

Asynchronous Transfer Mode (ATM) and Competing Technologies for High-Speed Computer Networking

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- ❑ Networking Trends
- ❑ Impact of Networking
- ❑ ATM Networks
- ❑ Competing technologies

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

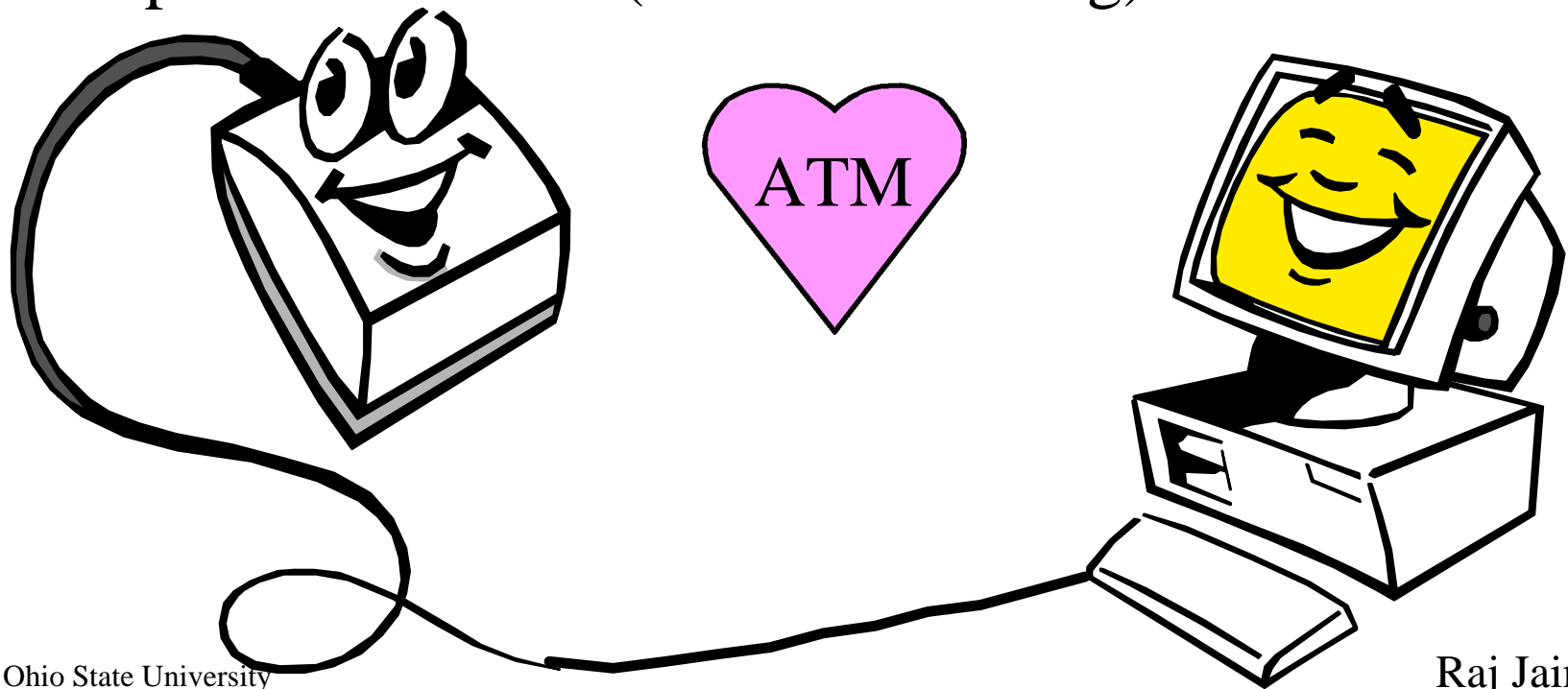
- ❑ Microwave ovens, stereo, VCRs, had some effect. But, Stone, iron, ..., automotive, electricity, telephone, jet plane, ..., networks caused a fundamental change in our life style
- ❑ In 1994, 9% of households with PC had Internet link. By 1997, 26%. Soon 98% ... like TV and telephone.
- ❑ URL is more important than a company's phone number. (54 URLs in first 20 pages of March '97 Good Housekeeping.)
- ❑ Better communication \Rightarrow Distance not important

Impact on R&D

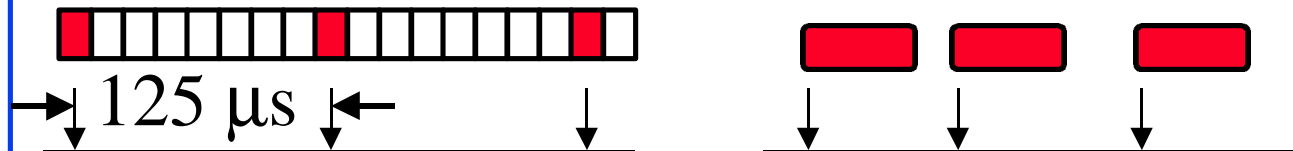
- ❑ Too much growth in one year
⇒ Can't plan too much into long term
- ❑ Long term = 1₂ year or 10₂ years at most
- ❑ Products have life span of 1 year, 1 month, ...
- ❑ Short product development cycles.
Chrysler reduced new car design time
from 6 years to 2.
- ❑ Distance between research and products has narrowed
⇒ Collaboration between researchers and developers
⇒ Academics need to participate in industry consortia

ATM

- ❑ ATM Net = Data Net + Phone Net
- ❑ Combination of Internet method of communication (packet switching) and phone companies' method (circuit switching)



ATM vs Phone Networks



- ❑ Current phone networks are synchronous (periodic).
ATM = Asynchronous Transfer Mode
- ❑ Phone networks use circuit switching.
ATM networks use “Packet” Switching
- ❑ In phone networks, all rates are multiple of 8 kbps.
With ATM service, you can get any rate.
You can vary your rate with time.
- ❑ With current phone networks, all high speed circuits are manually setup. ATM allows dialing any speed.

ATM vs Data Networks

- ❑ Signaling: Internet Protocol (IP) is connectionless. You cannot reserve bandwidth in advance. ATM is connection-oriented. You declare your needs before using the network.
- ❑ PNNI: Path based on quality of service (QoS)
- ❑ Switching: In IP, each packet is addressed and processed individually.
- ❑ Traffic Management: Loss based in IP. ATM has 1996 traffic management technology. Required for high-speed and variable demands.
- ❑ Cells: Fixed size or small size is not important

Why ATM?

- ATM vs IP: Key Distinctions
 - Traffic Management:
Explicit Rate vs Loss based
 - Signaling: Coming to IP in the form of RSVP
 - PNNI: QoS based routing
 - Switching: Coming soon to IP
 - Cells: Fixed size or small size is not important

Competing Technologies

- ❑ Fast Ethernet to the desktop
Gigabit Ethernet for the campus backbone
 - No traffic management. No priority. (Being added)
- ❑ Frame-Relay for Wide-area networking
 - Lower speed only (1.5 Mbps - 10 Mbps)
 - No support for quality of service (for video/voice)
- ❑ IP over SONET
 - No signaling \Rightarrow Fixed bandwidth. Can't dial in.
 - No traffic management \Rightarrow Unused bandwidth wasted.

Summary



- ❑ Networking is the key to productivity
- ❑ ATM Net = Phone + Data
- ❑ ATM vs IP: Signaling and traffic management

References

- ❑ All our ATM Forum contributions and papers are available **on-line** at <http://www.cis.ohio-state.edu/~jain/>
Specially see “Recent Hot Papers” and “References on Recent Advances in Networking”
- ❑ D. Tapscott, "The Digital Economy: Promise and Peril in the Age of Networked Intelligence," McGraw-Hill, 1995.
- ❑ G. Sackett and C. Y. Metz, “ATM and Multiprotocol Networking,” McGraw-Hill, 1997 (Technical).