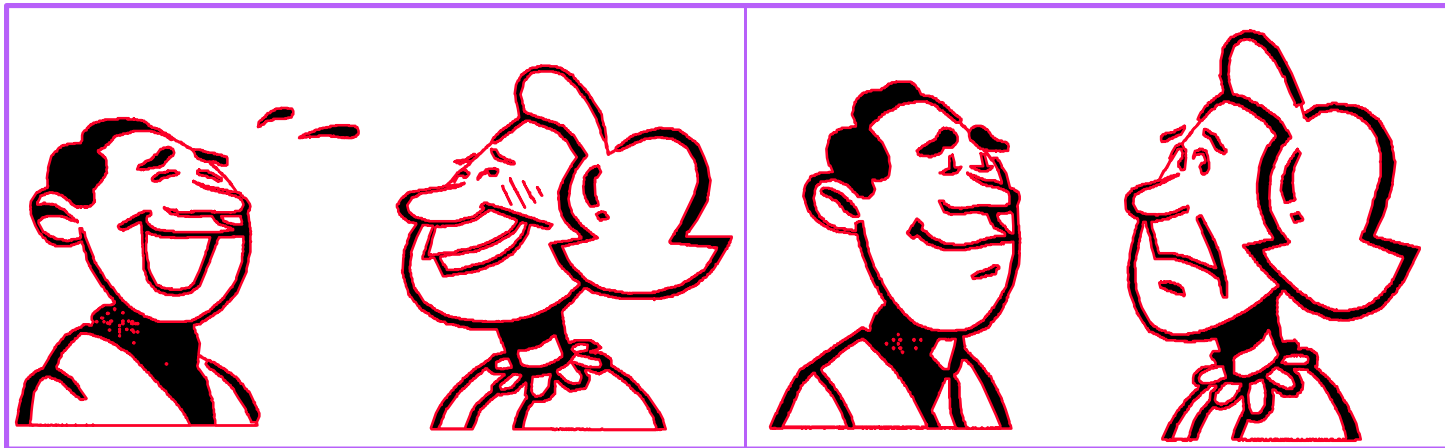


ATM Networking: Issues and Challenges Ahead



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- ❑ Trends in applications
- ❑ Failures and Successes of the Past
⇒ Requirements for Success
- ❑ Challenges: Economy of Scale, Performance, Simplicity

Ref: R. Jain, FDDI Handbook: High-Speed Networking using Fiber and Other Media," Addison-Wesley, Reading, MA 01867, Phone: (800)822-6339, (617)944-3700X2391, Fax: (800)333-3328, (617)944-7273, Email: MaureenC@AW.Com, ISBN: 0-201-56376-4, April 1994.

Networking: Failures vs Successes

- ❑ 1980: Broadband (vs baseband)
- ❑ 1981: PBX (vs Ethernet)
- ❑ 1984: ISDN (vs Modems)
- ❑ 1986: MAP/TOP (vs Ethernet)
- ❑ 1988: OSI (vs TCP/IP)
- ❑ 1991: DQDB
- ❑ 1992: XTP (vs TCP)

Requirements for Success

- ❑ Low Cost
- ❑ High Performance
- ❑ Killer Applications
- ❑ Timely completion
- ❑ Manageability
- ❑ Interoperability
- ❑ Coexistence with legacy LANs
Existing infrastructure is more important than new technology

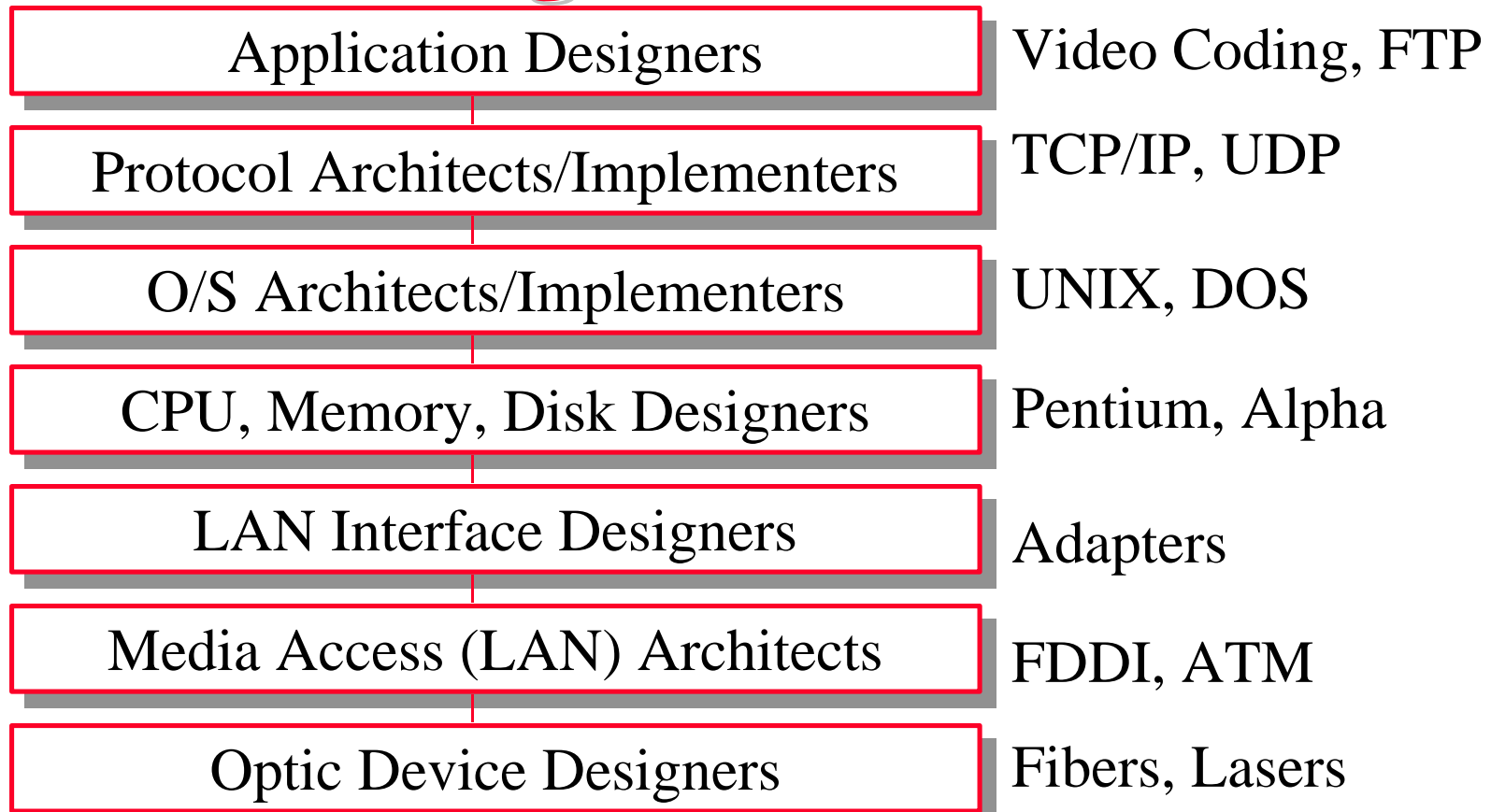
Challenge: Economy of Scale

- ❑ Technology is far ahead of the applications.
Invention is becoming the mother of necessity.
We have high speed fibers, but not enough video traffic.
- ❑ Low-cost is the primary motivator. Not necessity.
⇒ Buyer's market (Like \$99 airline tickets to Bahamas.)
Why? vs Why not?
- ❑ Ten 100-MIPS computer are cheaper than one 1000-MIPS computer ⇒ Parallel computing, not supercomputing
- ❑ Ethernet was and still is cheaper than 10 one-Mbps links.
- ❑ No FDDI if it is 10 times as expensive as Ethernet.
10/100 Ethernet adapters = \$50 over 10 Mbps
- ❑ Q: Given ATM or 100 Mbps Ethernet at the same cost, which network will you buy?
A: Ethernet. Proven Technology.

Challenge: Tariff

- ❑ High-speed is important for LANs
Low-cost is critical for WANs.
- ❑ Phone company's goal: How to keep the voice business and get into data too?
- ❑ Customer's goal: How to transmit the data cheaper?
- ❑ Tariff Today:
 - ❑ 64 kbps voice line = \$300/year
 - ❑ 45 Mbps line (\$45/mile/month)
Coast to coast = \$180 k-240 k/year
⇒ 155 Mbps line = \$540 k - \$720 k/year
- ❑ Tomorrow: 155 Mbps = \$1k/month+ \$28/G cells
⇒ \$13k - \$45k/year

Challenge: Performance

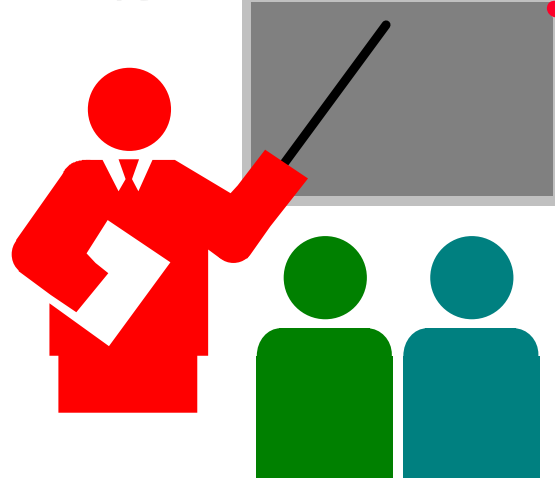


- ❑ Faster link \neq Faster applications
- ❑ Need to consider trends of all layers

Challenge: Simplicity

- ❑ No equal competition \Rightarrow Complexity
Ethernet vs Token ring war \Rightarrow improvements
- ❑ One size fits all \Rightarrow Complexity
Too many options too soon. Should work for
 - ❑ CBR and ABR LAN and WAN
 - ❑ Private and Public Low speed and High speed
- ❑ Switches have to do connection setup, route determination, address translation, anycasting, multicasting, flow control, congestion control, ...
- ❑ Cell header format chosen (from DQDB) before protocol design \Rightarrow Too few header bits. Bits used for dual purposes \Rightarrow Implementation complexity
- ❑ Many independent forums (ITU vs ATM Forum)
 \Rightarrow People energy divided

Summary



- ❑ Networking is critical and growing exponentially.
- ❑ High speed networking iff economy of scale
- ❑ Solving all problems can lead to complexity and failure.
- ❑ To succeed, ATM has to solve today's problem (data) well.

References

All our papers are available on-line at:

<http://www.cis.ohio-state.edu/~jain/>

- ❑ Raj Jain, "ATM Networking: Issues and Challenges," NetWorld+InterOp Engineering Conference, Las Vegas, April 1995.
- ❑ K. Siu and R. Jain, "A Brief Overview of ATM: Protocol Layers, LAN Emulation, and Traffic Management," Computer Communications Review (ACM SIGCOMM), April 1995.
- ❑ R.Jain, "Congestion Control and Traffic Management in ATM Networks: Recent Advances and A Survey", Invited submission to Computer Networks and ISDN Systems, February 1995.