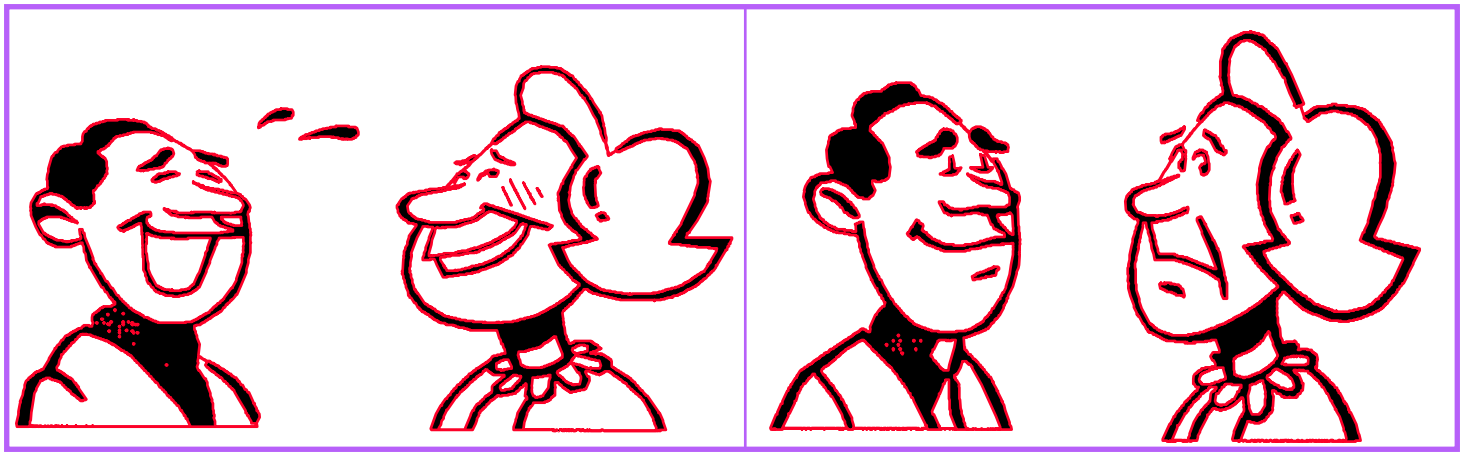
ATM Networking: Issues and Challenges Ahead



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- Trends in applications
- Failures and Successes of the Past
  $\Rightarrow$ Requirements for Success
- Challanges: 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

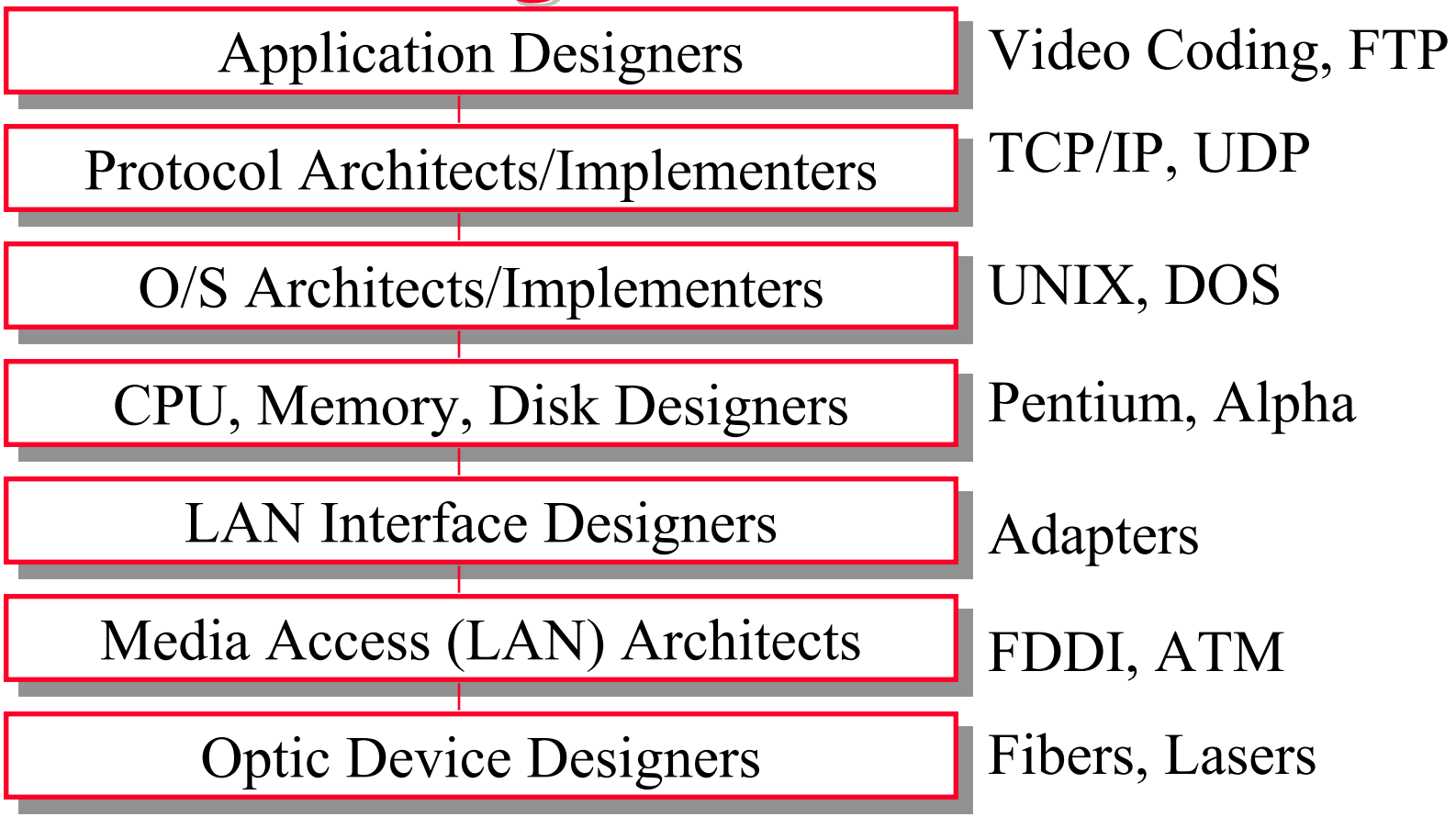
Challenge: Economy of Scale

- 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.
  $\Rightarrow$ Buyer's market (Like $99 airline tickets to Bahamas.)
  Why? vs Why not?
- Ten 100-MIPS computer are cheaper than one 1000-MIPS computer $\Rightarrow$ 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
    $\Rightarrow$ 155 Mbps line = $540 k - $720 k/year
- Tomorrow: 155 Mbps = $1k/month+ $28/G cells
  $\Rightarrow$ $13k - $45k/year

Challenge: Performance



- Faster link ≠ Faster applications
- Need to consider trends of all layers

Challenge: Simplicity

- No equal competition ⇒ Complexity
  Ethernet vs Token ring war ⇒ improvements
- One size fits all ⇒ 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 ⇒ Too few header bits. Bits used for dual purposes ⇒ Implementation complexity
- Many independent forums (ITU vs ATM Forum) ⇒ 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 Challanges," 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.

AT&T ATM Prices

- 1.5 Mpbs UBR PVC: $2415/mo
- 45 Mbps UBR PVC: $12,650/mo
- 56/64 kbps UBR PVC: $99/mo
- 56kbps CBR PVC: $173/mo
- 56/64 kbps VBR SVC: $0.035/minute
- 56/64 kbps CBR SVC: $0.06/minute
- 1.5 Mbps CBR SVC: $1.44/minute

- Ref: LAN Times, Jul 21, 1997, pp. 46.