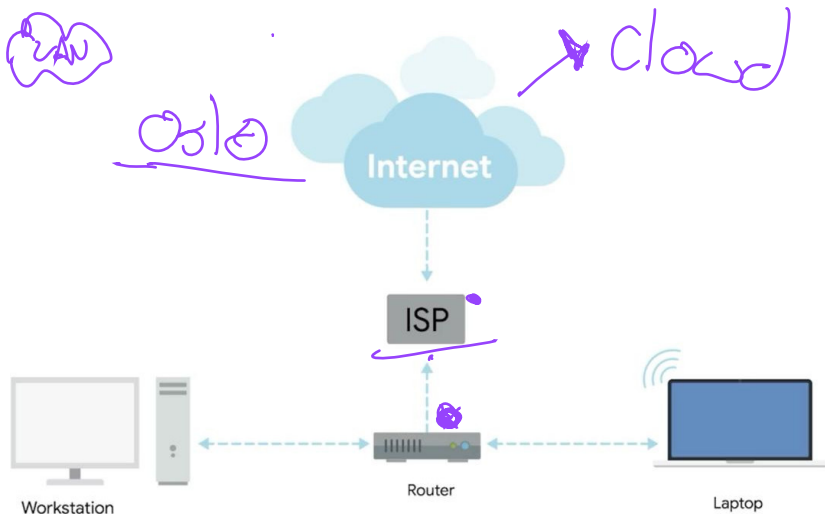# Routers

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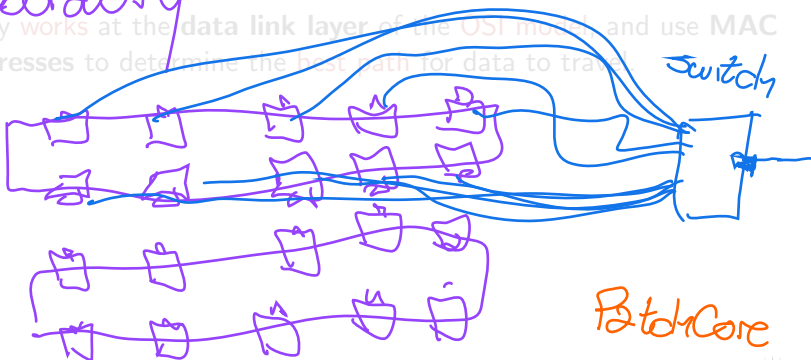
Routers in a WAN

Switches

- **Switches** are used to connect devices on the same network.

- They are used to **forward** data packets between devices, and to **filter** and forward data packets.

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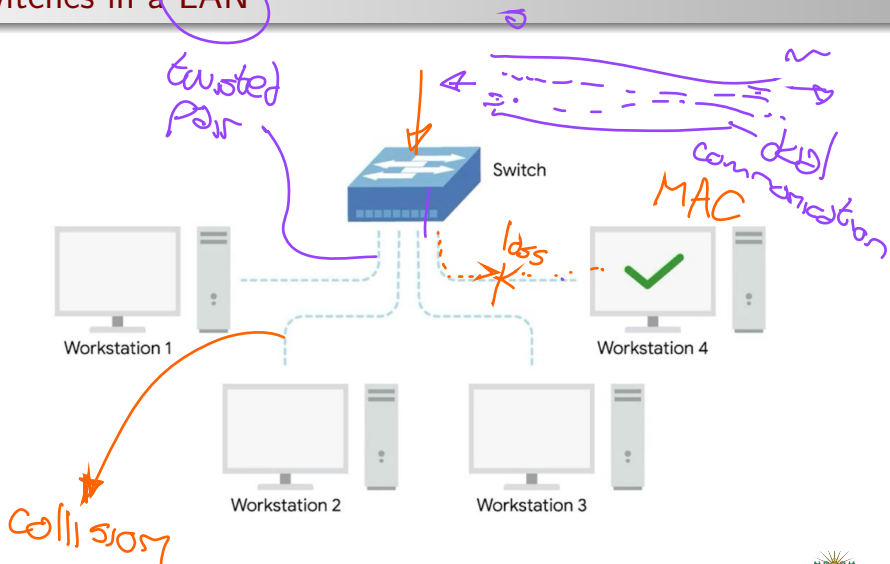
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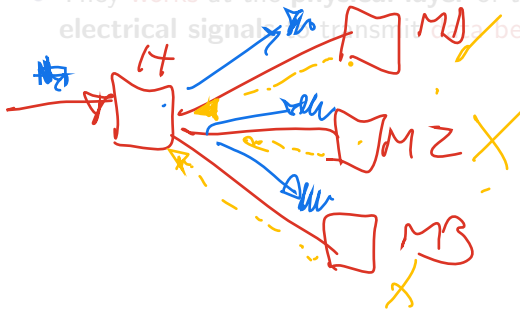
Switches in a LAN

Switch

twisted Pair

digital communication

MAC

loss

Workstation 1

Workstation 2

Workstation 3

Workstation 4

collision

Hubs

- **Hubs** are used to connect devices on the same network.

- They are used to **broadcast** data between devices, and to **forward** data packets to all devices on the network.

- They works at the **physical layer** of the OSI model, and use **electrical signals** to transmit data between devices.

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Hubs in a LAN
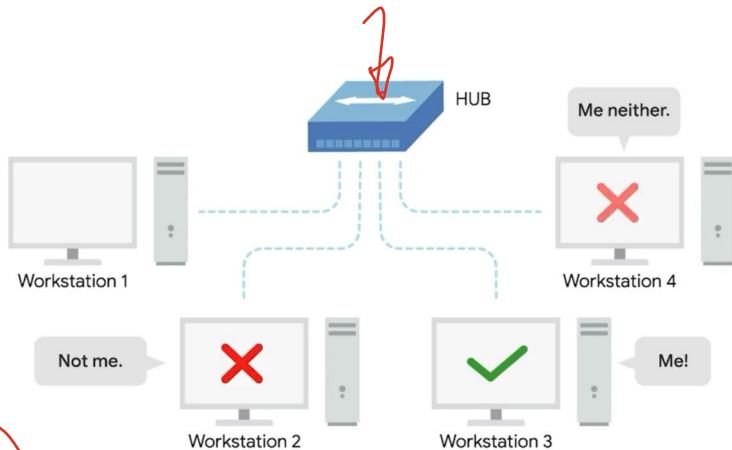
Repeaters

- **Repeaters** are used to extend the range of a network.
- They are sometimes called **signal boosters**, and are used to overcome the **attenuation** of data signals over long distances.
- Also, they could be known as **bridges**, and are used to connect two networks together.

Devices per Layer
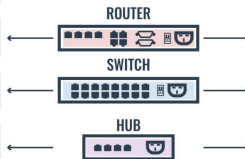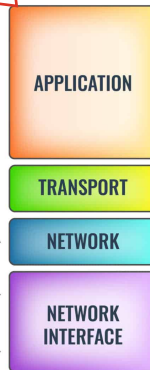

OSI REFERENCE MODEL

7	APPLICATION
6	PRESENTATION
5	SESSION
4	TRANSPORT
3	NETWORK
2	DATA LINK
1	PHYSICAL

ROUTER
SWITCH
HUB

TCP/IP CONCEPTUAL LAYERS

APPLICATION
TRANSPORT
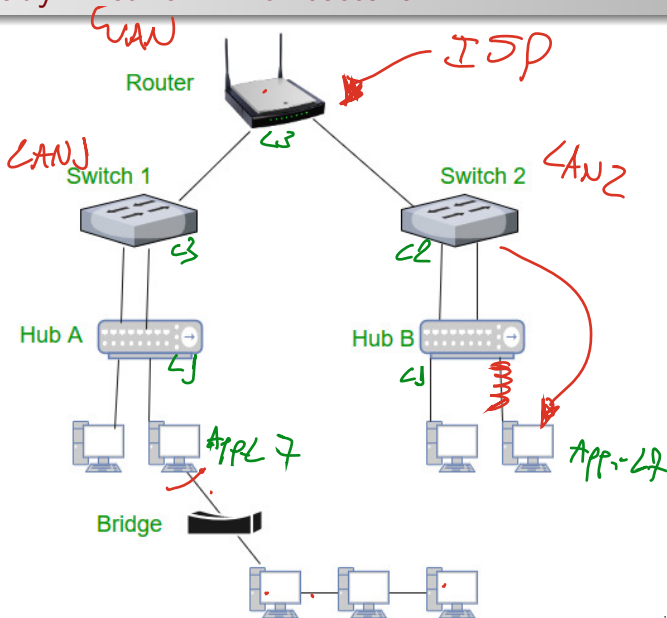NETWORK
NETWORK INTERFACE

Handwritten annotations: ISO, Layers, DoD, S-five layers, Department of Defense

Case of Study: Network Architecture

Outline

Conclusion

- **Cables** are the most important part of a network, and are used to transmit data between devices.

- There are different **types of cables**, such as coaxial, twisted pair, and fiber optic.

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Thanks!

Questions?

Repo: *https://github.com/EngAndres/ud-public/tree/main/courses/computer-networking*