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?

• 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
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
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)

• 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
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)

THE IAB ORGANIZATION

IAB BOARD

IRTF

IRSG

research groups

IETF

IESG

area 1

area n

working groups

Figure 1: New IAB Organization
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
History of the Internet: (continued)

- US government then began funding other networks like the gigabit testbeds, the vBNS, the DOE ESnet, ATDNet, 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 ARPANET, because ARPANET was not available to everyone. Used several technologies: IP over X.25, Phonenet (dialup mail - cheap), Arpanet, Cypress (low-speed leased lines), Dialup IP.
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
Internet Timeline

Timeline from http://www.isoc.org/internet/history/brief.shtml