"Five Challenges" Revisited

Progress on the GBN '95
"Five Challenges That Define High-Speed Protocols"

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Five Challenges

Known solutions to high BW "problems"

Increase the clock rate

- Increases BW, but makes BW-delay product (BDP) worse

Multiplex

- Removes the goal of "BDP to the user"

Use large payloads

- Equivalent to turning off the protocol

Increase the window size

- Works only if there exists data to send (helps, but not for WAN Gb BDP)

Relocate everything

- Removes the goal

ARPA/NSF Gb Workshop

ftp://ftp.std.com/pub/craigp/report.ps

Kinds of applications

- *Gb-enhanced (require Gb to be practical)*
  - Web as a network browsing tool (point, click, and WAIT)
- *Gb-challenged (radical revision for Gb)*
  - Web as an interactive distributed application (point and click)
- *Gb-enabled (exist only at Gb)*
  - What goes here?

Main impediment - Middleware

- *Applications require environment sensitivity*
- *Need integrated tools and "agents" (active processes)*

Progress at ISI

Protocol mechanism & meta-protocol

Low Latency Distributed Info. Access (LowLat)

- *Web fix via Mirage (model) via Parallel Comm. (protocol)*
- *Augment HTTP to accept source-initiated cache preloading*
  - Proxy capability, redirection, etc. already there

Intelligent Bandwidth

- *"Middleware" to manage trade-offs*
  - RAM
  - Disk
  - Processing
  - Bandwidth
  - Latency (propagation, artificial buffering, etc.)
  - Topology / protocol (e.g., 'radiocast,' multicast, tree vs. mesh, etc.)

Web Statistics

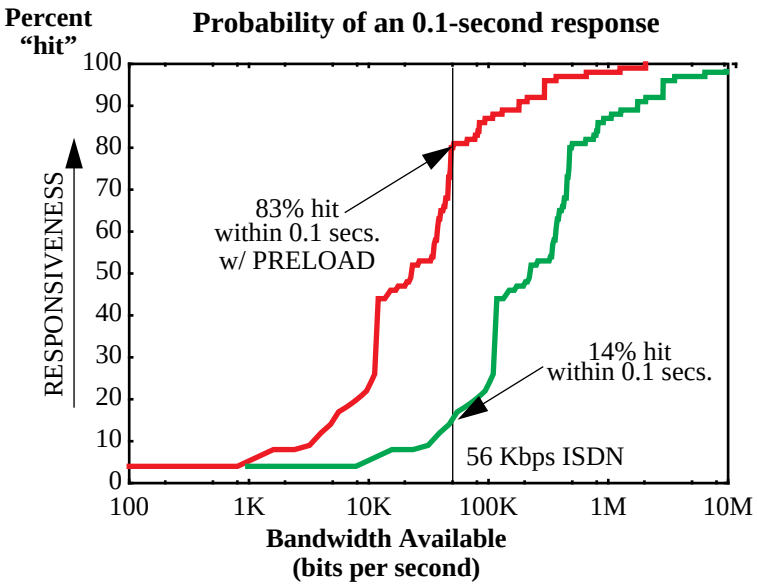
Using Web logs, presending appears feasible

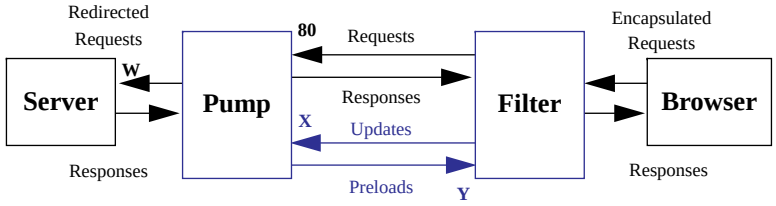
Latency reduction works

- *ISDN becomes interactive*
- *14% prob. -> 83% prob.*
- *92% pages <= 10 links*

Costs

- *10x BW for "zero cost fetch"*
- *More BW = less read-time*
- *Server load increases*
- *Client cache increases*
- *Requires preemption*





Intelligent Bandwidth

Integrate and automate environment-sensitive trade-offs

Trade-offs

- *BW(where?), latency, space (where?), topology, ...*
- *Automate trade-offs*
  - Middleware “knows” details
  - Application expresses “intent”
- *Integrated interface / management*

New networks break assumptions

- *Packet-switched LANs, cable, satellite, cellular networks*
- *Assumptions were symmetric BW, latency, path, topology*