

**Title:** GloMop: Global Mobile Computing By Proxy

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Mobile computing devices are much less useful if they don't give you multimedia connectivity such as Web access. Unfortunately, most of today's wireline and wireless modems for laptops and PDA's are limited to kilobits-per-second bandwidth, which is clearly inadequate for Web surfing and multimedia document retrieval. On the other hand, desktop CPU power is becoming cheaper every day, and desktop workstations typically enjoy a much better connection to the Internet or to large local disks. We can make mobile devices of all kinds useful to a wider audience by isolating users from the effects of poor networks.

A *proxy process* running on a powerful, well-connected desktop workstation can retrieve documents on the client's behalf, and *distill* them in real time to a representation that preserves much of their semantic content but is compressed by an order of magnitude or more. The compact representation can be transmitted quickly through the "straw" (the low-bandwidth and possibly high-latency link to the mobile client), and the user can then decide whether or not to expend additional resources to retrieve a *refined* (ie. higher-quality) version.

Below we list measured compression ratios and latencies for some common examples of distillation.

Example	Size reduction	Latency (Moderately loaded SPARCstation-20)
Image scaling and quantization	1-2.5 orders of magnitude	<3 sec. for "most" WWW images
PostScript to HTML	5-7x	2-3 sec. per page
MBONE to H.261 or VQ	>1MB/s to 128 or 28.8 Kb/s	Real time

Pythia (<http://www.cs.berkeley.edu/~fox/glomop/pythia.html>) is an implemented HTTP proxy that demonstrates this technology. Pythia is hosted on a SPARCstation 20 and can dynamically add distillers by harvesting idle cycles from Berkeley's Network of Workstations, allowing a modest degree of load balancing and emphasizing how cycles on the desktop can be traded for scarce bandwidth. Using Pythia with off-the-shelf browsers over a 14.4Kbaud modem reduces the perceived latency to display an image-rich Web page by approximately a factor of 5.

Our goal is for the proxy to make distillation decisions automatically based on models of available performance and dollar cost for the network being used. For example, a user traveling from Berkeley to Stanford may have to switch among various wireless networks: high-bandwidth in-building (e.g. AT&T WaveLAN), medium-bandwidth campus-area (e.g. Metricom), and high-latency metro-area wireless (e.g. Hughes satellite via DirecPC). We have implemented a version of Pythia that can respond to cross-network handoffs in real time, and are developing an application writing toolkit lightweight enough to run on PDA's that facilitates development of adaptive applications.