GloMop Update

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GloMop Update

- GloMop Vision & Design Requirements
- What's New
- Progress on Open Issues
- Research Directions
- Current Work: Building & Measuring
- Research Issues Summary

Vision: Proxy Benefits

- Mantra: *Access Is the Killer App*
- Address client hardware limitations
- Address client software/protocol limitations
- Dynamically react to changing network conditions by adapting content automatically (*on-demand dynamic transcoding*)

A.Fox, E. Brewer, S. Gribble, E. Amir, *Adapting to Network and Client Variation via On-Demand Dynamic Transcoding,* to appear at ASPLOS-VII.

GloMop: High-Level Abstraction

- Document structure abstraction
  - Uniform document structure made of *chunks*
  - Each chunk is a single MIME type
  - Type chosen to fit client's ability to render
- Session-level network abstraction
  - Proxy is a logical connection
  - Network scheduling invisible to applications
  - Asynchronous, multithreaded communication
- Distillation abstraction
  - User preferences for distillation

Requirements

- Security and authentication
- Support existing applications & infrastructure to promote widespread adoption
- Scale to very large numbers of users
- Uniform architecture from laptops to personal communicators
- Sensible interface and implementation for distillation/refinement preferences

What's New: Research Infrastructure

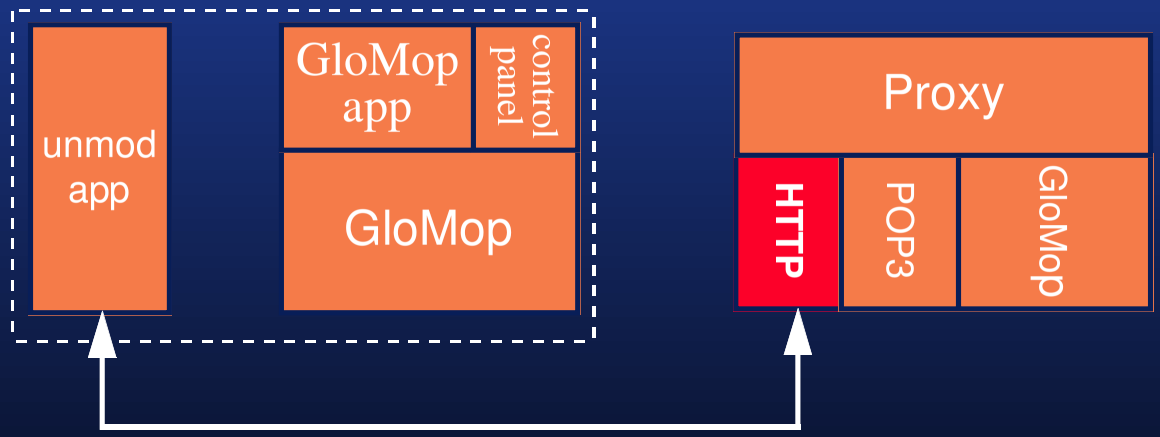
- *gmwish*: GloMop Client API
  - Tcl/Tk shell for writing GloMop-aware apps
  - Connection to proxy, asynchronous callbacks, document request, chunk management…
- Test-driving GloMop: "image browser" app
  - Debug user preferences mechanism
  - Debug refinement interface
- Charon: lightweight indirect authentication via Kerberos IV (A. Fox and S. Gribble, submitted to MobiCom 96)

What's New, continued

- *gmproxyd:* Modular Proxy
  - "Pluggable" client protocol filters
  - Remote controlled distillers
  - Pythia will be (re)implemented as a special case
- Better size prediction for GIF munching
- Proxy-Transcoder Manager (PTM) prototype
  - Load balancing of distillers on a NOW
  - Prototype implementation balances simulated loads
  - Integration into Pythia and *gmproxyd:* end of summer

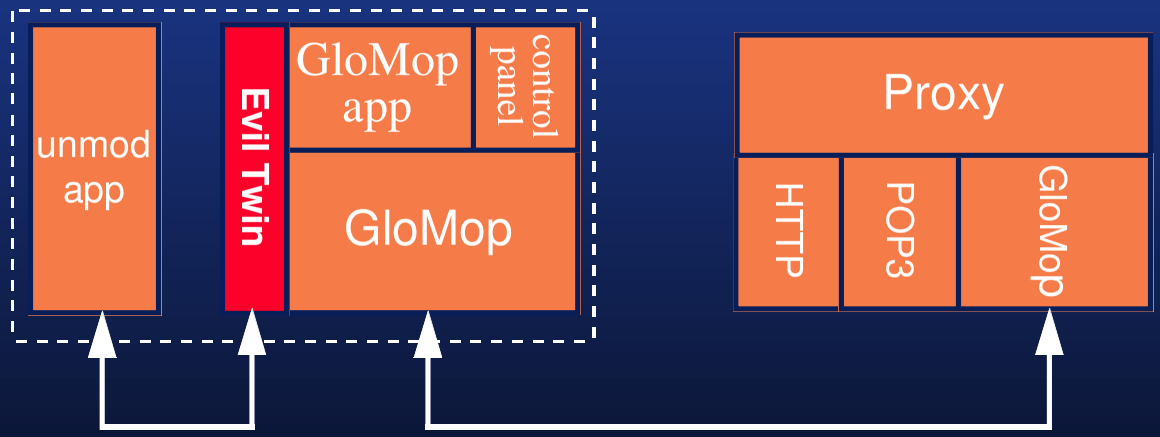
#1: Support for Existing Infrastructure

- Proxy-side Protocol Converters
  - Pluggable proxy module
  - Translates existing protocols and formats to/from GloMop API calls
  - *Lose benefit of optimized single-connection protocol*



Alternative: Proxy's Evil Twin

- Protocol converter *at the client*
  - –Get benefit of optimized single-connection protocol
  - –E.g. MOWGLI project (Univ. of Helsinki/Nokia)
  - –*Inappropriate for "small" device*



Composing with Other Projects

- E.g. Harvest (distributed caching), Rover (queued RPC object model)
- GloMop protocol lightweight enough to carry "any" kind of traffic
- Proxy-side protocol handlers modular and extensible

#2: Interesting Range of Clients

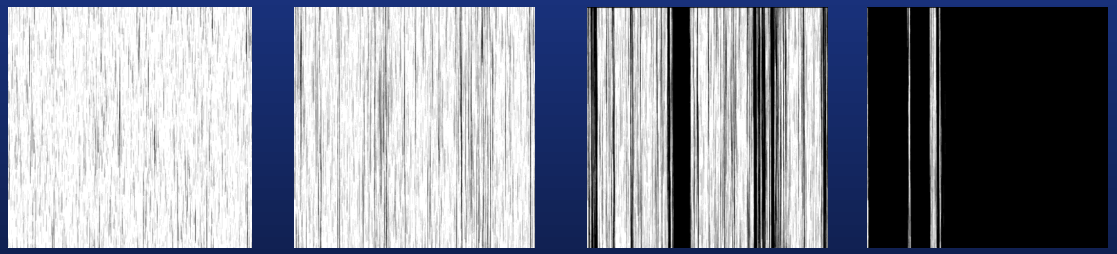
- PDA's, midrange cel phones, pagers, personal communicators, next-generation InfoPad
- Full GloMop is too heavyweight: devices too small, and there are *way many* of them
- *GloMop Lite:* minimal app support layer/set of abstractions for these clients
- What low-cost hardware support makes sense? (encryption, DSP, etc.)

#3: Scalability—Computation

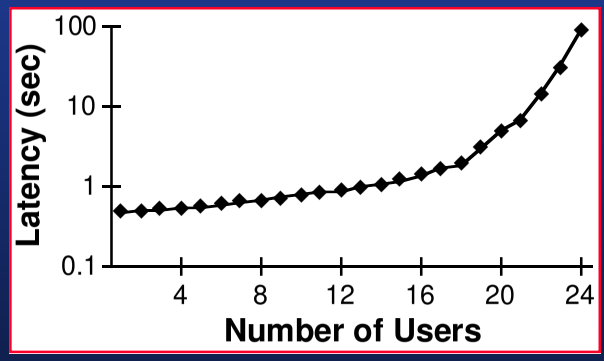
- WWW traffic bursty at all levels: long idles, very high peaks (Crovella & Bestavros, SIGMETRICS 96)
- Document sizes: heavy-tailed, with small documents accessed much more frequently
- Detailed statistical profiling of WWW underway (Gribble, Gauthier et al.)
- Caching works well at all levels (Various)

Scalability: Load Characterization

- Playback of UCB CS HTTP logs
- One HP 715/80 PA-RISC workstation
- Distiller performance based on recent measurements



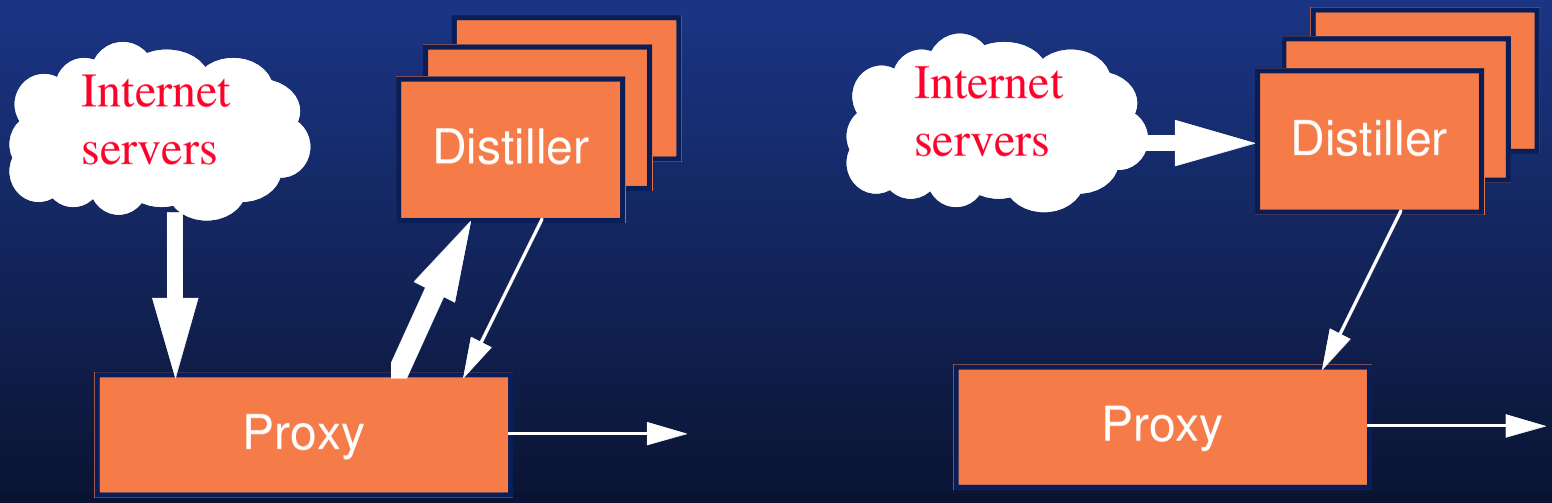
10 users 16 users 20 users 24 users



Distillation Latency

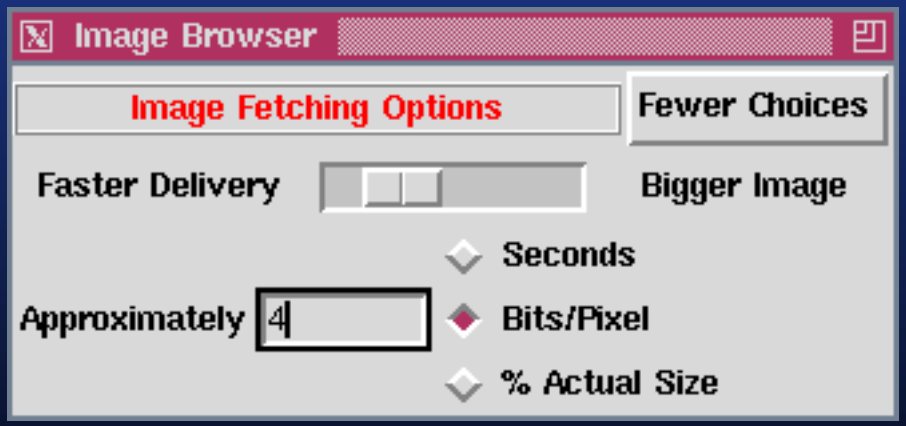
Scalability: Storage & Network

- Remote control distillers
  - Avoids proxy touching every byte of originals
  - Proxy and distillers can communicate on physically separate fast network (e.g. Myrinet)
  - Side effect: distributes "cache" of open documents



#4: Dynamic Adaptation

- Can automated statistical modeling determine optimal target format?
- How to specify hardware/software constraints?
- How to trade off distillation parameters?
- User interface for distillation prefs?



#5: Open Issue—Delivery Classes

- No support yet in *gmproxyd*
- How many distinct classes, and which ones?
- Interaction with link-level CBQ?
- Doesn't make sense for GloMop Lite…

We need to get the prototype fully working in order to explore this.

Projects in Progress

Need to build & observe system to "debug" various elements of it.

- *gmwish* and image browser
  - user prefs, refinement, dynamic adaptation
- Berkeley TCS, Geoworks Inc.
  - characterization of heavy-load operation
  - load balancing on a NOW
- Wink Communications
  - Content adaptation for "really small" clients
  - Order-of-magnitude larger number of clients

Research Issues Summary

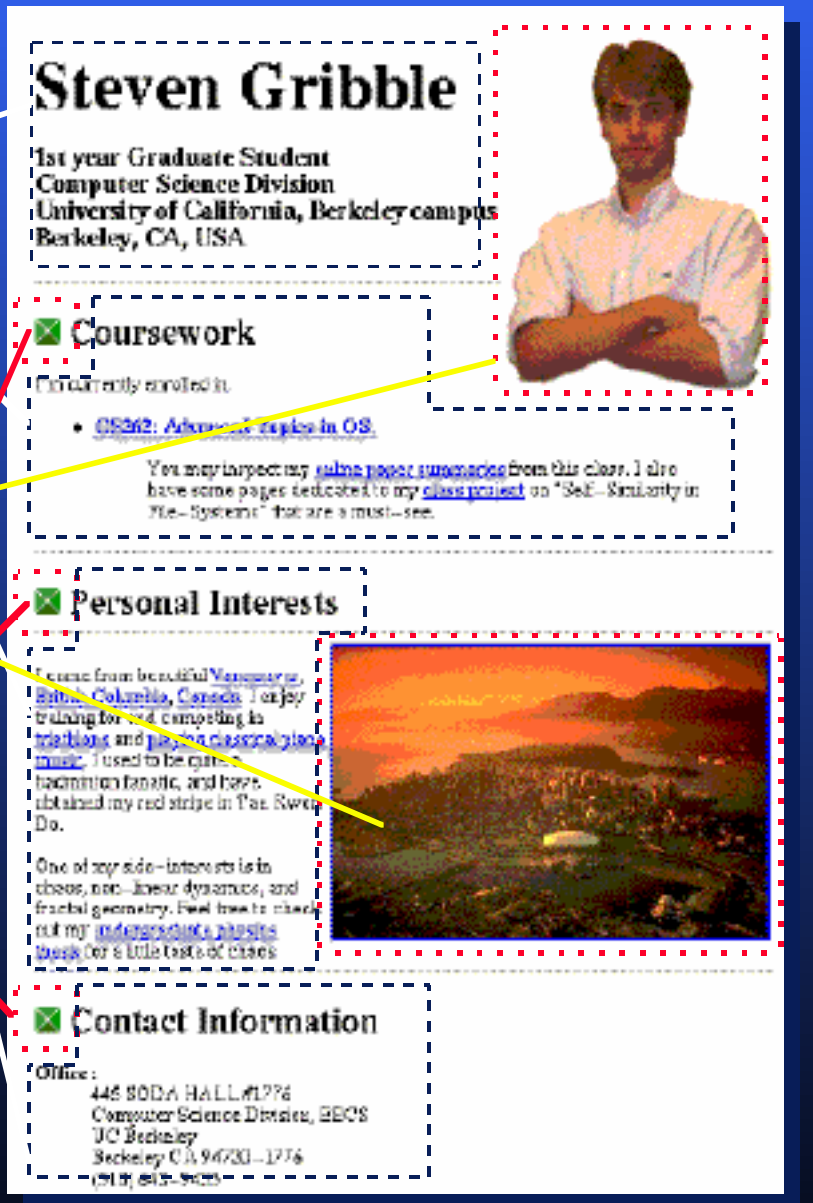
- Existing infrastructure: use protocol filters
- Scalability: initial numbers encouraging, PTM prototype
- Huge numbers of small clients: Nokia, Wink
- Dynamic adaptation UI & computation: sample image browser

We need to build & deploy systems,

so that's what we're doing.

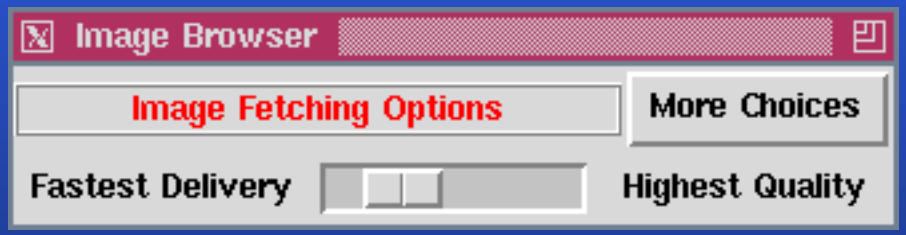
Document Structure: Chunks

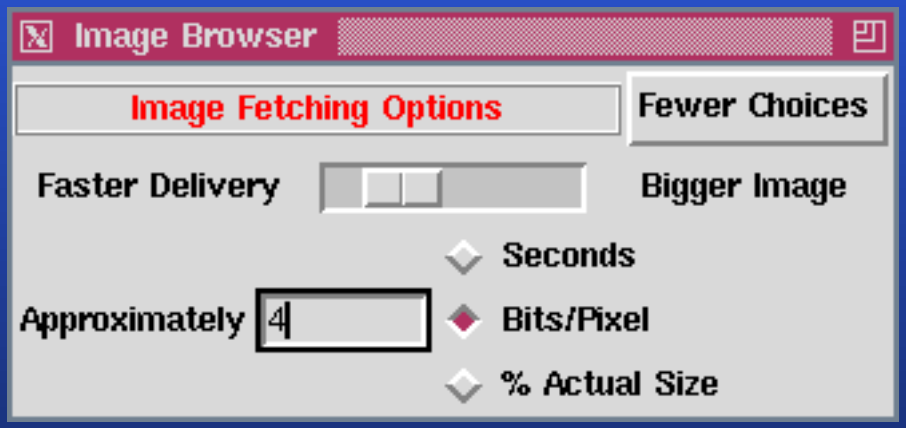
- 4 *text/html* chunks (or 1 big one)
- 2 large *image/jpeg* (distillation probably needed)
- 3 small *image/gif* (distillation probably not needed)
- Document = collection of chunks



#5: Distillation/Refinement UI

- Prototype image browser written with *gmwish*





- *Pythia* web proxy

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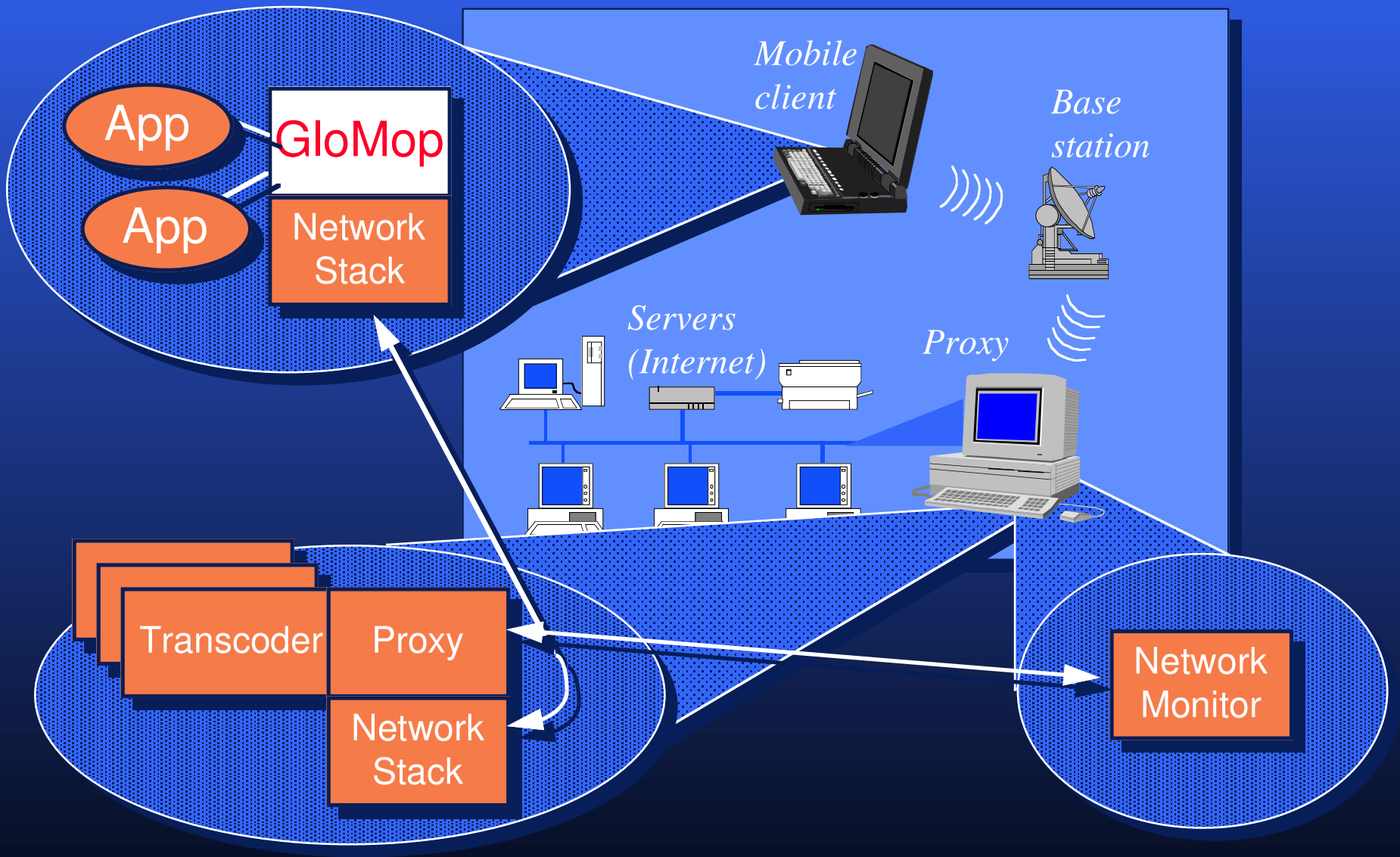
App
App
GloMop
Network Stack
Mobile client
Base station
Servers (Internet)
Proxy
Transcoder
Proxy
Network Stack
Network Monitor