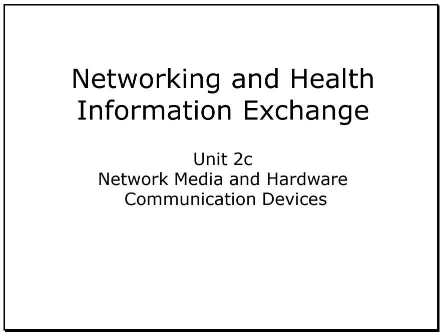
Slide 1

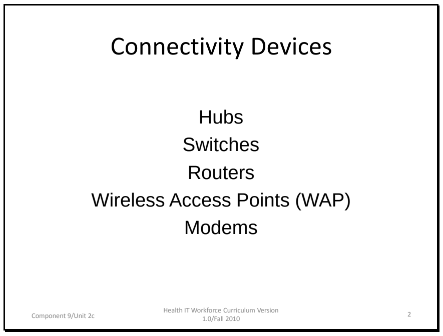


Networking and Health Information Exchange

Unit 2c
Network Media and Hardware
Communication Devices

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

Slide 2

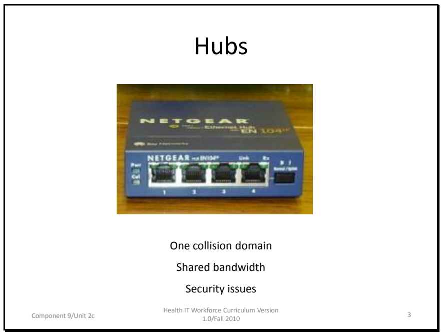


Connectivity Devices

Hubs
Switches
Routers
Wireless Access Points (WAP)
Modems

We know we need a NIC in each node and media to connect the node now what do we connect the node to? We can use a hub, switch, router, wireless access point (WAP) or modem. These devices will allow nodes to talk to other nodes on a network.

Slide 3



Hubs

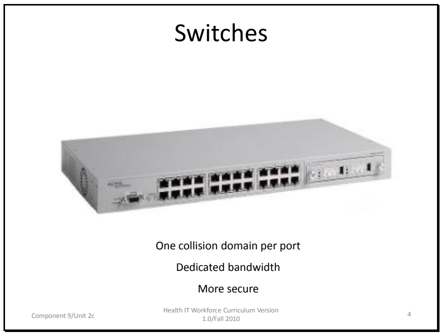
One collision domain
Shared bandwidth
Security issues

Hubs contain multiple ports to interconnect multiple devices. They are not used a lot in modern networks but you may still encounter them. They are cheaper than switches and work well for just a few nodes.

Each node has a connection to a port on the hub. There is a security concern with hubs. If data comes into one port it goes out to all other active ports. This means that the signal (data) can be received by all devices connected to those ports. A device will not “read” a packet if it is not addressed to them however packet sniffing software (like Wireshark) could be installed on that device and the device could be running in promiscuous mode which means it will read all packets that it receives regardless of the address. If the packet contains unencrypted data like usernames, passwords then the user of that device now has that information.

Another problem with hubs is that bandwidth is equally shared among all active ports. If the bandwidth coming into the hub is 10 Mbps and there are 5 active ports than each port has access to 2 Mbps. The ports are all part of one collision domain. All devices that are connected to those ports must compete with each other to have access to the network.

Slide 4



Switches

One collision domain per port

Dedicated bandwidth

More secure

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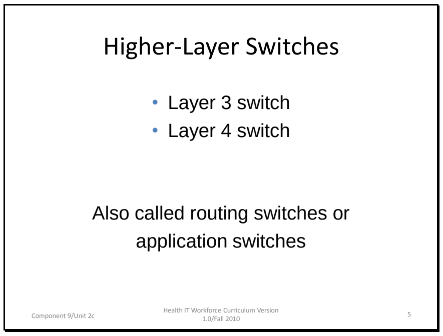
With switches each device has its own connection to a port on the switch. Each port is a collision domain so a switch with 4 active ports would have 4 collision domains. If there is 10 Mbps coming into the switch then each port has 10 Mbps. Switches have a switching (or MAC) table which means that a table is created that associates the MAC address of the device connected to the port with the port #. If a packet is destined for a particular device (MAC) then that packet will only be sent to the

port associated with that MAC. This is a more secure form of data transmission. It is not susceptible to the same type of packet sniffing issue we had with hubs.
Switches operate at layer 2 (Data Link) of the OSI model.

Slide 5



Higher-Layer Switches

- Layer 3 switch
- Layer 4 switch

Also called routing switches or application switches

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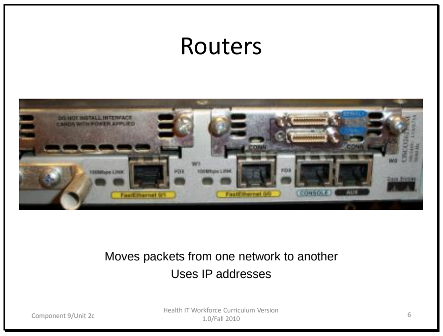
There are more sophisticated switches that can operate at other layers in addition to layer 2. Layer 3 switches can interpret layer 3 (network) information. Layer 4 switch can interpret layer 4 (transport) information.

Slide 6



Routers

Moves packets from one network to another
Uses IP addresses

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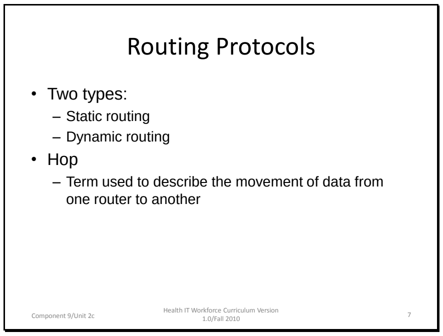
Routers are multiport connectivity devices that connect different networks (LANs, WANs, different transmission speeds, media, and protocols) to each other. Routers operate at the Network layer (Layer 3) of the OSI Model. They move packets from one network to another (routes packets).

Slide 7



Routing Protocols

- Two types:
  - Static routing
  - Dynamic routing
- Hop
  - Term used to describe the movement of data from one router to another

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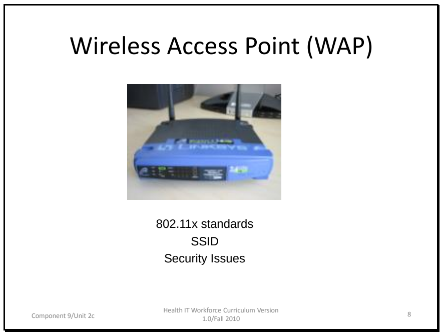
Routers choose the best route for a packet to take to arrive at its destination. There are two ways that the router knows what the best path is, static routing and dynamic routing. In static routing a network administrator programs a router to use a specified path to move data between two nodes. In dynamic routing routers automatically calculate the best path between nodes and accumulate this information in a routing table. Routers share information about the routes with each other.

A hop is a term used to describe the movement of date from one router to another. For example if a packet travels across 3 routers from its source to its destination it is said to have taken 3 hops.

Slide 8



Wireless Access Point (WAP)

802.11x standards
SSID
Security Issues

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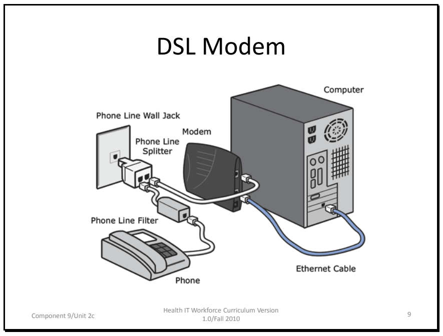
A wireless access point (WAP) is used to provide wireless access to a network. It uses the 802.11x standards. Each WAP has a Service set identifier (SSID). Wireless devices use this SSID to make an association with the WAP.

Wireless is by default an unsecure transmission method. You should take precautions to secure your WAP. This includes setting up WPA, WPA2 or WEP on your WAP. This requires each wireless device to have a password to authenticate to the WAP and is also used to encrypt data that is being transmitted between the WAP and wireless device. Be aware that unsecured WAPs are a BIG security risk for your network.

Most WAP in homes are a combination of switch (multiple ports), router (move packets between wired and wireless networks) and WAP (provide access to wireless network.)

Slide 9



DSL Modem

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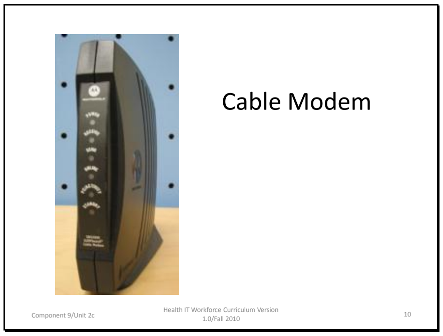
A small office may use DSL or cable modems to provide Internet connectivity.

A digital Subscriber Line (DSL) modem is a device used to connect a pc or router to a telephone circuit that has DSL service configured. DSL is provided by your local phone company. The location that wants to have DSL has to be within a certain distance (generally 18,000 "wire feet“) of the phone company’s central office.

Slide 10



Cable Modem

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Using the same method in which you get cable tv you can now get Internet connectivity. The coaxial cable coming into your house would be connected to the cable modem and then a twisted-pair cable would be used to connect a pc or WAP to the modem. Cable is a shared bandwidth system so the more people using the system, the less bandwidth each customer receives.