

CS 107 Fall 2006

Class 9: Networking

1 Transporting Signals.

Signals.

- Analog signals are continuous waves. The frequency of a wave is how often it changes from positive to negative and back. When used to carry data, higher frequency waves can carry more data than lower frequency.
- Digital signals are on or off, with sudden changes between those states.

Cables.

- Twisted pair cables are used now to network homes and offices. (Ethernet)
- Coaxial cables are used for cable TV and cable modems. They are harder to work with than twisted pair. They are big, do not go around corners very well, and are harder to terminate.
- Fiber-optic cables are used for most long-distance lines. They are bundles of thousands of strands of glass, surrounded by a protective sheath. Light waves are used to carry the data through the glass strands.

Network computers.

- A hub connects several local computers to the local network. Information coming into the hub is broadcast to all of those computers, and each computer picks up packets that were sent to its own IP address. When messages are sent through the hub, packets from all those computers take turns going out through the outgoing line.
- A wireless hub can send and receive wireless messages, but otherwise works like a hub.
- Some networks are switched: in that case messages are sent only to the one machine with the proper IP address.
- A printer or scanner might be attached to a computer that is on the network. A better plan, though, is to use a network printer (one that has the hardware and software to connect to the network itself).
- A firewall forms a barrier between the local network and the Internet. Firewalls are used to detect and eliminate viruses and unauthorized access. To use a web server, there must be a hole in the firewall (an open port).

Wireless computing. Wireless access to the Internet has enabled some wonderful things:

- Instant messaging from a cell phone.
- GPS systems for hikers, travelers.
- “Prox” cards can take the place of keys for office buildings. Just stand near the card reader so that it can read the card in your wallet in your pocket, and it will open the door for you.
- RFID chips: implant in an auto or pet to let us locate it when stolen or lost.

- Express lanes through highway toll booths (Easy-pass)
- Network access in small, isolated villages, by means of a traveling wireless-hub-truck.

There are some real problems with wireless technology:

- Your neighbor can break into your signal to listen or to “piggyback” his own messages on it.
- Privacy is, therefore, compromised; identity theft is a concern.
- Some people worry about the government spying on them if RFID chips become very widely used.

2 The OSI 7-layer Model for Networking

1. Physical layer: cables, transmitters, etc. transport bits. This layer is responsible for making and maintaining connections and sharing the lines. Ethernet implements layers 1 and 2.
2. Data Link layer. Adds checksums to the bits for error detection and correction.
3. Network layer: puts the bits into packets. The Internet Protocol (IP) operates at this level.
4. Transport layer: Responsible for making packet transfer reliable. Routers work at this level. TCP is the common UNIX protocol.
5. Session layer. Responsible for managing sessions, cookies
6. Presentation layer. Responsible for encryption, data compression.
7. Application layer. Some useful network applications: HTTP, NFS, Telnet, FTP.