

## **ETC 647 – Creating Technical Learning Environments**

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### **Module Three - Networks**

#### **Learning Log**

##### **Why do schools install networks?**

The main reason that schools, business or anybody install networks is to share resources. By sharing hardware, like printers, schools can reduce cost. By networking computers schools can share other peripherals, such as scanners, storage devices, etc. Networks also allow the sharing of software, which districts can purchase a license agreement for network use. Sharing data among networked computers is easy and can be a time saver. Networks enable teachers to work together regardless of their location and time frame.

The primary disadvantage of a network is their vulnerability to unauthorized access and the potential threat of malicious code including viruses, worms, Trojan horses and blended threats.

Most school computer labs use LAN (Local Area Networks) which connects computers within a very limited geographical area. The district might use a WAN (Wide Area Network) to connect to each school via the Internet.

##### **Common Components of a Network**

To establish a network a few options need to be kept in mind.

- 1) The geographical scope - Where is the area in which the network is located? Is this a LAN or a WAN.
- 2) The organizational structure - What is the hierarchy of devices connected to a network? Is this a client/server or a peer-to-peer?
- 3) The physical topology - What is the physical layout or relationship between the network devices? Is it star, bus, ring, mesh or tree?
- 4) The network links - What technology is used to carry the data? Is it, twisted-pair cable, coaxial cable, fiber-optic cable, RF signals, microwave, infrared light or power line?
- 5) The bandwidth - What is the capacity of a network for carrying data? Is it broadband or narrowband?
- 6) The communication protocols - What is the transportation standard for packaging data? Is it TCP/IP, SPX/IPX (Novell), NetBEU/NetBIOS (Microsoft) or Apple Talk?

## **What is the difference between a switch and a hub?**

Hubs and switches connect computers on a network but work in different ways.

A *hub* is a central connection point that is designed to broadcast data between workstations and peripherals. Some hubs are repeaters. They keep repeating the signal and this can cause unnecessary traffic on the network. A hub would be used for a smaller network where there would not be a high amount of traffic. High amounts of traffic on a hub could result in the "crashing" of information packets.

A *switch* reduces the amount of information flow on the network based on the address information in each packet. The switch knows which port is connected to the device and forwards the packets to the correct ports. Switches are better for larger networks.

Sometimes hubs and switches are used in the same network.

## **Organizational Structure - (Client/Server and Peer-to-Peer)**

In a *client/server network*, the server is the most important resource. The clients are the individual computers that are networked to the server. The server contains the data or information that is shared among the network.

In a *peer-to-peer* each computer is treated as an equal resource. Every computer can store information or data and can be transported directly to each other without having to pass through a server.

My guess would be that most school districts use a client/server network for simple management reason. There maybe computer labs at individual school where peer-to-peer would be used to share information between the workstations.

## **Ethernet**

I have seen Bob Metcalfe speak on television and he quite a guy. His story is very interesting. He is the creator of the Ethernet. The Ethernet is defined by IEEE 802.3. It simultaneously broadcast data packets to all network devices. A packet will only be accepted at a device to which it is addressed.

The original Ethernet standard cared data at only 10Mbps (megabits per second). The most popular speed for small to medium LANs is the Fast Ethernet, which carries data at 100Mbps. There is also an Ethernet Standard of Gigabit (1000Mbps) and 10 Gig (10Gbps).

From what I gathered about cable length for the Ethernet, it depends on the type of cable and the standard. I went with the Fast Ethernet and discovered that 100 meters or 328 feet. This is about the size of a football field. This limitation is the results of the timing of the Ethernet signals on the cable.

## **Hubs, Switches, Routers and Bridges**

*Hubs* are network devices that are designed to broadcast data to computers and peripherals. Some are repeaters that can boost the strength of the signal carrying data over a network.

*Switches* are devices that filter and forward packets between segments in a local area network.

*Routers* are the most commonly used gateway. It is an electronic device that joins two or more networks. A gateway is a term that is used to describe a device or software code used to join two dissimilar networks by translating data sent from one network into a compatible format for the receiving network.

*Bridges* are connecting devices that join two similar networks so they can transfer data without regard to its format.

### **5 - 4 - 3 rule in regard to Ethernet**

This is a rule that is used when connecting nodes (computers/peripherals) on to a network via Ethernet. It states that between any two nodes there can be a maximum of five segments connected through four repeaters, and only three of the five segments may contain user connections. This rule is to minimize transmission times of the signal over the Ethernet connection.