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Data Communication CS601 Lecture No 36

Lecture Prepared By

Muhammad Abid Ali

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CS601 Lecture No 36 Topic 213 to 220

Connecting Devices

- **Hosts and networks do not normally operate in isolation**
- **Connecting devices connect hosts together to make a network or connect networks together to make an internet**

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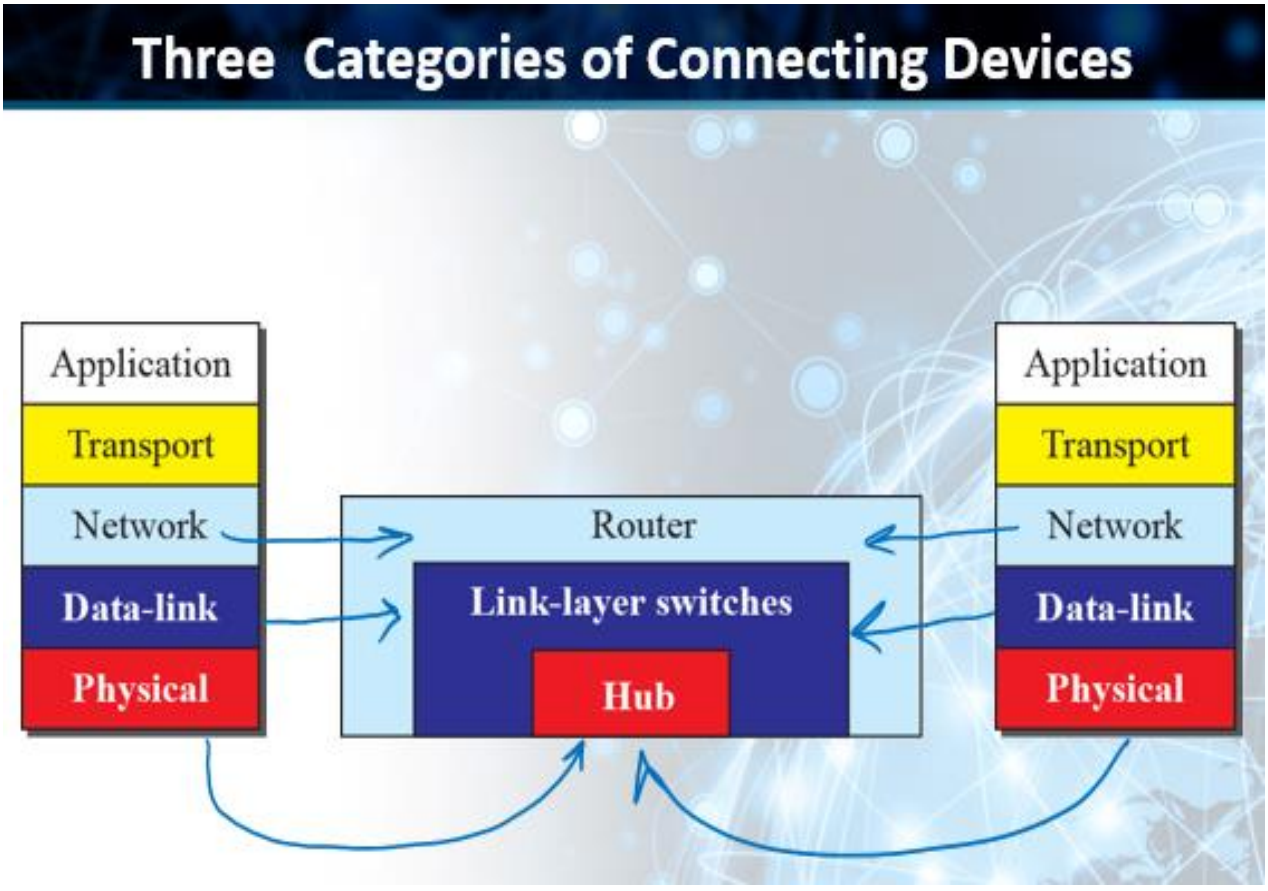
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- **Connecting devices can operate in different layers of the Internet model**

Three kinds of connecting devices:

- ✓ **Hubs**
- ✓ **Link-layer switches**
- ✓ **Routers**



Hubs

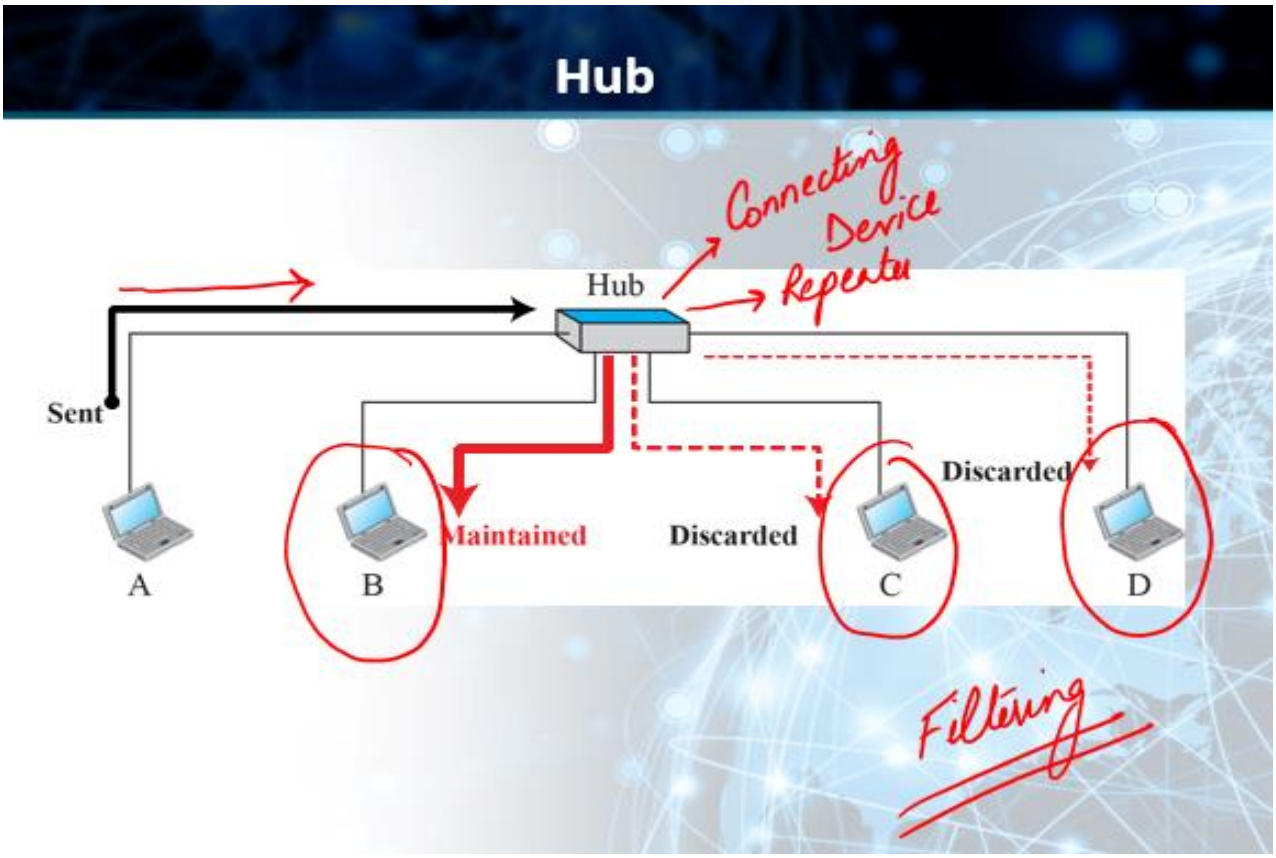
- **Hub is a device that operates only in the physical layer**

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- **Signals that carry information within a network can travel a fixed distance before attenuation impacts the data**
- **A hub (repeater) receives a signal and, before it becomes too weak or corrupted, regenerates it**



Link-Layer Switches

- **A link-layer switch (or switch) operates in both the physical and the data-link layers**
- **As a physical-layer device, it regenerates the signal it receives**
- **As a link-layer device, the link-layer switch can check the MAC addresses (source and destination) contained in the frame**

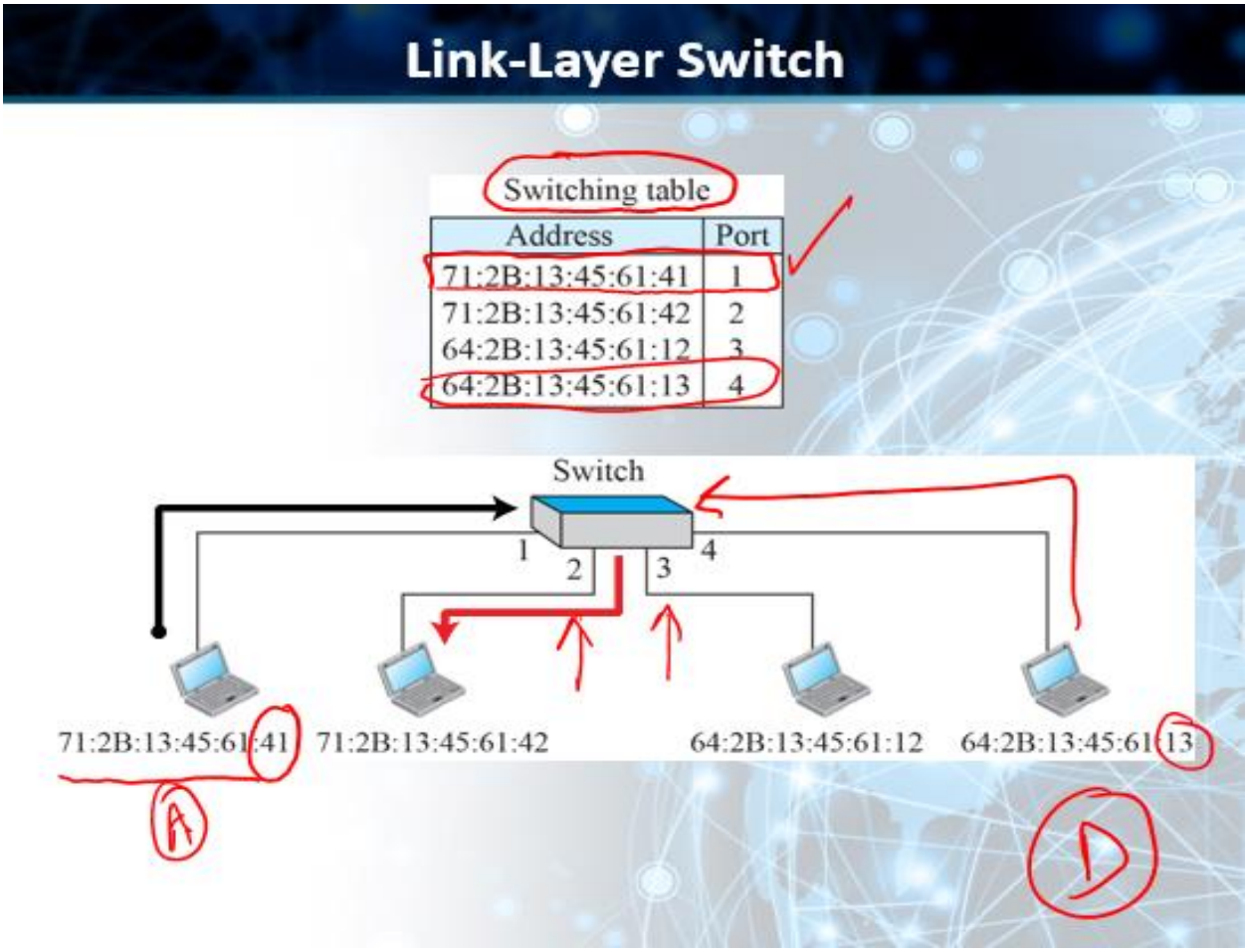
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Switch versus Hub

- **Switch has the 'Filtering' capability**
- **Unlike hub, a switch can check the destination address of a frame and decide on outgoing port**
- **Switch eliminates collisions and does not require carrier sensing**
- **Switches connect heterogeneous devices**



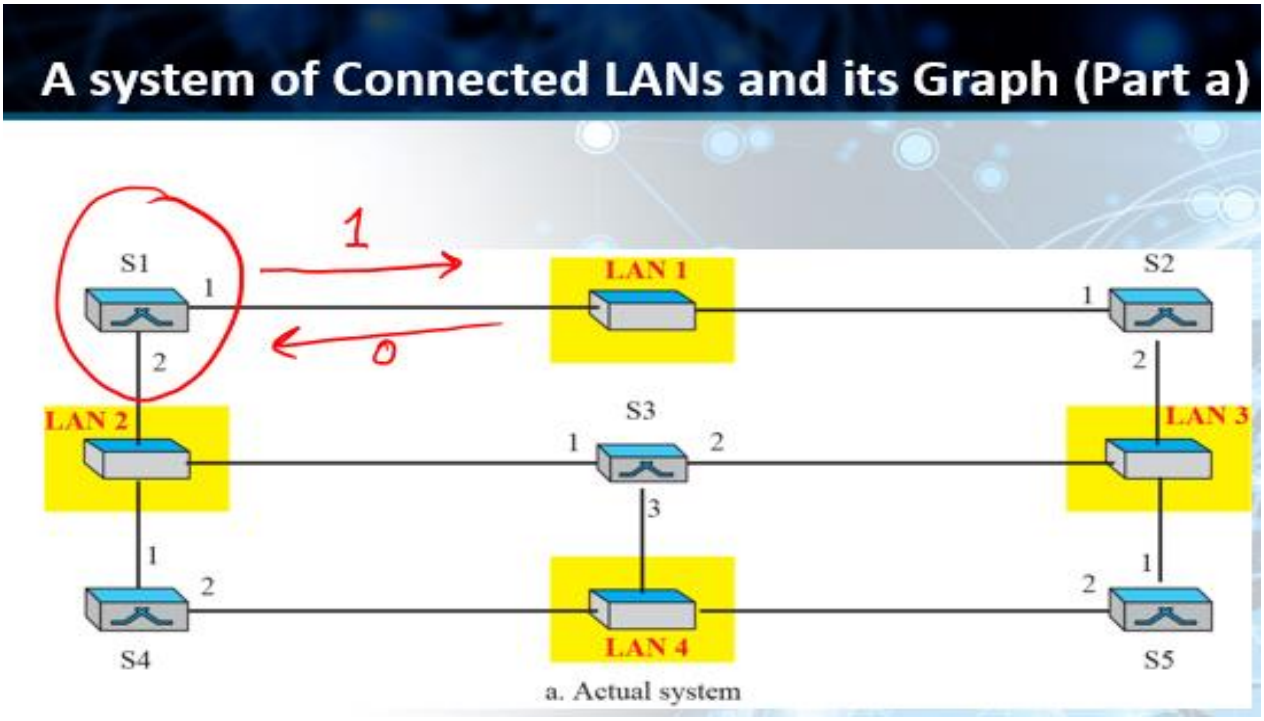
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Spanning Tree Algorithm

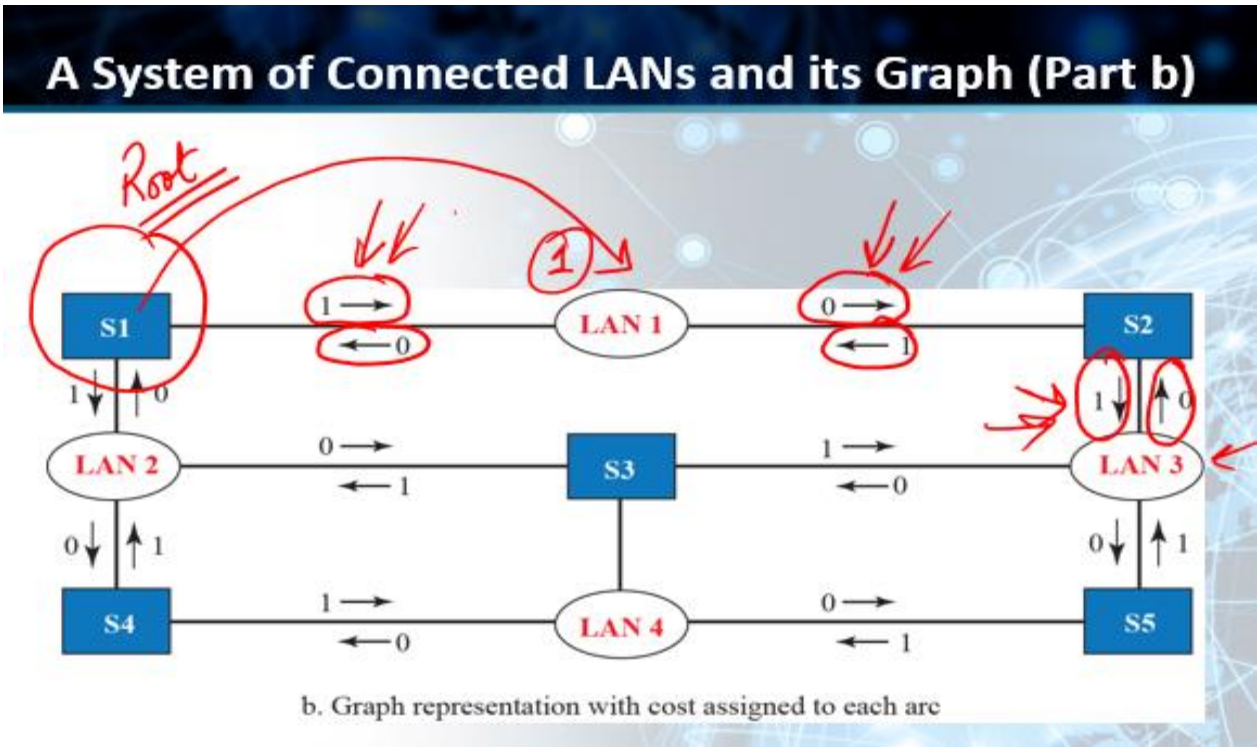
- **In graph theory, Spanning Tree is a graph in which there is no loop**
- **In a switched LAN, this means creating a topology in which each LAN can be reached from any other LAN through one path only (no loop)**
- **To find the spanning tree, we assign a cost (metric) to each LAN link**



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Routers

- **We compare routers to two-layer switch and a hub**
- **A router is a three-layer device; it operates in the physical, data-link, and network layers**

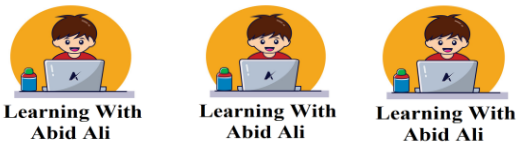
Router vs. Switch

Three differences between a router and a repeater or a switch:

1. A router has a physical and logical (IP) address for each of its interfaces.
2. A router acts only on those packets in which the link-layer destination address matches the address of the interface at which the packet arrives.

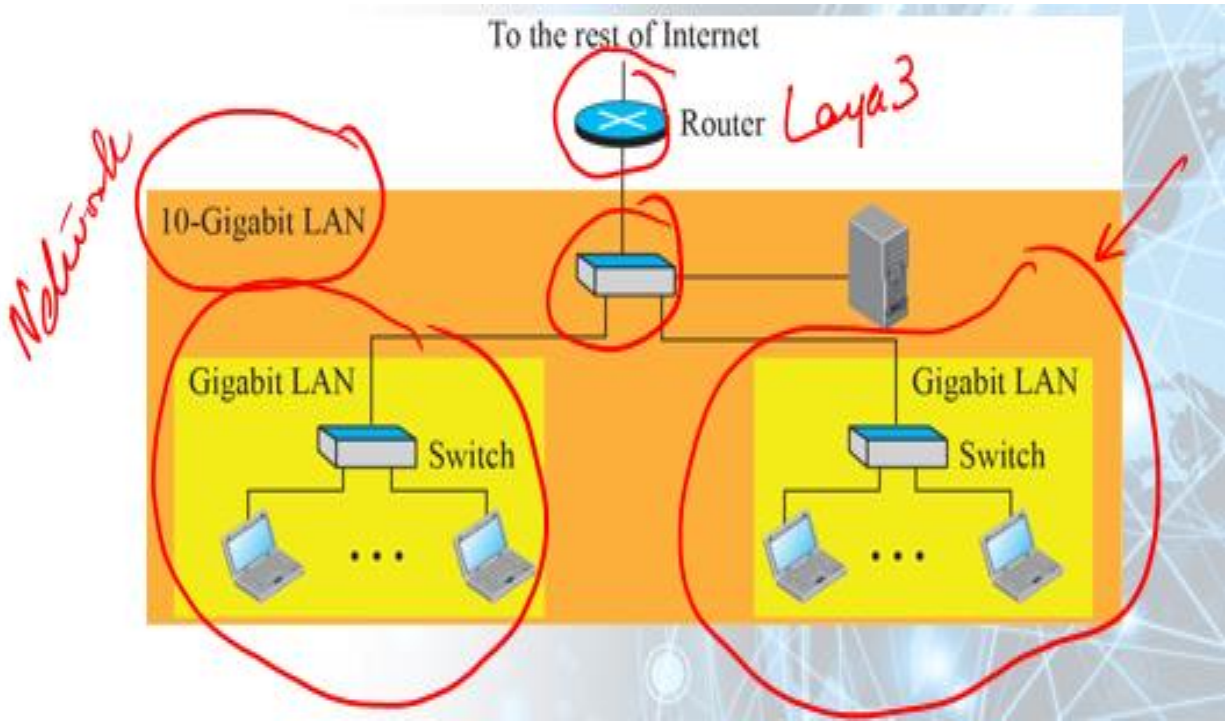
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3. A router changes the link-layer address of the packet (both source and destination) when it forwards the packet.

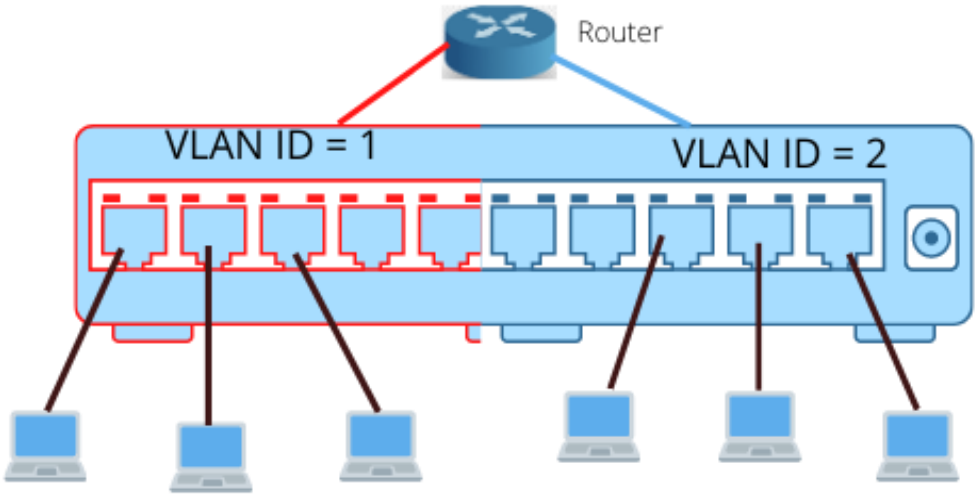


VIRTUAL LANS (VLAN)

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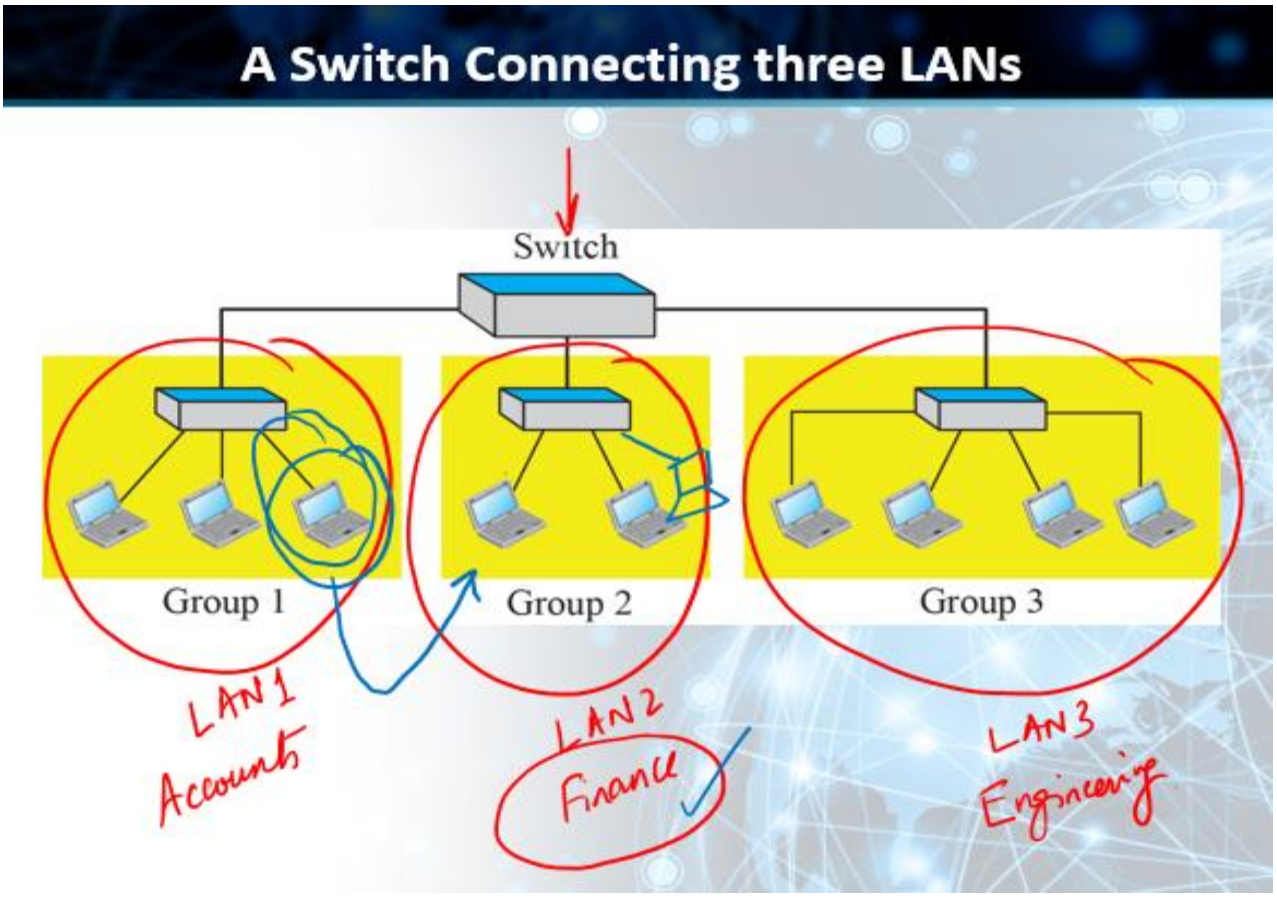
LAN With VLAN

- **A VLAN is a LAN configured by software, not by physical wiring**
- **A station is considered part of a LAN if it physically belongs to that LAN i.e. The criterion of membership is geographic**
- **Provides a virtual connection between two stations belonging to two different physical LANs**

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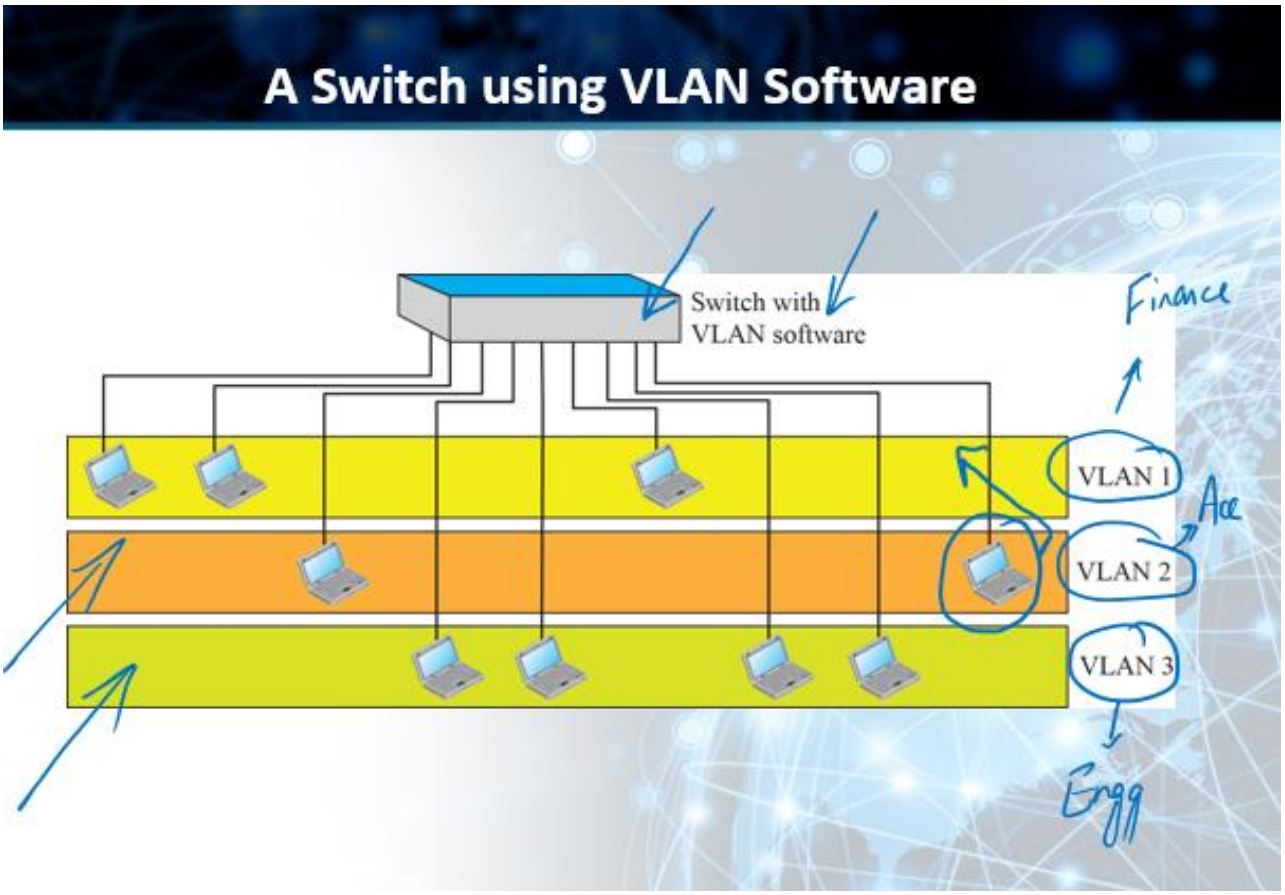
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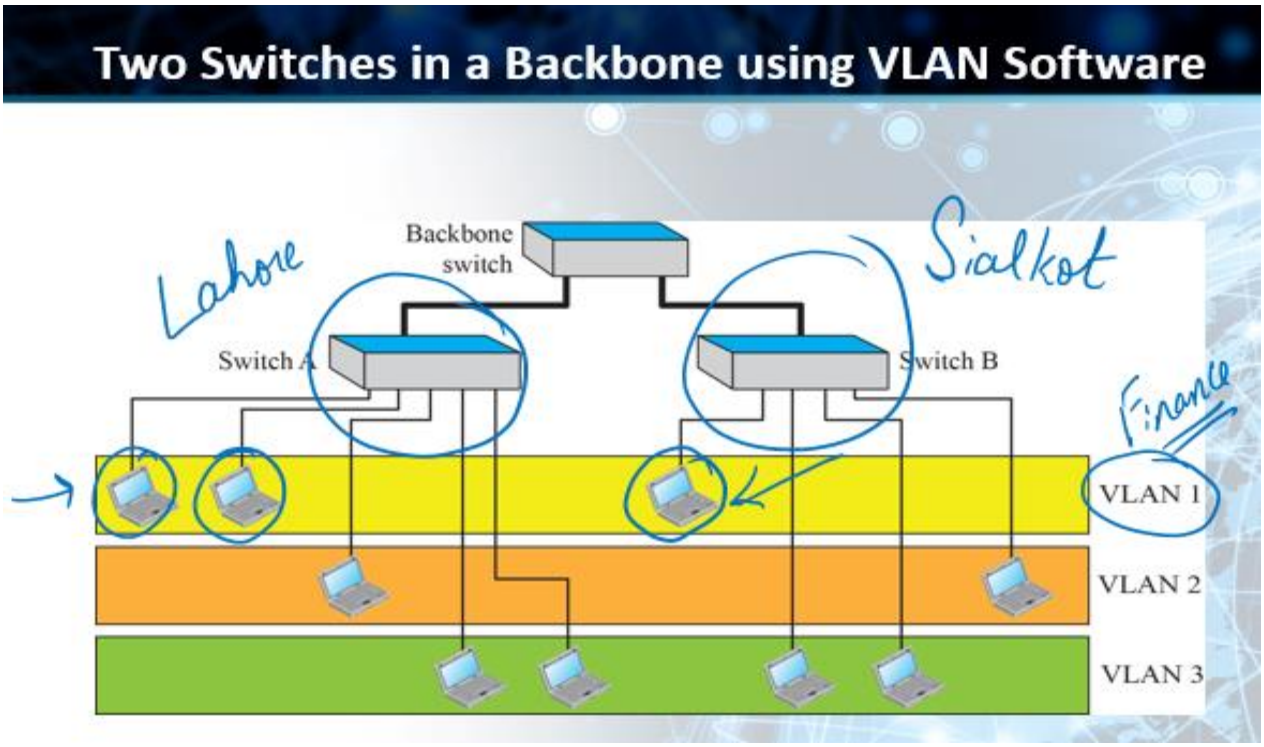
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Membership of a VLAN

- **What characteristic can be used to group stations in a VLAN?**
- **Vendors use different characteristics such as interface numbers, port numbers, MAC addresses, IP addresses, IP multicast addresses, or a combination of two or more of these**

Communication between Switches

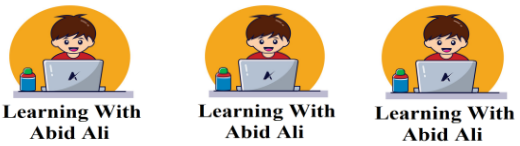
In a multi-switched backbone, each switch must know:

Which station belongs to which VLAN; and

The membership of stations connected to other switches

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Advantages of using VLANs

- **Cost and Time Reduction**
- **Creating virtual Workgroups**
- **Security**

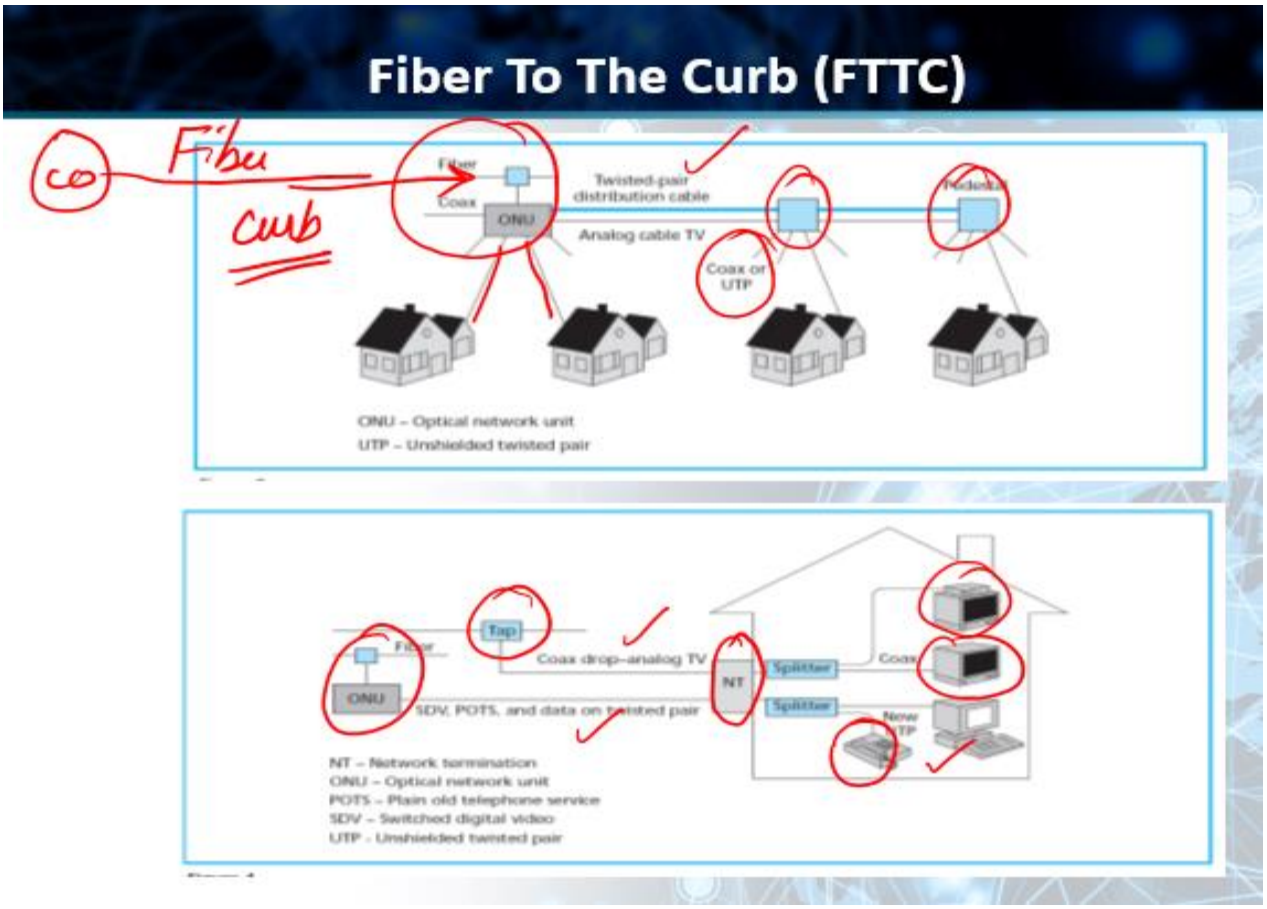
Fiber To the Curb (FTTC)

- **An access network in which fiber is used for part, but not the entire link from the provider to the end-user**
- **An optical to electrical (O/E) conversion takes place somewhere near the end-user**
- **The terminal network segment of a FTTC network is usually twisted pair or coaxial cable**
- **The final optical receiver in a FTTC network typically serves several customers**

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Fiber To the Home (FTTH)

- **Need: High-speed data, reliable voice and high-quality video**
- **Problems:**
  - ✓ **How to get high speed lines out to each customer?**
  - ✓ **How to future-proof the architecture?**
- **Solution: <u>FTTH</u>**
- **Fiber-to-the-home (FTTH) is the installation of optical fiber from a telephone switch directly into the subscriber's home**
- **It is one of the latest access technologies**

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- **FTTH is also referred to as Fiber-to-the-Building (FTTB)**