COMPUTER COMMUNICATION NETWORK

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Virtual Local Area Networking

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LAN

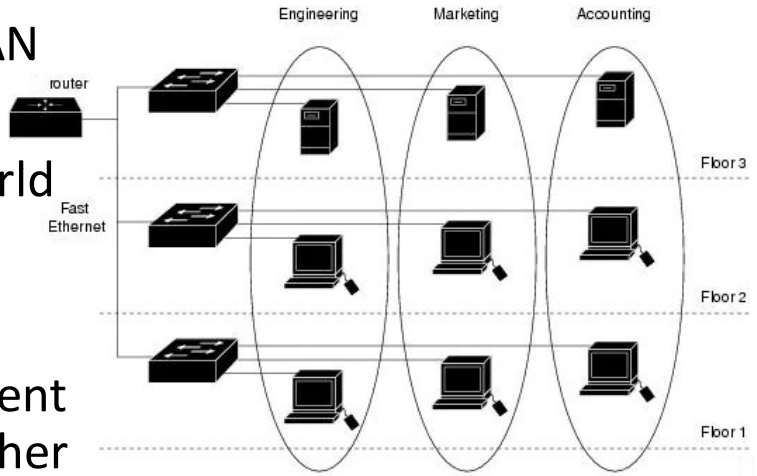
- Span of LAN is the broadcast domain
- Switches can not isolate propagation of broadcast messages. If number of node increases then number of broadcast message increases which degrades performance of LAN
- So number of nodes need to be limited and hence LAN spreads in limited area
- Someone in LAN can sniff all packets using tools like Wireshark. It may be a threat for information leak.
- Isolation of data transaction and privacy of data may be important for a company for security

Virtual Local Area Networking

- Company may like to isolate traffic of executive team form rest of the employee or from specific group of users
- Dividing a bigger network in multiple LANs is better from performance, administrative and management perspective
- If number of nodes in a LAN is less then switches need to maintain less number of ARP entry and process less, which reduces load to switches
- For network administrator it becomes easier if multiple small LANs are there instead of one to debug network problems
- Managing users in group, their movement and providing network usage features becomes easier, if they are divided in smaller LANs

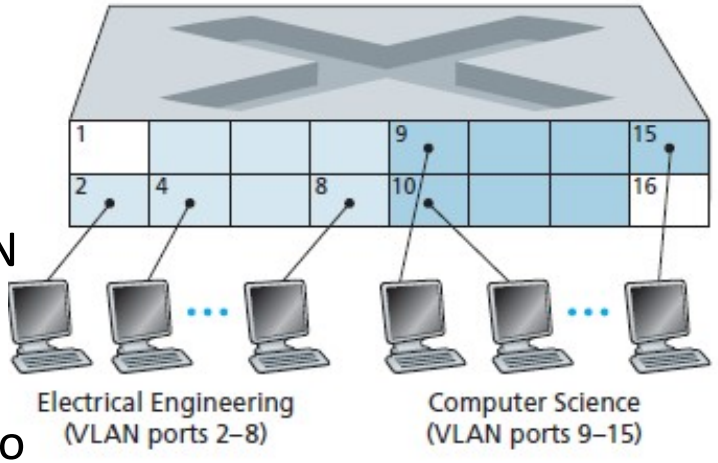
Difficulties in LAN

- LANs are often configured hierarchically
- Each workgroup (department) having its own switched LAN connected to the switched LANs of other groups
- Such a configuration often does not works well in real world
- Departmental LANs can be done using separate switches which makes LAN location specific
- But due to space optimisation or due to project requirement people of different departments might have to seat together which break LAN separation architecture
- These difficulties can be handled by a switch that supports virtual local area networks (VLANs).



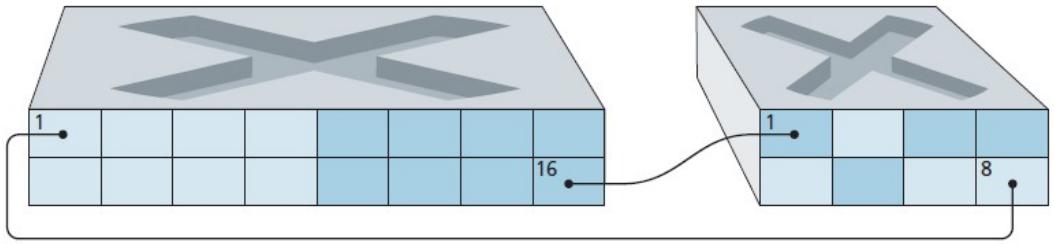
VLAN

- A switch that supports VLANs allows multiple virtual local area networks to be defined over a single physical local area network infrastructure
- In a port-based VLAN, the switch's ports (interfaces) are divided into groups by the network manage
- Each group constitutes a VLAN, with the ports in each VLAN forming a broadcast domain
- If the user at switch port 8 joins the CS Department, the network operator simply reconfigures the VLAN software so that port 8 is now associated with the CS VLAN
- A table of port-to-VLAN mappings is maintained within the switch and switch hardware only delivers frames between ports belonging to the same VLAN.



Port based VLAN

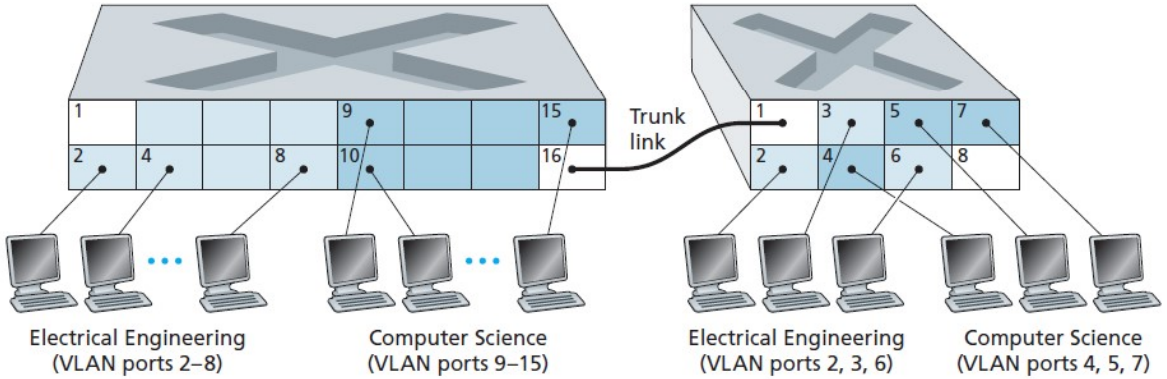
- If people of departments are housed in a separate building, where they'd like to be part of their department's VLAN, two VLAN switches need to be interconnected
- One solution can be



- But if number of departments and buildings are more many ports will be wasted

Trunking

- A more scalable approach to interconnecting VLAN switches is known as VLAN trunking



- For multiplexing and demultiplexing packets of each VLANs are given a four byte VLAN tag

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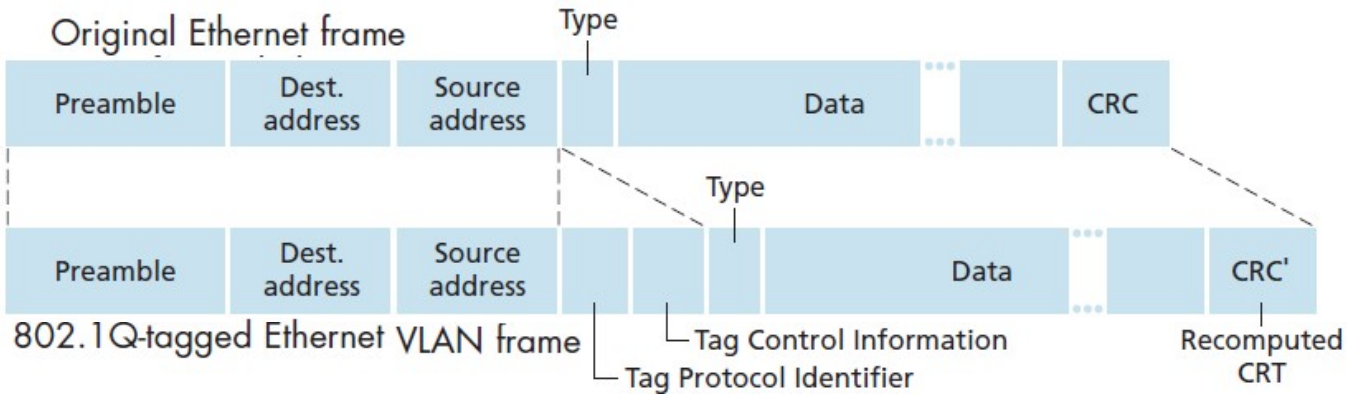

- 802.1Q standard defines VLAN protocol
- Tag Protocol Identifier (TPID) field has a fixed hexadecimal value of 81-00)
- 2-byte Tag Control Information field contains a 12-bit VLAN identifier field
- 3-bit priority field that is similar in intent to the IP datagram TOS field.

- In MAC-based VLANs, the network manager specifies the set of MAC addresses that belong to each VLAN. Whenever a device attaches to a port, the port is connected into the appropriate VLAN based on the MAC
- VLANs can also be defined based on network-layer protocols (e.g., IPv4, IPv6, or Appletalk) and other criteria.

Other Types of VLAN

- VLAN trunking can be done based on IP address also
- So two remotely located offices can be part of same VLAN using Internet infrastructure
- If your organisation's system supports, you can be part of the same LAN from home using some trunking software
- This allows to access all the resources which are only accessible in organisation's local LAN

THANK YOU

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