MegaATM:
ATM Technology for Gigabit Networking

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- Requirements for Success
- Economy of Scale
- High Performance
- Scalability
- MegaATM Technology

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)

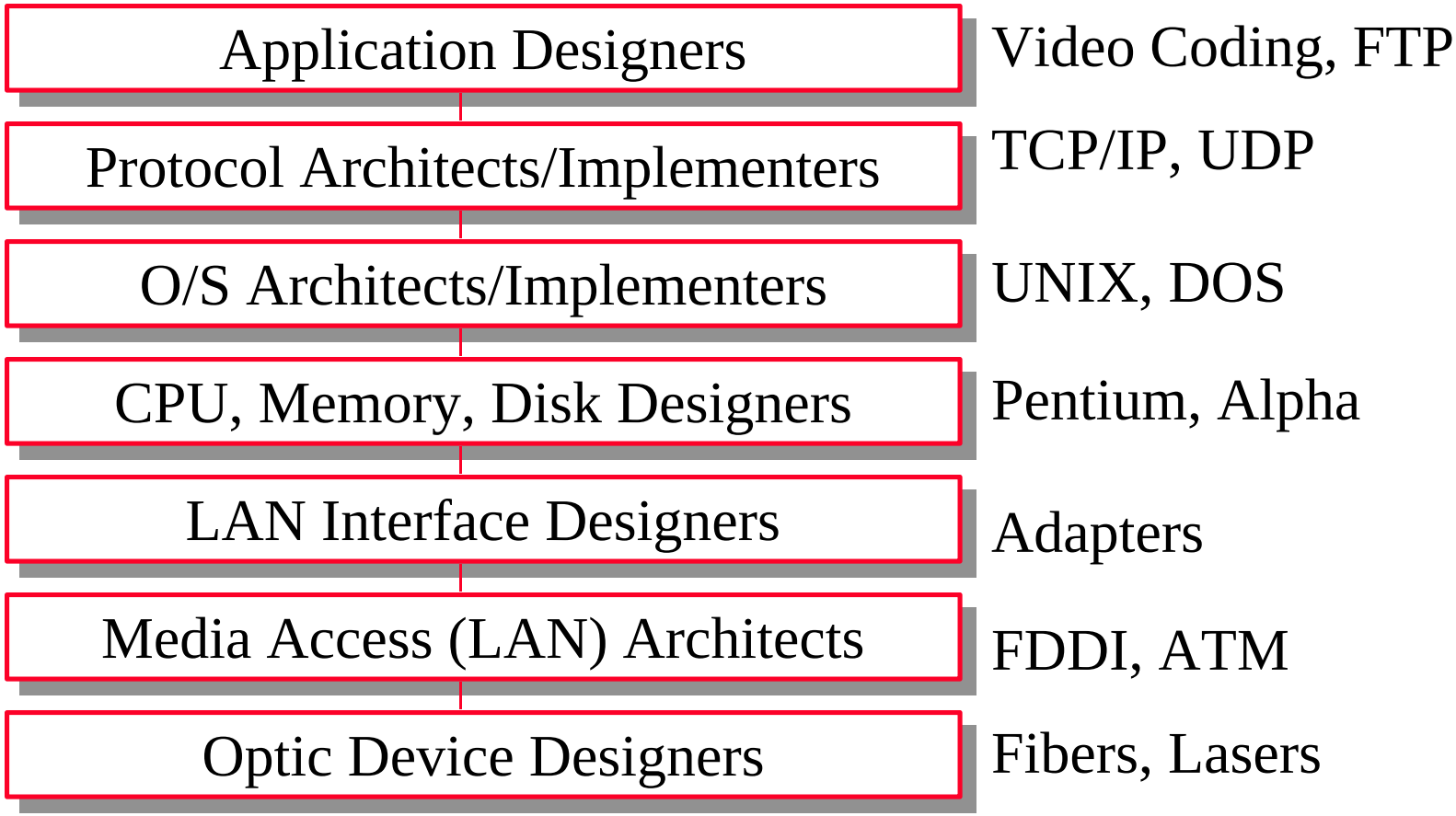
Requirements for Success

- 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.
- Q: Given ATM or 100 Mbps Ethernet at the same cost, which network will you buy?
  A: Ethernet. Proven Technology.

Challenge: Performance



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

Challenge: Scalability in Speed

- Queueing Theory:
  - Mean(response time) $\propto$ cell-time
  - Var(resp time) $\propto$ cell-time^2 + Var(cell time)
- Smaller cell $\Rightarrow$ Lower delay jitter, also lower efficiency
- Delay jitter= fn(cell-time) not fn(cell-size)
- At higher speeds: Video still recorded at 30 frames/sec
  $\Rightarrow$ No change in time jitter required
  $\Rightarrow$ No change in cell time as in SONET
  6 ms = 48 bytes at 64 kbps but 900 kB at 1.2 Gbps
  HDTV Frame = 20 Mb = 50,000 Cells
- Switch cost $\propto$cell rate $\propto$1/(Cell size)
  2 Gbps = 3 M cells/s $\Rightarrow$ 3n MIPS

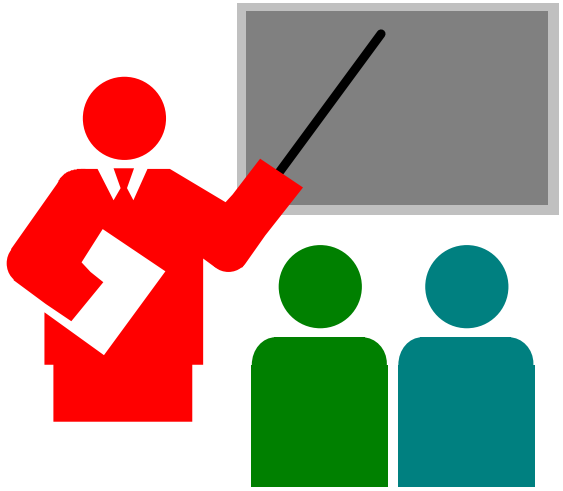
The MegaATM Technology

- Keep all good aspects of the ATM technology
  - Constant Cell Size
  - VP/VC Labels (instead of addresses)
  - Switching
- Cell Size $\propto$ Speed
  Cell time = Constant at all speeds (As in SONET)
- One-way delay $\geq$ Cell time $\times$ Number of hops
  Cell time $\approx$ Hundred μs
- Cell Time = 125 μs $\Rightarrow$ Cell Size = 1/64 MByte = 1/8 Mb
  $\Rightarrow$ MegaATM
- At one Gigabit: 8000 Cells/second (instead of ??)
- HDTV frame = 20 Mb = 160 cells

What Do We Plan To Do?

- Multiplexing: Multilple lower speed cells to one higher speed cell
- Optimal size
- Effect on the message delay variation (instead of cell delay variation)
- Complete check of ATM technology for gigabit rate
- Modify current switch design
- Interfacing ATM networks to MegaATM networks

Summary



- High speed networking iff economy of scale
- Delay requirements remain in ms even at gigabit speeds
- Nano-second cell time ⇒ increased cost with no perceptable difference to humans
- 125 μs cell ⇒ 1/64 MByte cells at 1 Gbps ⇒ MegaATM

Thank You!