Chapter 1
Introduction, Overview, History

Motivation (why do we need networks?)

- What is a “computer network”. Didn’t know in early 60’s.
  - most computers were mainframes, why network mainframes?
  - all users were already on the same mainframe!
  - what “computing devices” are we connecting?
    - the telephone network that connects telephones?
    - the line between the terminal and the computer?
    - the line between the printer and the computer?
    - the memory card and the CPU?
    - TV cables carrying video signals to TVs?
- We need to answer two questions:
  1. Why connect computers?
  2. How do you connected them?

Why Connect Computers?: (continued)

- More Recent Answers

How Do You Connect Computers?

- How do you connect the computers?
- What is needed to achieve the functionality listed above?
- you need hardware, software, and above all, specifications
  1. Hardware
  2. Software
  3. Specifications

Why Connect Computers?

- In the early 60’s researchers envisioned computer networks and attempted to answer the question: What will we do with connected computers?
- Some of their early answers to the above question were:
  - Move data/files between computers
  - Allow remote access (login) to computers
  - Email
  - Extend UNIX services across the network
  - Shared printer access
Brief History of the Internet

- Many independent vendors each creating their own networks (both local area and wide area)
- ARPA recognized the importance of building large-scale networks formed from many (potentially different) communication technologies.
- ARPA began funding research in the mid 1970's, primarily focusing on packet switched technologies
- ARPANET resulted from this research, was a point-to-point network; but they were also looking at radio and satellite communication networks too like:
  - SATNET - a satellite based network
  - WIDEBAND - a packet-radio based network
  - MILNET - an ARPANET clone for unclassified military use

History of the Internet: (continued)

- 1985 NSF saw importance of TCP/IP to communication between researchers and access to remote computing facilities (supercomputers)
- 1986 NSF funded NSFNET. NSF’s main goal was to connect the supercomputer centers and then later provide seed funds to get regional networks going that connect to NSFNET.
- Late 1980’s NSF began opening up access to NSFNET more and more
- NSF contracted to IBM/MCI/Merit for some time to run the Internet
- 1989 Internet was becoming a production network and IAB was re-organized

History of the Internet: (continued)

- 1979 ARPA formed the ICCB (Internet Control and Configuration Board) to guide the development of the ARPANET (the ICCB operated till 1983)
- 1980 ARPA started converting its machine to TCP/IP
- 1983 Secretary of Defense mandated TCP/IP be used on all computers connected to long-haul networks
- 1983 ARPANET split into ARPANET (research) and MILNET (military)
- 1983 Formed IAB (Internet Architecture Board) to replace ICCB
- ARPA also funded BBN and UCB to put TCP into UNIX and make it widely available to universities
3. **BITNET** - a network centered around IBM machines. Leased-line based, provide mail and file transfer (no remote login), used message switching technology
4. **IBM SNA** (Systems Network Architecture) networks
5. **Digital DECnet networks**

**History of the Internet: (continued)**

- New IAB Committees were:
  - **IABB** - IAB Board - made up of a wide range of people (not just researchers)
  - **IRTF** - Internet Research Task Force
  - **IETF** - Internet Engineering Task Force
  - **IRSG** - Internet Research Steering Group
  - **IESG** - Internet Engineering Steering Group

- 1992 the Internet Society formed to encourage participation in the Internet (help people join) - took over much of the

- Around 1993 daily operations passed to the **INTERNIC** (Internet Network Information Center) (a group from AT&T http://www.internic.net

**Internet Timeline**


**History of the Internet: (continued)**

- US government then began funding other networks like the gigabit testbeds, the vBNS, the DOE ENSnet, ATDNnet, Internet II .. etc ..
- There were several other government/academic/unix networks that were also being used during the time frames described above. Examples include:
  1. **USENET** - a nationwide network connecting Unix machines. Used UUCP (Unix to Unix Copy Protocol), was message based instead of packet based. All you needed to join was a modem, a phone line, a unix machine, and a neighbor to connect to. USE PRIMARILY FOR the exchange of network news.
  2. **CSNET** - was a logical network of the computer science community and was started as an alternative to the ARPA NET, because ARPA NET was not available to everyone. Used several technologies: IP over X.25, Phonenet (dialup mail - cheap), Arpanet, Cypress (low-speed leased lines), Dialup IP.