Chapter 15 -- Networks

What is a Computer Network?

- A collection of computing devices that are connected in various ways in order to communicate and share resources.
- Connections are usually made using physical wires or cables.
- Connections can also be *wireless*, using radio waves or infrared signals.

Some terminology

- **node** or **host**: any device on a network
- **data transfer rate**: the speed with which data is moved from one place on a network to another (key issue)

Types of Computer Networks

- **Local-area network (LAN)**   A network that connects a relatively small number of machines in a relatively close geographical area (a few square kilometers).
- **Wide-area network (WAN)**   A network that connects two or more local-area networks over a potentially large geographic distance (possibly the entire planet).
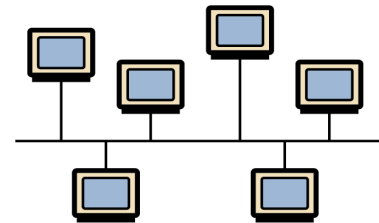
Local-area Network (LAN)

LAN topologies

- **Ring topology**: A configuration that connects all nodes in a closed loop on which messages travel in one direction
- **Star topology**: A configuration that centers around one node to which all others are connected and through which all messages are sent
- **Bus topology**: All nodes are connected to a single communication line that carries messages in both directions.
  Example: Ethernet.
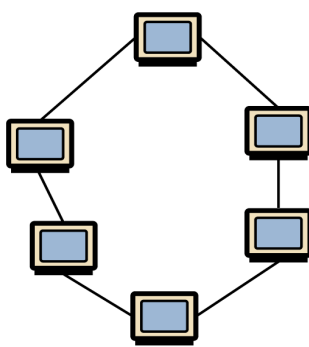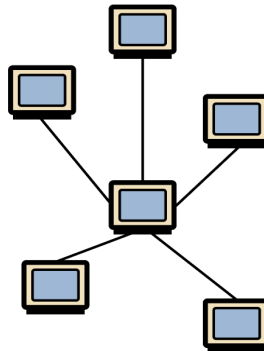
Ring topology   Star topology   Bus topology

Ethernet
- Ethernets use bus or ring topologies.
- to send a message, wait for an idle moment and send it.
- all machines constantly listen to the net for messages addressed to them.
- if someone else picks the same moment to send we have a collision.
- should a collision occurs, both parties must re-send.
- but they must choose the moment randomly, or else they will re-collide.

- collisions limit the number of messages that can be sent on ethernet LANs and determines the variable latency experienced by the users
- this technique for resolving collisions is called Carrier Sense Multiple Access (CSMA)

Token-Ring
- Token-Ring uses ring topology.
- a token continually travels around the ring
- to send a message, wait for the token and grab it
- now you have control of the network, send your message
- listen for your message
- when you hear it, it has travelled around the entire ring and so has been received
- place the token back on the ring
- unlike Ethernet, no collisions are possible

Local-area networks are used for communication as well as resource sharing, including:
- Printers
- Computing and Web servers
- File servers

The **client/server model** is a popular way of resource sharing over a LAN:
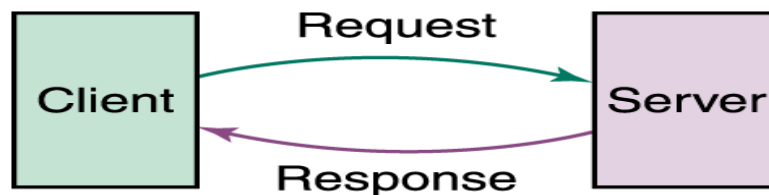
File server A computer that stores and manages files for multiple users on a network.

Wide-area Network (WAN)

- A network that connects two or more local-area networks over a potentially large geographic distance.
- Often one particular node on a LAN is set up to serve as a **gateway** to handle all communication going between that LAN and other networks.
- Communication between networks is called internetworking.
- The **Internet,** as we know it today, is essentially the ultimate wide-area network, spanning the entire globe.
- **nodes** are a location on a network where there is an aggregation of connections
- Internet nodes are also those places where many smaller networks are actually connected to the Internet

Gateway

Gateway
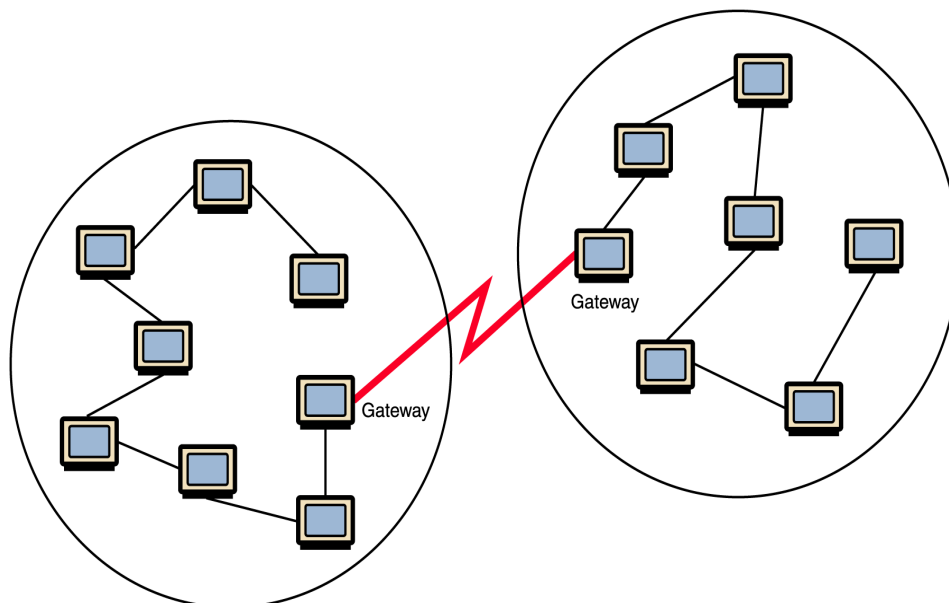
- **Internet backbone** A set of high-speed networks that carry Internet traffic. (These networks are provided by companies such as AT&T, GTE, and IBM.)
- **Internet service provider (ISP)** A company that provides other companies or individuals with access to the Internet.

History of the Internet

www.computerhistory.org/internet_history