Networking and Its Relationship to Higher Education

Raj Jain
The Ohio State University
Charlie Bender
The Ohio Super Computer Center

http://www.cis.ohio-state.edu/~jain/cis788-97/

New Address: Raj Jain, Washington University in Saint Louis, jain@cse.wustl.edu, http://www.cse.wustl.edu/~jain
Overview

- Networking Trends
- Impact of Networking
- Effect on Education
- Technology life cycles
Trends

- Communication is more critical than computing
  - Greeting cards contain more computing power than all computers before 1950.
  - Genesis's game has more processing than 1976 Cray supercomputer.
- Internet: 0.3 M hosts in Jan 91 to 9.5 M by Jan 96
  ⇒ More than 5 billion (world population) in 2003
Stone Age to Networking Age

- Microwave ovens, stereo, VCRs, had some effect. But, Stone, iron, …, automotive, electricity, telephone, jet plane,…, networks caused a fundamental change in our life style.

- In 1994, 9% of households with PC had Internet link. By 1997, 26%. Soon 98% … like TV and telephone.

- URL is more important than a company's phone number. (54 URLs in first 20 pages of March’97 Good Housekeeping.)

- Better communication ⇒ Distance not important
Cave Persons of 2050
Garden Path to I-Way

- Plain Old Telephone System (POTS) = 64 kbps = 3 ft garden path
- ISDN = 128 kbps = 6 ft sidewalk
- T1 Links to Businesses = 1.544 Mbps = 72 ft = 4 Lane roadway
- Cable Modem Service to Homes: = 10 Mbps = 470 ft = 26 Lane Driveway
- OC3 = 155 Mbps = 1 Mile wide superhighway
- OC48 = 2.4 Gbps = 16 Mile wide superhighway
Impact on Education

- Email is faster than telegram
  \[ \Rightarrow \] Fast pace of life
- Shorter product life cycles.
  Distance between research and products has narrowed
- Technology is changing faster than our ability to learn
  \[ \Rightarrow \] A person’s value (salary) decreases with experience (years out of college)
- Recent graduates know C++, HTML, Java, TCP/IP, ...
- New Opportunities/Challenges for educators
- New challenges for learners
Impact on Learning

- Life-long learning $\Rightarrow$ Distance education
- All institutions are at the same intersection $\Rightarrow$ World-wide competition
- A handheld device has storage enough to carry a small library
- Computers have bigger memory than humans $\Rightarrow$ Knowing where to find the information is more important than the information
Life Cycles of Technologies

Number of Problems Solved

Research          Productization          Time

You are here

You are here
New Challenges: Exponential growth in number of users. Exponential growth in bandwidth per user. Traffic management, Security, Usability, ...
Networking is the key to productivity

Networking Age

Impacting all aspects of life, particularly, education

Investment of 70’s paid off in 90’s.

Need new investment for the next decade.