Improving VNC Performance with the Message Accelerator

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Introduction

•This project explores a new systems architecture and programming paradigm for Thin Client computing.
•In this architecture, a Message Accelerating Proxy is added to the standard client-server system.
•The proxy can be added to an unmodified client-server system, and can be used for either modification of updates or buffering/caching of updates.

Devices

Zypad Wearable Computer
Video Glasses
Chumby
iPhone
Cell Phone

The current proliferation of cheap, lightweight devices offers a perfect opportunity for the use of Thin Client systems.

Applications

Virtual Worlds
Maps
Historic Information
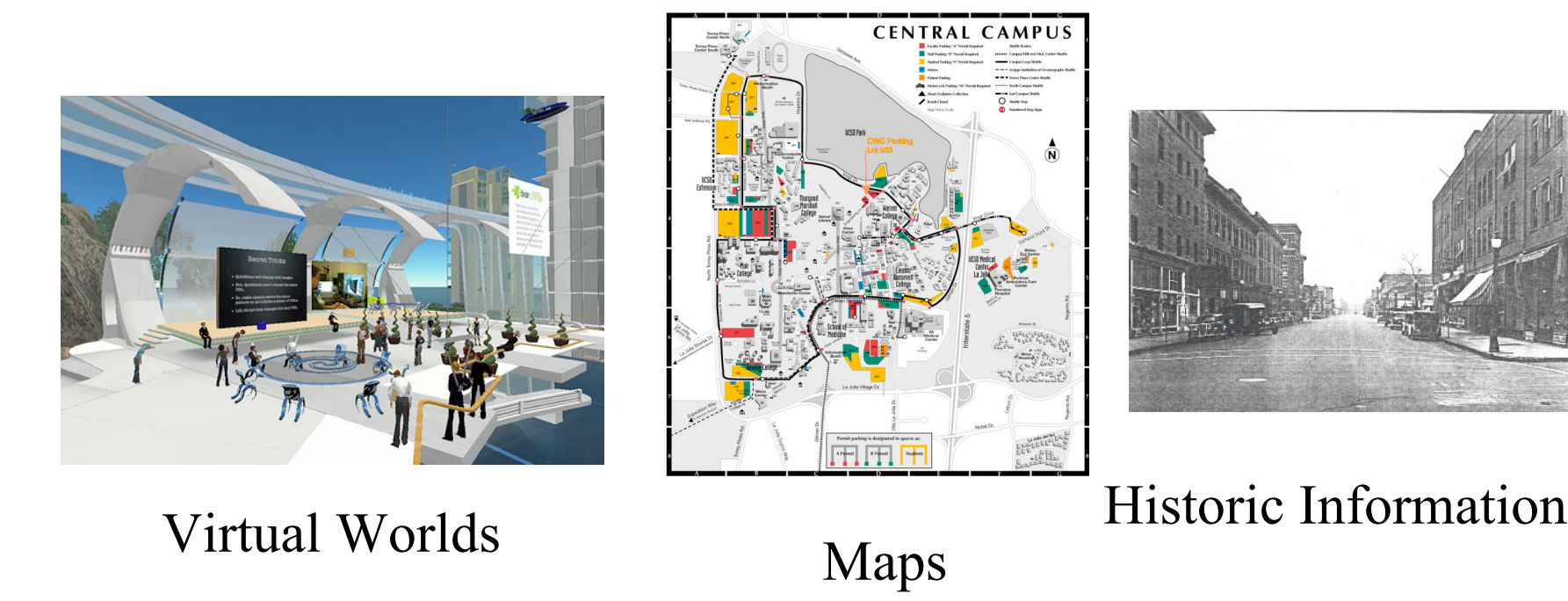
Since we carry these devices with us everywhere, it would be ideal if they knew about our location and could give us contextual information about our surroundings.

What is Thin Client Computing?

Screen updates
internet
User input
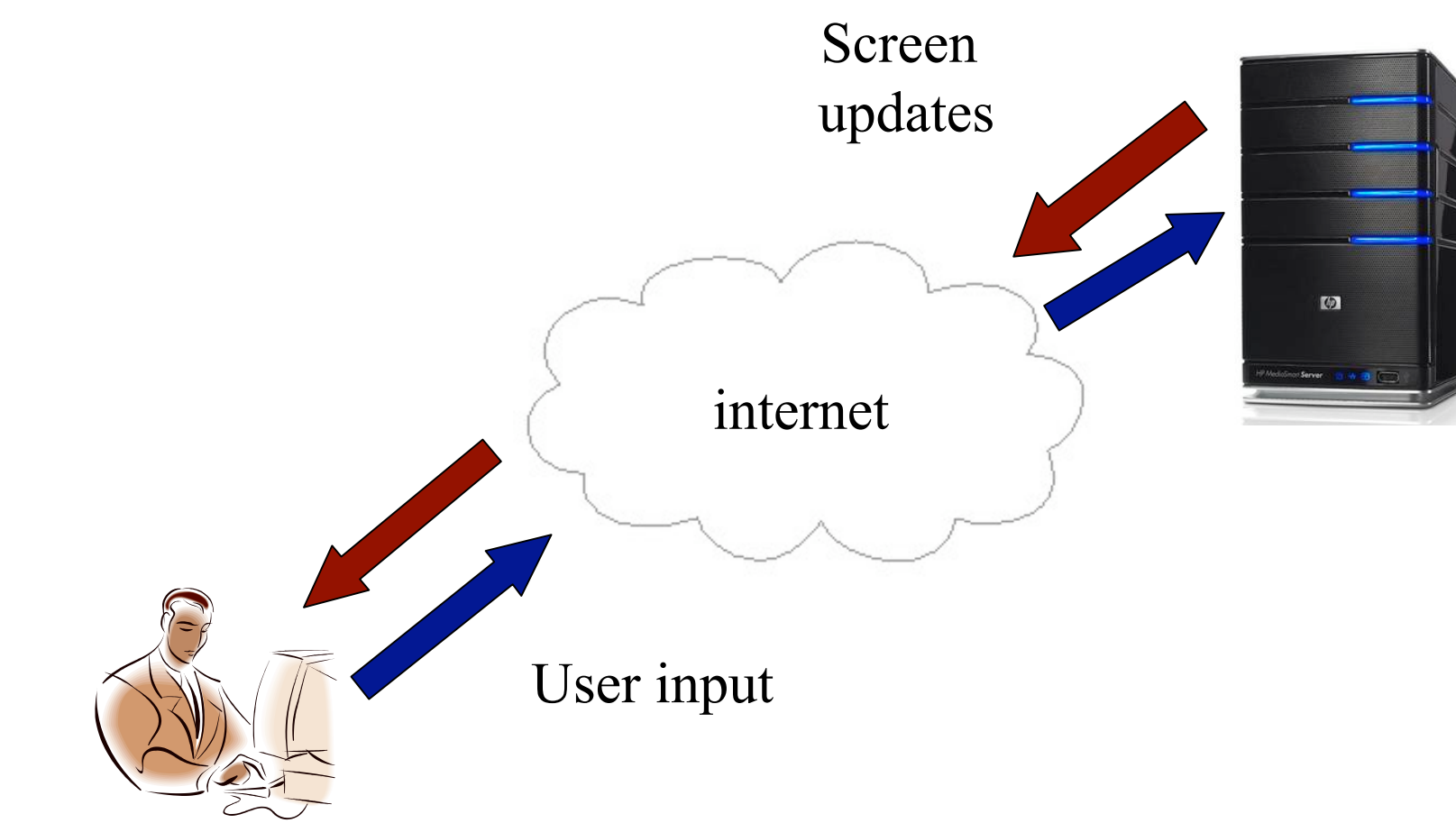
In Thin Client computing, all applications run on the server, and the client is used predominantly for I/O. User input is sent to the server, and screen updates are sent to the client.
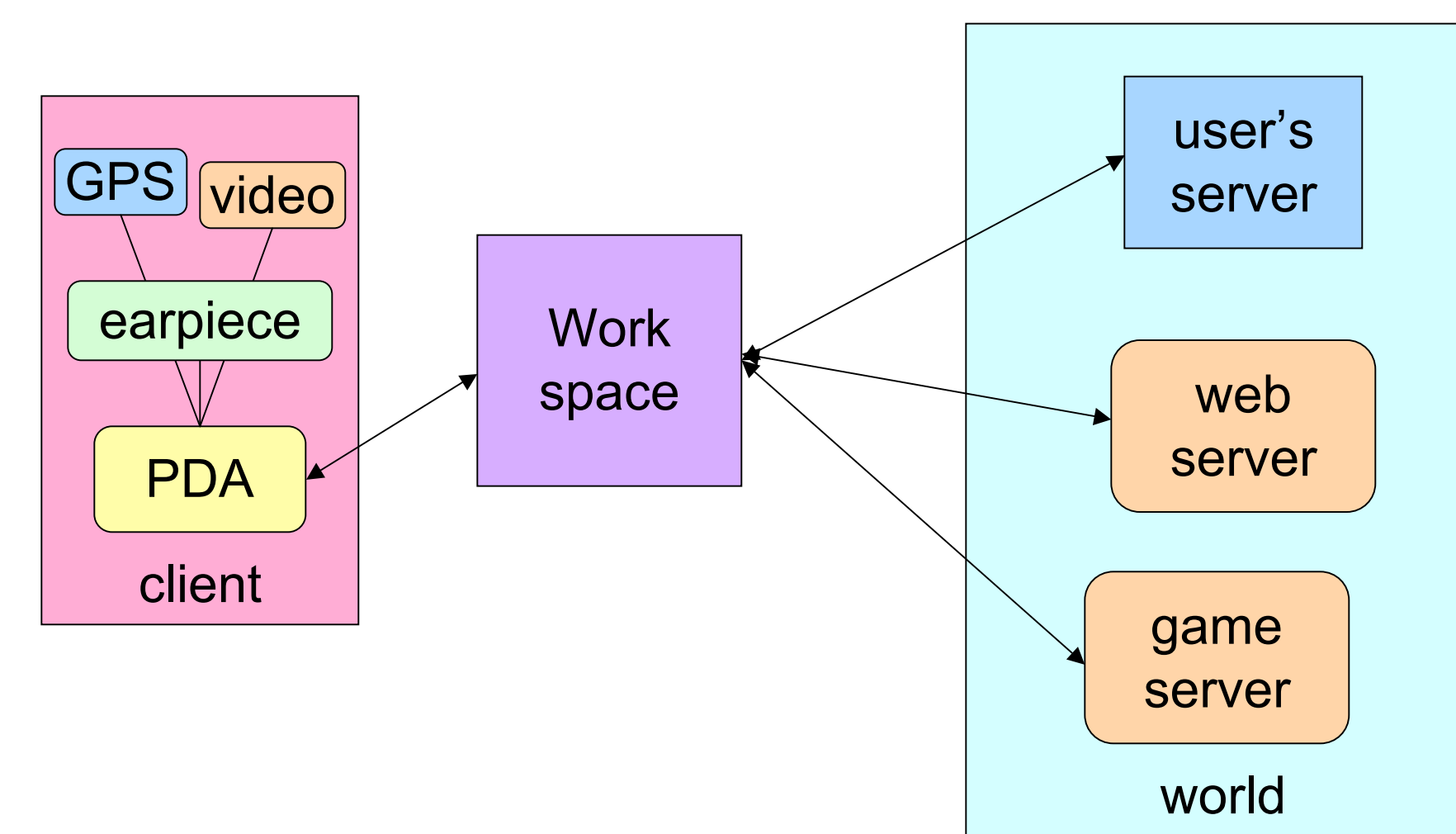
Why Thin Clients? Intensive Applications

• Machine Learning/Vision
 – Object recognition
 – Speech recognition
• Graphics
 – Rendering
• Data Storage
 – Video
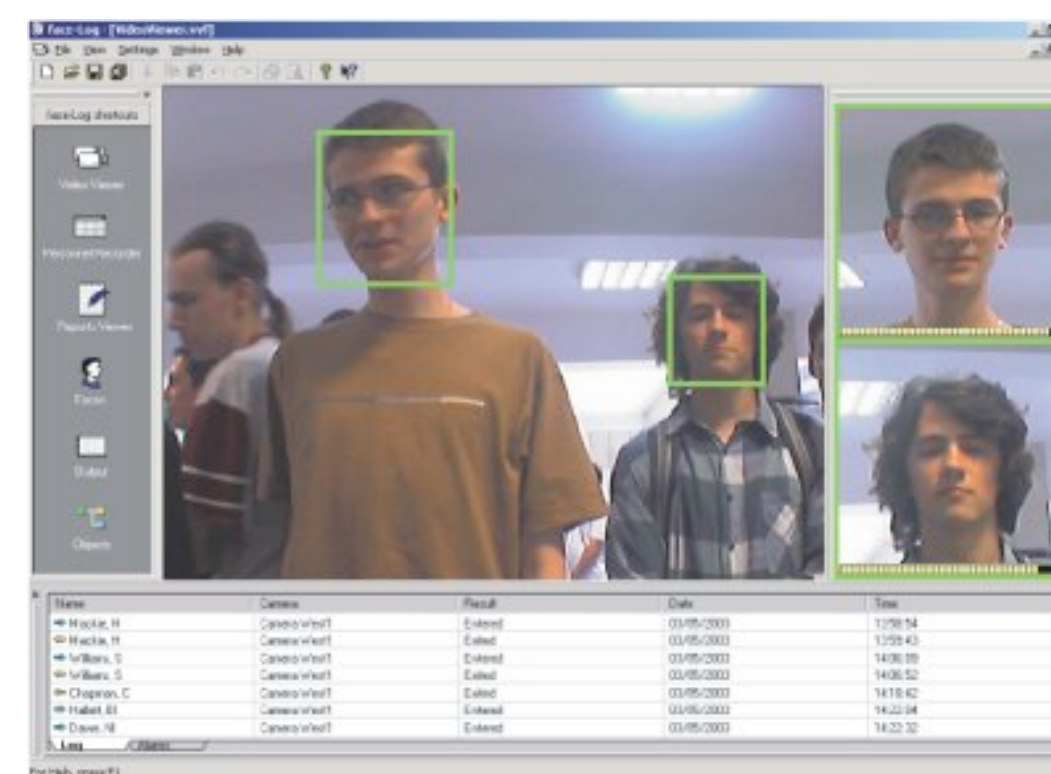
The applications that fully exploit knowledge of our surroundings have high processing and storage needs.

System Architecture

GPS video
earpiece
PDA
client
Work space
user's server
web server
game server
world

The proxy runs between the client and server(s), and work is distributed between the proxy, client, and various servers.

Uses of the Proxy

•Buffering updates
•Caching Location-Dependent Information
•Compressing or Decompressing Updates
•Scalable Video Coding
•Video Processing
•Encryption

The Proxy is ideal for any task that requires frequent quick communication with the client, or any task that requires specialized knowledge of its location, since it is stationary.

How VNC Works

internet
application
frame buffer
VNC client
requests
updates
VNC server
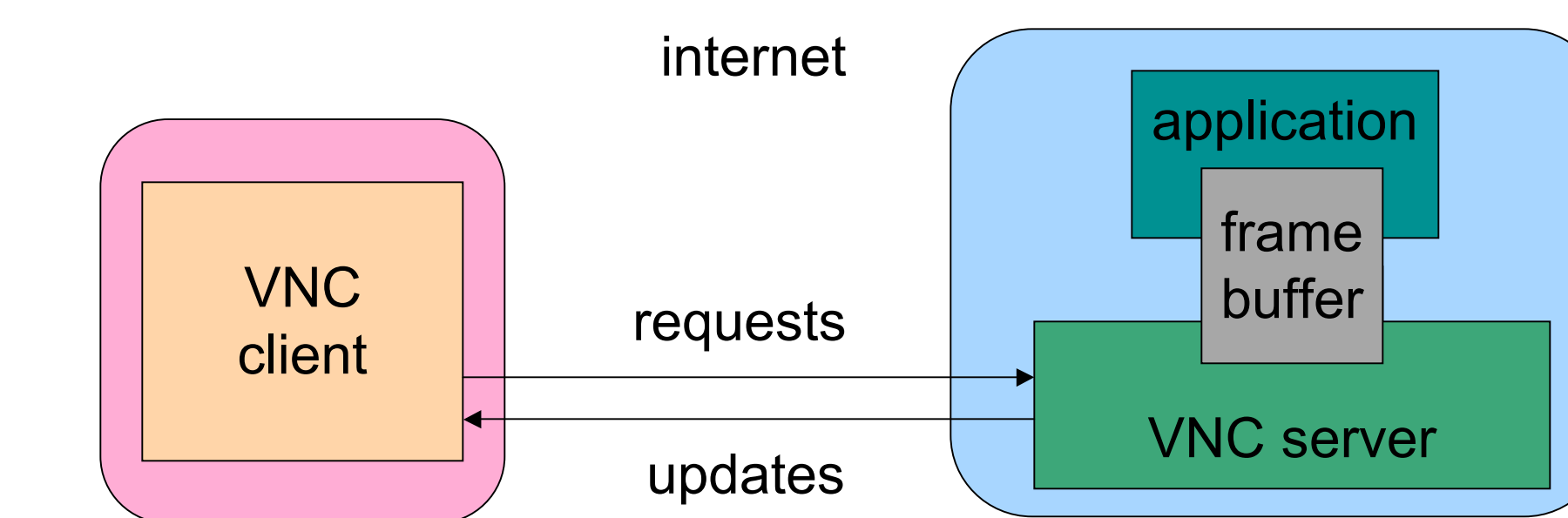
•VNC runs at the application layer and scans the framebuffer for updates.
•It is a client-pull system: the client requests updates before the server sends them.

Adding the Message Accelerator to VNC

internet
requests
VNC client
slow
Message Accelerator
fast
VNC server
requests
updates
updates
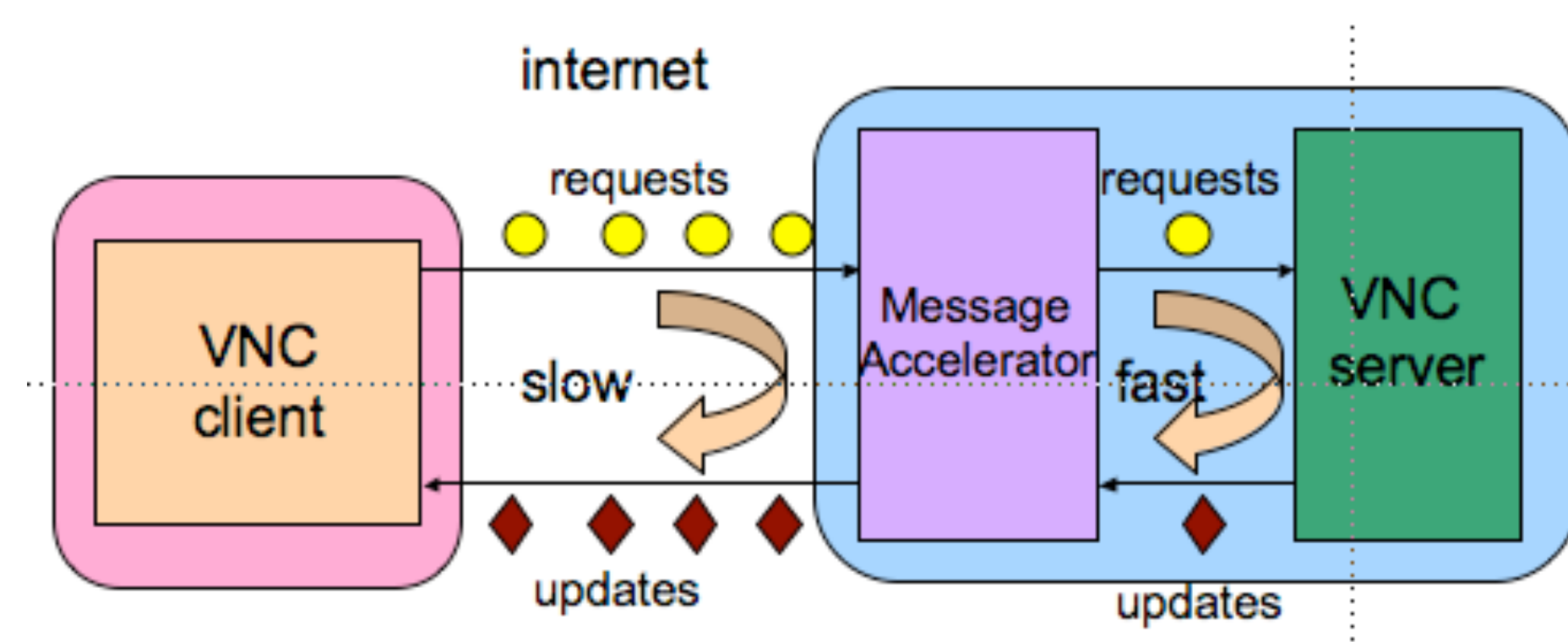
The Message Accelerator continuously queries the VNC Server for updates, and pipelines sending these updates to the VNC Client, without waiting for a request from the client.

Experimental Results
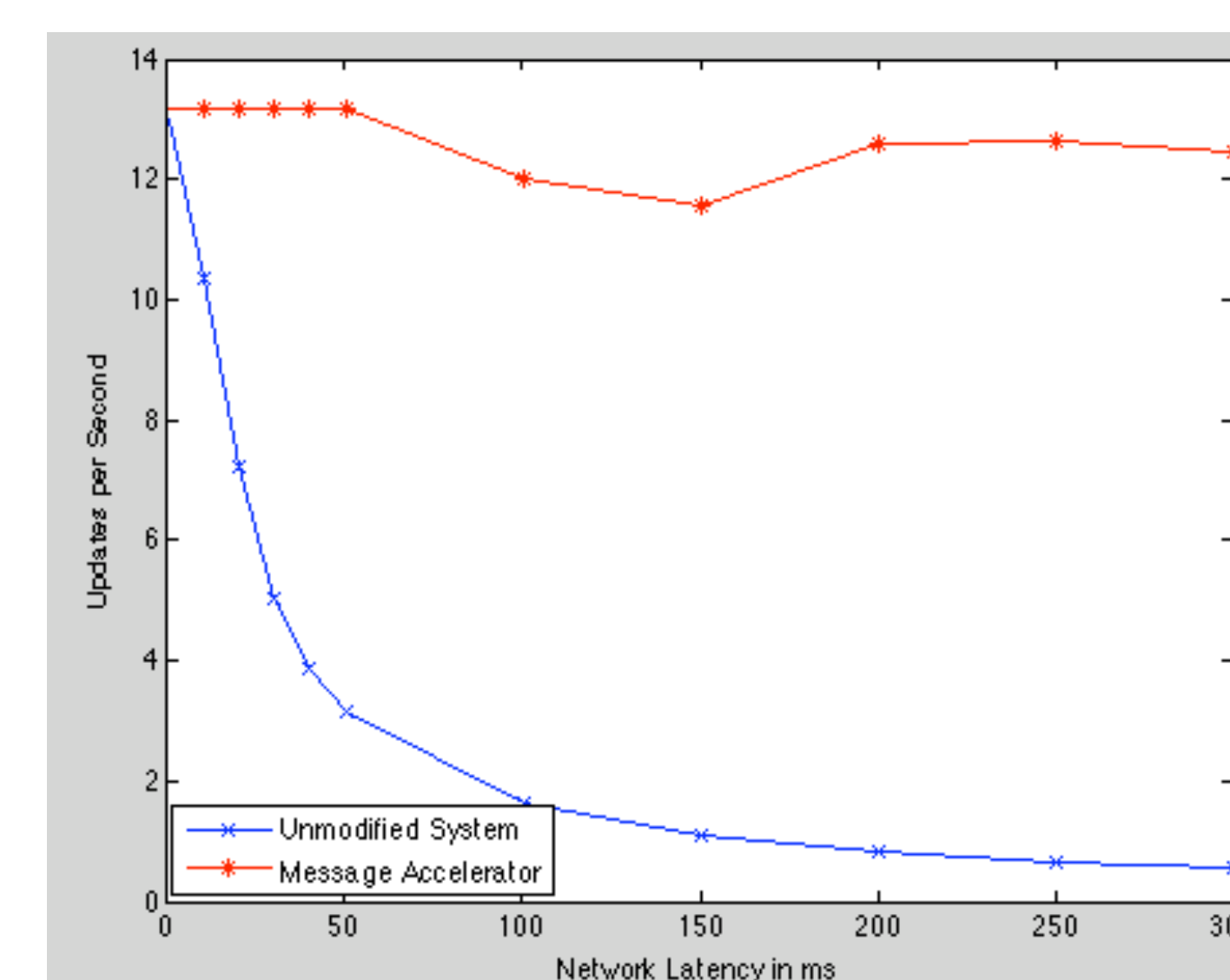
With the Message Accelerator, the update rate remains constant across network latency. In the unmodified system, the update rate decreases rapidly. At 100 ms of network latency, the Message Accelerator is performing better by an order of magnitude.

Experimental Results
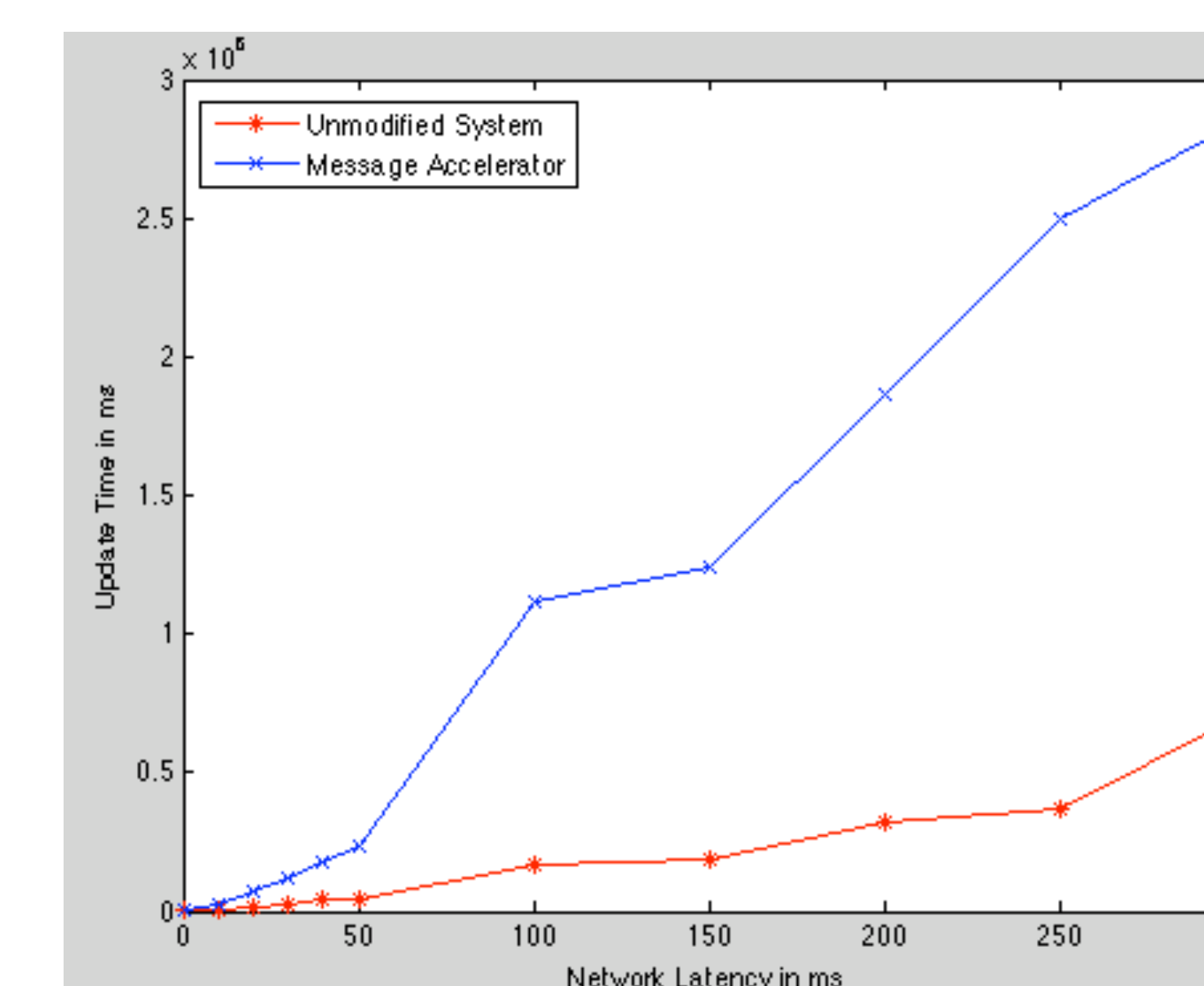
The Standard Deviation of Update Time quickly rises in the unmodified system, reflecting uneven update times. This can reflect the video being displayed in an uneven, jittery fashion.

Conclusion

•The proxy offers a way to perform computationally difficult tasks with quick update speeds, while requiring the user to carry only light-weight, low-power devices.

•Using this systems architecture lets users use devices they already carry with them for location/context-dependent, computationally-intensive applications.

•Experiments on with VNC show that the proxy system has the potential for performance advantages in existing client-server systems, without modifications to the existing code.