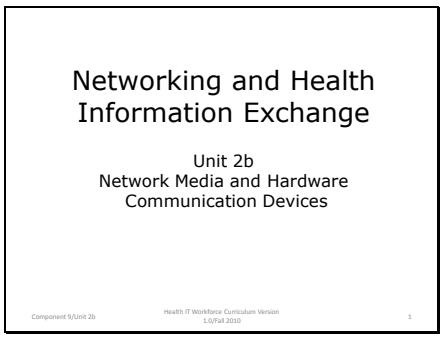
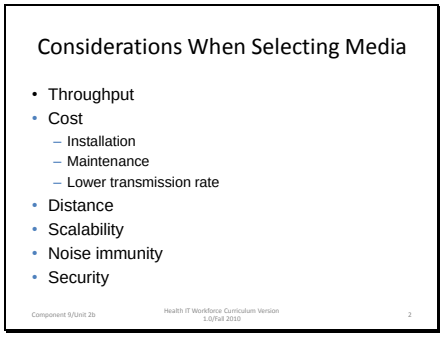
Slide 1



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

Slide 2



When selecting the media to use on your network there are many things to consider.

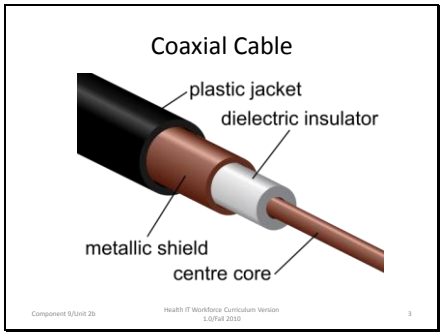
You need to consider cost. This include the cost of installation including cost of media, media connectors, cost to install (can your IT department install the media or will you have to hire a contractor). You also have to consider the cost of maintaining the media. If a cable breaks how easily can you fix it? How long would it take to fix it? Can you IT staff fix it or will you have to call the consulting company back in? You also have to consider that one media may cost less to install and maintain but it may not give you the transmission rate you need so employees' work is slowed down because it takes a long time to download a file. It may be worth having a more expensive media installed and maintained in order to increase productivity.

You have to consider size and scalability. Different media have different maximum segment and network lengths and support for different number of nodes.

You have to worry about noise. Copper cables are affected by EMI and wireless by RFI. Fiber is not affected by either.
Conduit can be used to help protect copper cables from EMI.

Security is also an issue. Wireless is more susceptible to security problems like eavesdropping than copper or fiber optic. There are steps that can be done to make wireless networks as secure as wired networks.

Slide 3

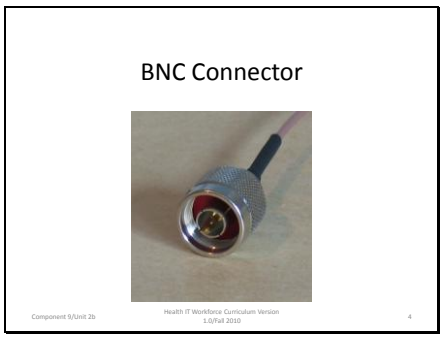


Copper cables include coaxial (coax) and twisted-pair. Both transmit electrical signals

Coax cable consists of a central copper core surrounded by an insulator, braiding, and outer cover called a sheath. The center core is what actually carries the signal and if core is broken then the network is "down" – data can not be transmitted. A type of coaxial cable is what is used for cable tv.

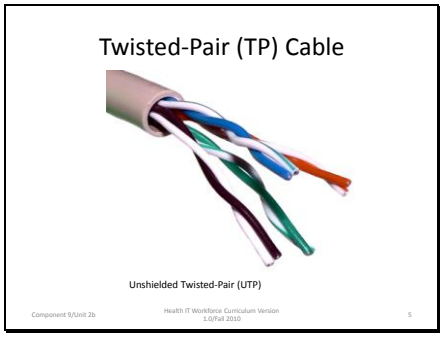
Coax isn't used much in modern networks. If you encounter coax today in a network it will be thin coax also know as Thinnet.

Slide 4



The connector used for Thinnet is called a BNC connector. This connects the coax cable to the NIC card in a node.

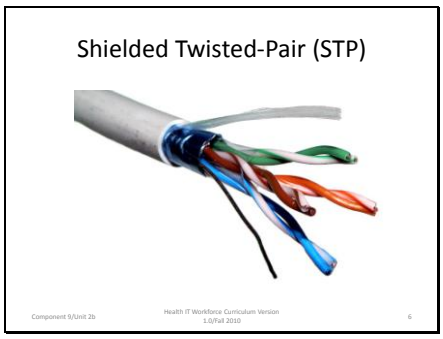
Slide 5



The majority of modern networks use twisted-pair cable. There are two types of twisted-pair (TP), unshielded twisted-pair (UTP) and shielded twisted-pair (STP). Both contain color-coded pairs of insulated copper wires twisted around each other and encased in plastic coating. There are typically 8 wires twisted into 4 pairs and all 4 pairs are twisted around each other. The twists in wire help reduce effects of EMI. The number of twists per meter or foot is known as the twist ratio.

TP also comes in different categories. Current networks would use Category 5 or 6 (cat 5 or cat 6). The different categories allow for different bandwidths

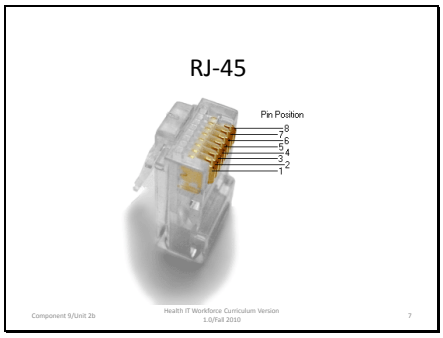
Slide 6



STP cable consists of twisted wire pairs that are insulated and surrounded by shielding made of metallic substance – notice the blue shielding in the graphic. This extra shielding provides more protection against EMI. It is more expensive than UTP.

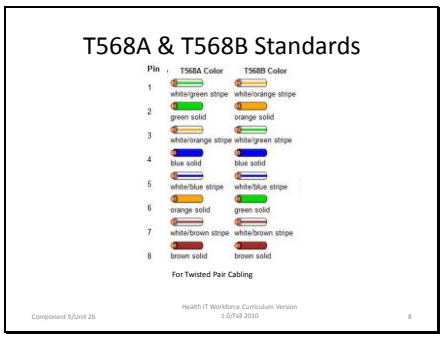
A word that you may encounter when dealing with TP is plenum. If TP cable is non-plenum it will put off a toxic gas when it burns, plenum cable will not so it is required if the cable is run in ceiling or air ducts.

Slide 7



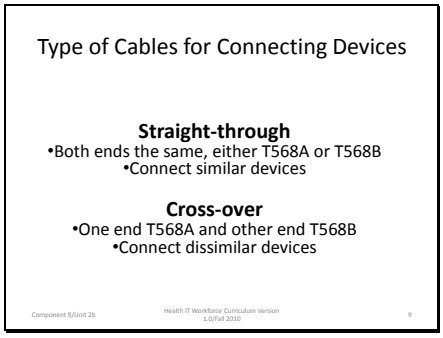
The connector for TP is an RJ45. It is like telephone connectors (RJ-11) except bigger. Notice the PIN layout in the graphic because we will be coming back to it.

Slide 8



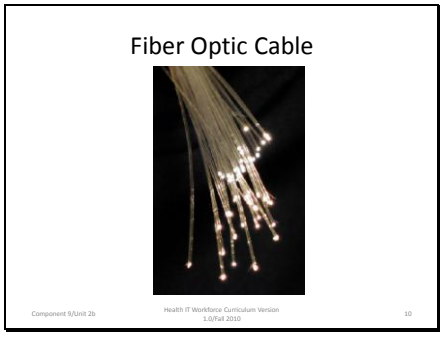
If you are going to make your own twisted-pair cables you should follow the T568A or T568 B standards as shown as the slide.

Slide 9



Certain types of twisted-pair cables are used for making connections between devices. Straight-through cables are used to connect dissimilar devices like a pc to a hub/switch. Both ends are the same-either both T568A or both T568B.
Cross-over cables are used to connect similar devices like a pc to a pc. One end is T568A and the other end T568B - PINS 1 & 3 and 2 & 6 are swapped.

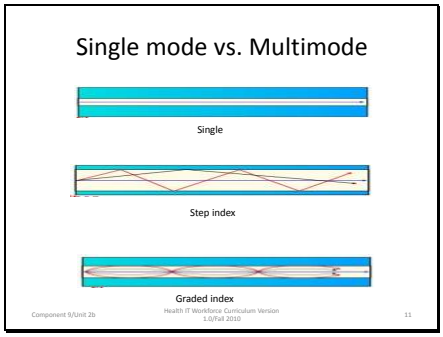
Slide 10



Fiber optic cables do not transmit electrical signals but light signals. Fiber optic is made up of the core that carries the light pulses, the cladding that reflects the light pulses back into the core and the buffer coating that protects the core and cladding from moisture, damage, etc. The fibers are the size of a human hair

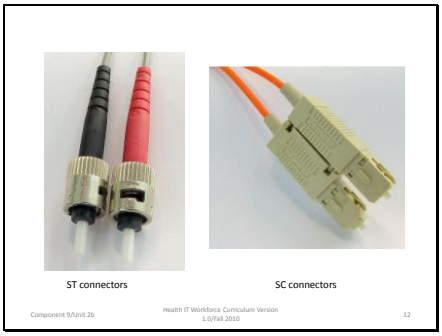
It is faster and more expensive than copper cables. Signals transmitted over fiber can experience optical loss (which is equal to attenuation for copper cables).

Slide 11



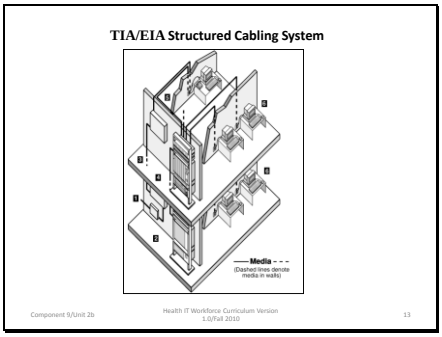
There are 2 ways that fiber transmits signals, single-mode and multimode. Single-mode fiber carries light pulses along a single path. Only 1 signal can be transmitted at a time. Multimode fiber carries many pulses of light at one time. There are 2 types of multimode fiber, step index and graded index. With step index rays of light are guided along the fiber core by total internal reflection, angle in equals angle out. In graded index multimode a change in the density of the glass makes the light bend and travel down the fiber.

Slide 12



There are many different types of connectors used for fiber optic cable. Two of the more commonly used are ST and SC connectors.

Slide 13

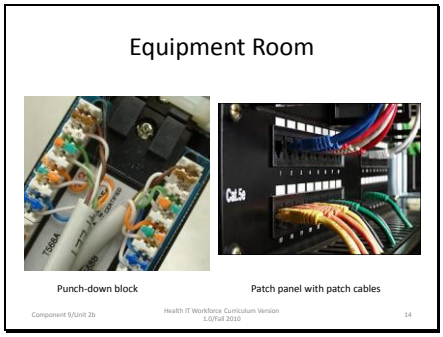


With more and more companies using networks there was a need for a standard for network cabling. In the early 90s the TIA/EIA 568-A standard for structured cabling system was introduced.

There are six subsystems of a structured cabling system.
1. Building Entrance – This is the point at which outside cabling interfaces with the intrabuilding backbone cabling; may also be referred to as demarcation point, a term left over from telephone networks (telephone company network ends and connects with the wiring at the customer premises)
2. Equipment Room – where the equipment to provide the connect between the intrabuilding network and external network resides.
3 Backbone cabling - interconnection between telecommunication closets, equipment rooms and entrance facilities
4 Telecommunications Closet - houses the telecommunications cabling system equipment.
5 Horizontal Cabling - extends from the work area telecommunications

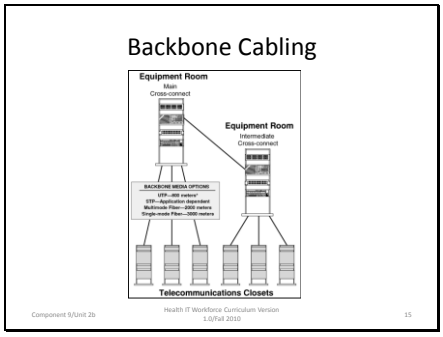
(information) outlet to the telecommunications closet
6 Work Area – where work is done – where pc, server, printer, etc is located

Slide 14



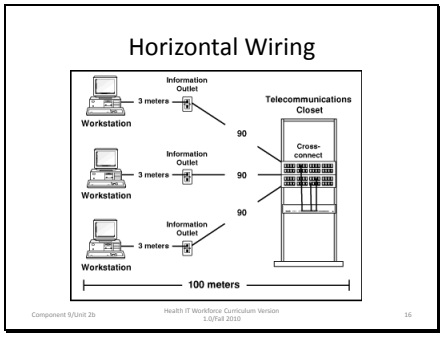
Some common equipment found in an equipment room is the punch-down block, patch panel and switch/hub. A punch-down block is a panel where the TP is brought and literally all 8 wires are punched down into the block. In the front of the punch down block is a patch panel that contains RJ45 ports. Patch cables are a relatively short section of twisted-pair cabling with connectors on both ends that connect the port in the patch panel with a port on a switch, hub or router.

Slide 15



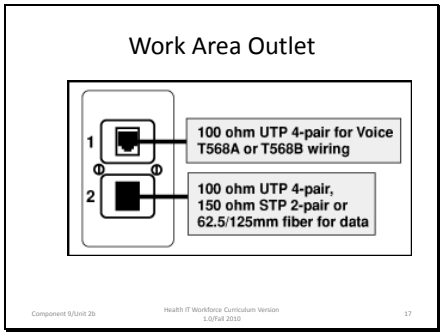
Backbone cabling includes the vertical connection between floors (risers), cables between an equipment room and building cable entrance facilities and cables between buildings (interbuilding). The cables between floor and equipment rooms are typically TP or fiber with the cables between buildings being fiber.

Slide 16



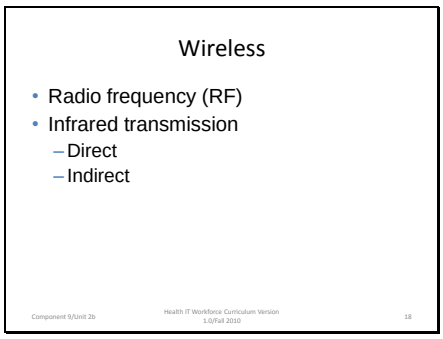
Horizontal wiring extends from the work area telecommunications (information) outlet to the telecommunications closet. This wiring is generally run in the walls, floor or ceiling.

Slide 17



Each work area must have a minimum of 2 information outlet ports, one for voice and one for data. A patch cable is used to connect the outlet to the node

Slide 18

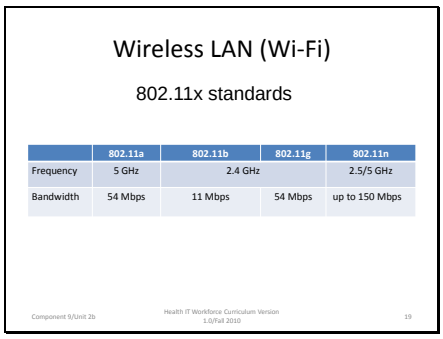


In addition to using copper or fiber optic cables we can use wireless to connect our network devices. There are 2 types of wireless transmissions, radio frequency (RF) and infrared. Radio frequency transmits a series of radio waves across a set frequency. RF is used by cellphones, radioes and walkie-talkies. Infrared networks use infrared light signals to transmit data through space. Examples are your remote control, UPC scanner at store and infrared mouse, keyboard, etc for pcs

Direct infrared transmission depends on the transmitter and receiver remaining within line of sight; Example - trying to change tv station and someone standing in front of and can't change

In indirect infrared transmission, signals can bounce off of walls, ceilings, and any other objects in their path so that it can be sent from the transmitter to the receiver. Example you can point remote control at wall and it bounce off wall and changes tv station (angle in equals angle out)

Slide 19



There are 4 standards for wireless technology used today. 802.11 b, g, a and recently introduced last year n. b and g are compatible. You will see equipment that says b/g. Your equipment (wireless access point) and NIC must use the same standard in order for them to communicate with each other.