CSE and EE 461
Lecture 2

Summer Quarter 1998

Scales of Networks

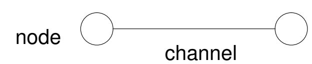
- Parallel Computer - 1 meter, 10 - 100,000 nodes
  very little data loss or corruption, very regular topology
- Local Area Network (LAN) - 10 m - 1 km, 10 - 1,000 nodes
  some data loss, often a simple bus interconnect
- Metropolitan Area Network (MAN) 1k - 10k, 100 -
  more data loss, irregular topology, dynamic routing
- Wide Area Network (WAN) - 10 km - 10,000 km, 1,000 - 1M nodes
  more data loss ,irregular topology, dynamic routing
- Intranet (Enterprise network) - 1k - 100k nodes, may be WAN or Man, under one authority
- Internet - world wide, 100 million nodes, not under any one authority

Generic vs. Specific Networks

- Generic Networks - Classes of networks without refering to a specific one
  Appletalk
  Ethernet
  Novell NetWare
  SNA
  ATM
  FDDI
  An internet
- Specific Networks - actual instances of networks
  UW campus network
  ARPANET
  The Internet

Basic Network Building Blocks

Point-to-point channel**:**



Broadcast channel:

Basic Data Units

- Packet

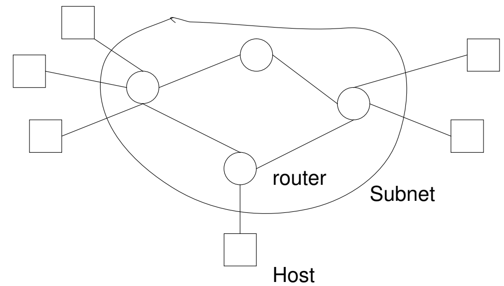
  - Data often of variable length
  - Header contains

    - destination address
    - source address
    - packet length
    - protocol information
    - sequence number for reordering
    - error detection bits

- Frames - often have header and trailer
- Cells - usually fixed length

Network Structure (Cont.)

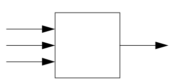
Packet-Switched or Store-and-Forward Network



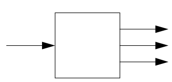
Router = Packet Switching Node
= Interface Message Processor (IMP)
= Data Switching Exchange

Router Functions

- Receive packets of data destined for different destinations
- Buffer the packets (store)
- Send packets to other routers or hosts (forward)
- Multiplex - Packets from several sources forwarded to the node



- Demultiplex - Packets from one source forwarded to separate nodes



Subnet Topologies

- Point-to-Point Topologies

  line, star, tree, ring, intersecting rings, complete, irregular
- Broadcast Subnets

  bus - carrier sense multiple access channel (CSMA)

  Satellite or radio - multiple access channel

  ring - with high-speed transceivers

Wireless Networks

- Satellite
- Cellular network
- Mobile vs. wireless networks

Protocols

- An agent is a relatively independent entity that can perform an algorithm
- A protocol is family of algorithms that enables two or more agents to communicate. Each agent performs one of the algorithms in the family.
- Protocols are typically layered, that is, a high level communcation is enabled by uses the services of a lower level communication protocol.
- Protocol stack - list of protocols one per layer
- Reasons for layering

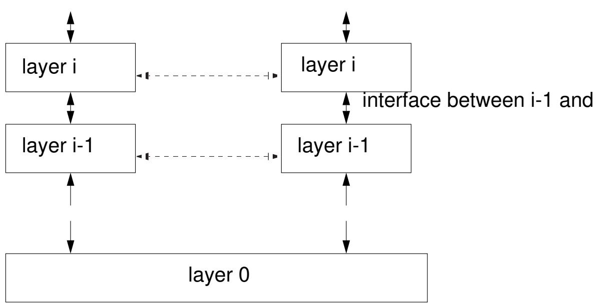
  - Hide the implemenation details of services provided to a layer
  - Different layers can be replaced independently
  - Different layers may be owned or run by different companies

Protocol Hierarchy

- Network Protocols are designed in layers or levels.

  Layer 0 is the physical medium

  The role of layer i > 0 at one site is to communicate with level i at another site by packaging its data for layer i-1. Level i-1 provides "services" to level i.



A Data Transfer Scenario