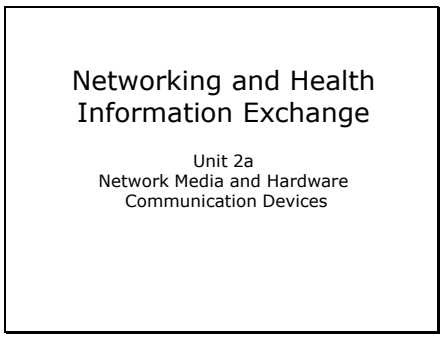
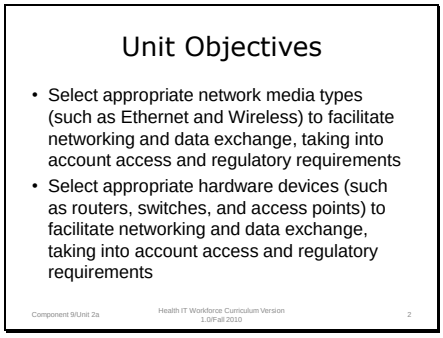
Slide 1



Networking and Health Information Exchange
Unit 2a
Network Media and Hardware Communication Devices

Slide 2

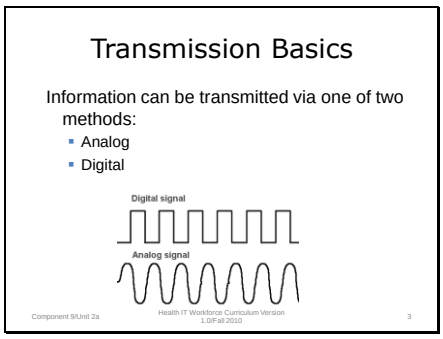


In this unit we will cover the following objectives:

•Select appropriate network media types (such as Ethernet and Wireless) to facilitate networking and data exchange, taking into account access and regulatory requirements

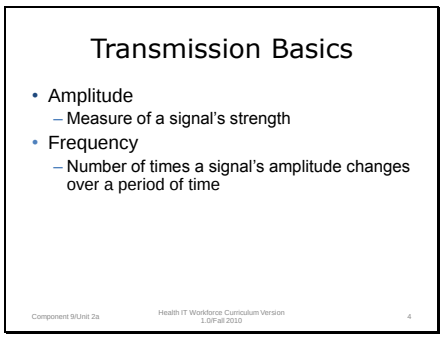
•Select appropriate hardware devices (such as routers, switches, and access points) to facilitate networking and data exchange, taking into account access and regulatory requirements

Slide 3



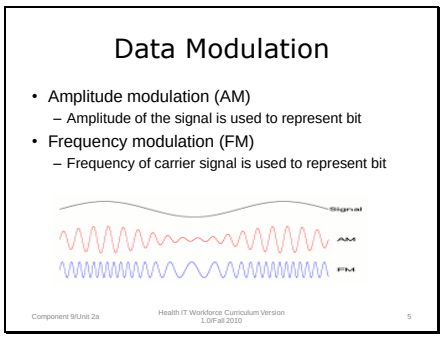
First we will cover some general terms that you need to know when dealing with networking. Information can be transmitted in one of two ways in a network, analog or digital. An analog signal is a continuous signal and it is hard to distinguish each "character". Examples of analog signals are voice, analog clock and old analog tv signals. With digital signals each "character" is very distinct. A computer uses digital signals, use 0 and 1s. Another example is a digital clock and digital tv. It may be hard to tell the exact time on an analog clock (use example) but with a digital clock you can tell exactly what time it is.

Slide 4



A couple of characteristics of a signal are amplitude and frequency. Amplitude is the height of a wave at a given period of time. Frequency is the number of time a signal changes in a given period of time. It is measured in hertz (Hz).

Slide 5



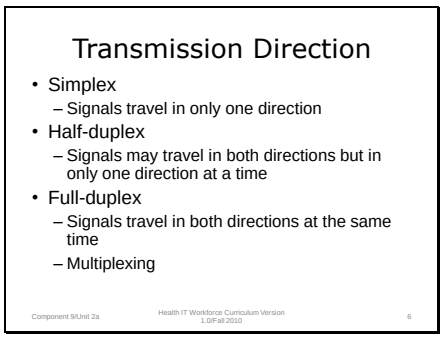
The amplitude and frequency of a signal can be changed, or modulated, to represent data. For example if we are using amplitude modulation a big amplitude represents a 1 where as a lower amplitude represents a 0. With frequency modulation lots of changes in signal over a given period of time represents a 1 where fewer changes in signal during a given period of time represents a 0.

Amplitude modulation is used by AM radio so other electric sources like lighting could cause a 0 (low amp) to become a 1 (high amp). Signals that are produced by amplitude modulation are carried a shorter distance before degrading (think of AM radio stations).

Frequency modulation is used by FM radio. The signals are carried longer distances and are less susceptible to interference by other electric sources (think of FM radio stations)

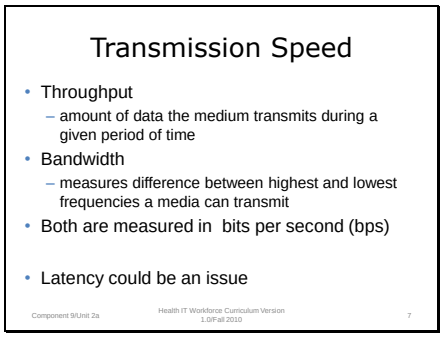
Graphic is an example of amplitude modulation and frequency modulation for an analog signal.

Slide 6



Data can flow in one of three possible ways in a network, simplex, half-duplex or full-duplex. Simplex means that data can only flow in one direction like water coming out of a water faucet. You can't send water up a faucet. Half-duplex means that data can flow in both directions but only one direction at a time. An example is a CB radio. You can talk on the radio and listen on the radio but only one of those things at time. Full-duplex means that data can flow in both directions simultaneously. An example is a 2 or 4 lane highway, traffic travels in both directions at the same time. Full duplex allows multiple signals to travel simultaneously over a single media. This is called multiplexing. Full duplex will allow more data to be transmitted.

Slide 7



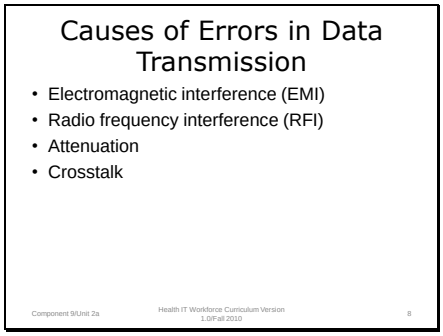
Bandwidth is a measurement of the difference between the highest frequency and lowest frequency that a media uses. Medium or media is the type of cable or wireless that is carrying the signal between devices. Bandwidth is theoretically the max amount of data that a particular media can carry. Throughput is the actual amount of data that is being transmitted on the media at a given period of time. Throughput is almost always lower than bandwidth. Bandwidth is important in determining the "pipe" that your data will be able to travel down. The bigger the bandwidth, the bigger the "pipe". Example is a 4 lane highway. Bandwidth would be

4 vehicles but if there is a wide vehicle taking up 2 lanes, the throughput would just be 3 vehicles.

Bandwidth is measured in bps.
Chart for bps :
1 bit per second – bps
1000 bits per second- Kbps
1,000,000 bits per second – Mbps
1,000,000,000 bits per second – Gbps
1,000,000,000,000 bits per second – Tbps
Current technology has transmission speeds measured in Mbps or Gbps.

Latency could be an issue in data transmission. Latency is a delay between the transmission of a signal and its receipt. This may cause a device to think that its signal has not been received and it will resend the signal causing excess traffic on the media.

Slide 8



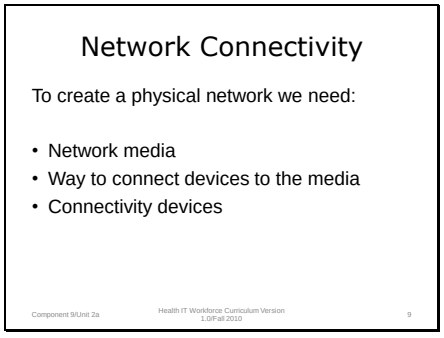
There are many things that can cause errors during the transmission of data. These errors may cause the data to not be received at all or they may alter the data that is received so it is not the same as what was sent.

Electromagnetic interference (EMI) and radio frequency interference (RFI) are caused by motors, power lines, fluorescent lights, radio or tv tower signals or any other source of electrical or radio signals. EMI interferes with signals that are being sent electronically (across copper cables) and RFI interferes with wireless signals.

Attenuation is the loss of signal strength as it travels away from source. An example is yelling in a canyon – HELLO, HELlo, Hello, hello; can use repeaters to boost signal strength so it can travel farther

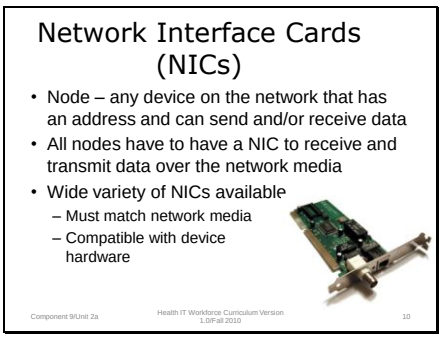
Crosstalk is when signals from one wire interfere with signal on another wire. Both wires are part of the same cable. Alien Crosstalk occurs when signals from adjacent cables interfere with another cable's transmission. An example of crosstalk would be like when a cordless phone's signal could be picked up on a baby monitor.

Slide 9



In order to have a physical network we need media, way to connect devices to the media and connectivity devices to connect the devices to so that they can communicate. Media or medium is what connects the network devices to each other. It can be a cable or wireless. The way to connect the devices to the media will be network interface cards (NICs). Interconnectivity devices include hubs, switchers, routers and wireless access points.

Slide 10



A node is any device on the network that has an address (like an IP address) and can send and/or receive data. Examples of nodes are pcs, laptops, printers, telephones, pdas, tablets, anything that you can connect to a network. Any node that you want to connect to the network must have a NIC.

There are many different types of NICs available. The NIC you use must be compatible with the hardware of the device you are installing it in. For example if the pc only has PCI slots then NIC must be a PCI NIC. It must also be compatible with the media you will attach it to. For example if you are connecting a laptop to a twisted-pair cable then the NIC must have the correct port for a twisted-pair cable.

Slide 11

Wireless networks are very popular today. One type of NIC is a USB wireless NIC. It can be used in laptops and desktops. Lots of cell phone companies offer wireless network plans and supply customers with wireless USB adaptors so they can connect to the network

There are other types of wireless NICs like the one show in the slide with an antenna attached. Just like there are many different types of cars, there are many different types of NICs. They will all get you connected to the network but some will give you better connections than others.