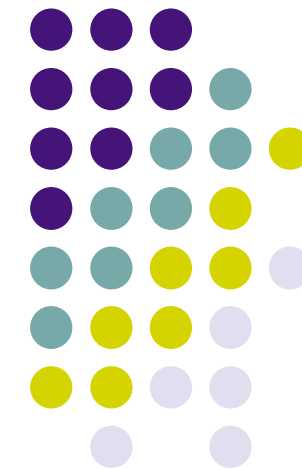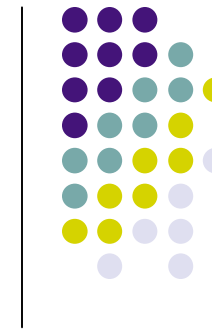# Improving VNC Performance with the Smart Proxy Architecture
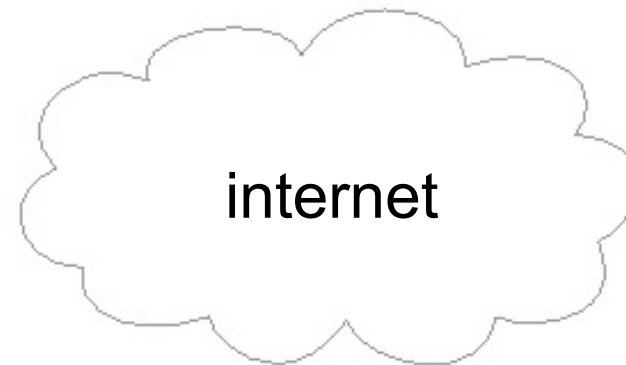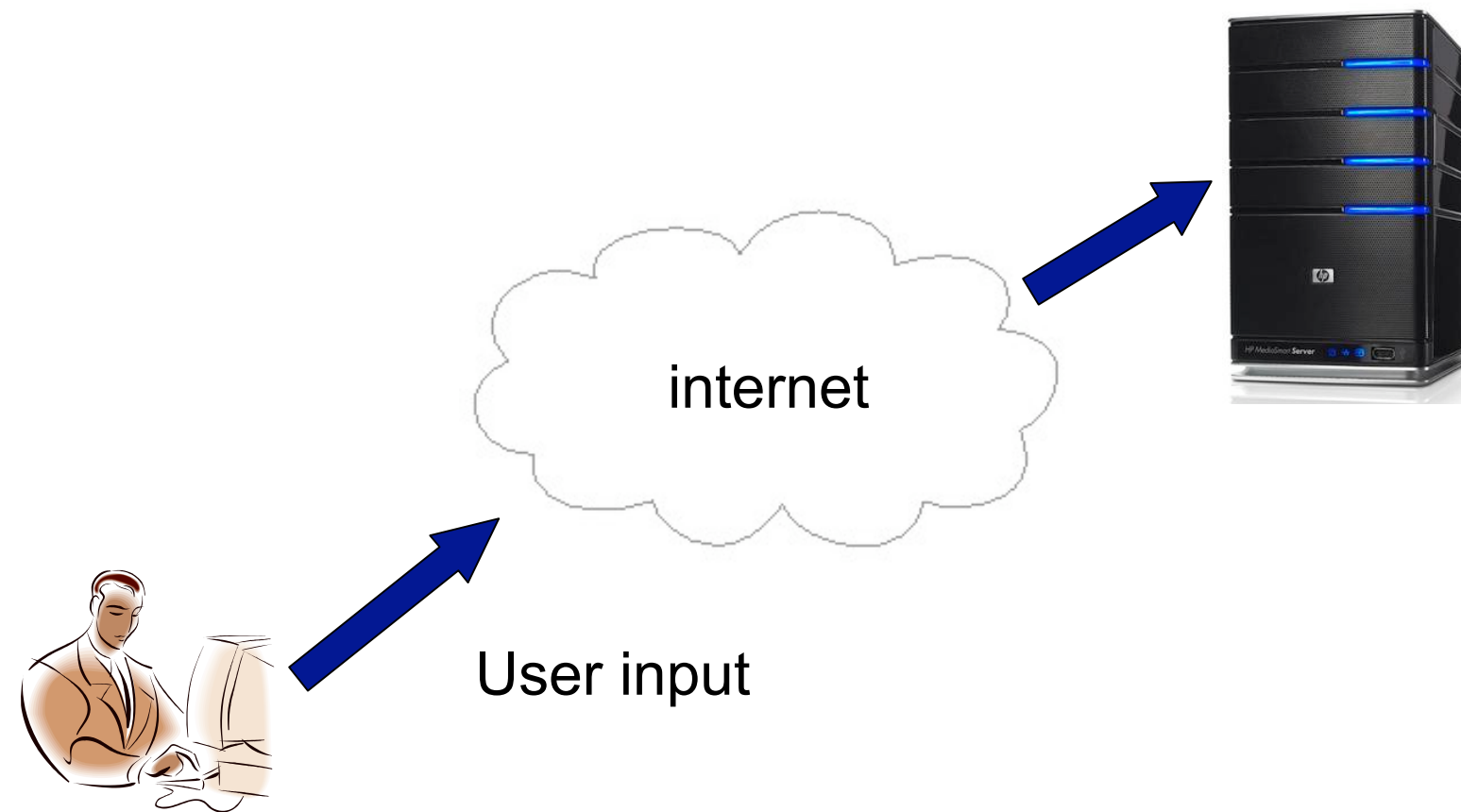
Cynthia Taylor, Joe Pasquale

UCSD

- **Introduction**
  - What is Thin Client Computing?
  - Why Thin Clients?
  - What is VNC?
  - Latency and Performance
  - Defining Performance
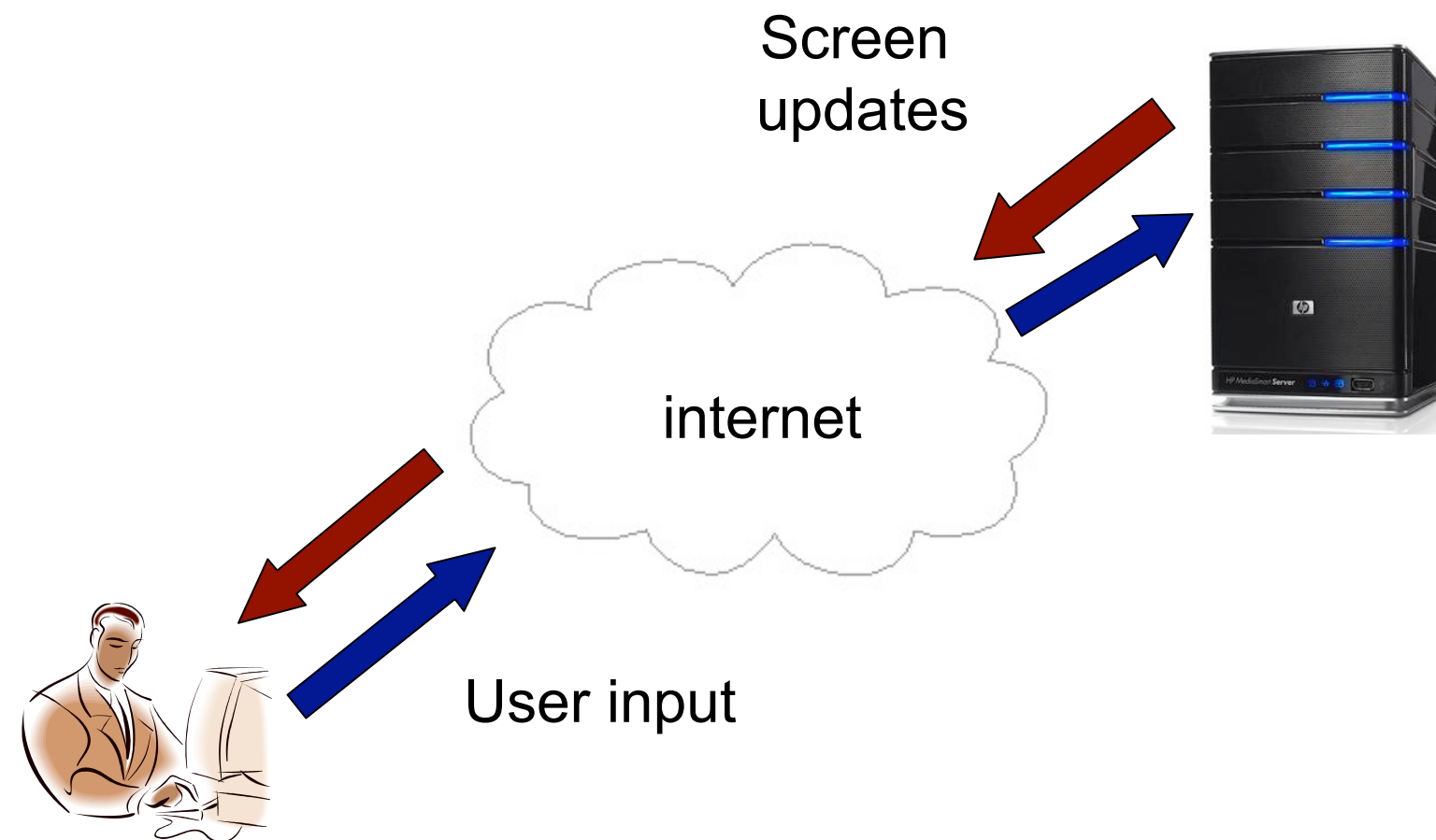- **The Smart Proxy Architecture**
- **Results & Conclusion**

What is Thin Client Computing?

internet

What is Thin Client Computing?

internet

User input

What is Thin Client Computing?

Screen updates
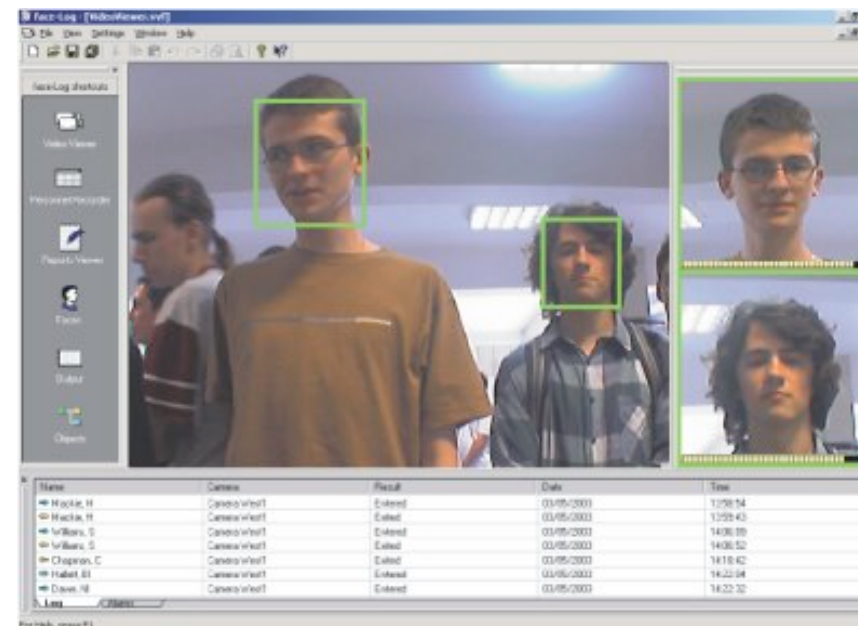
internet

User input

Why Thin Clients?
Lightweight Devices

Why Thin Clients?
Intensive Applications

- Machine Learning/Vision
  - Object recognition
  - Speech recognition
- Graphics
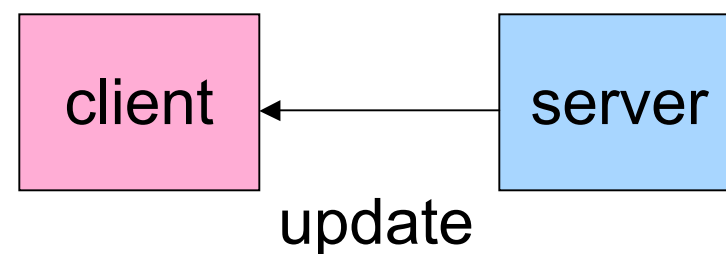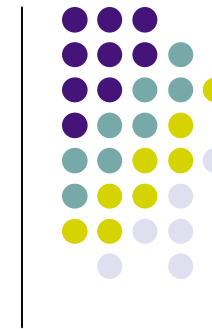 - Rendering
- Data Storage
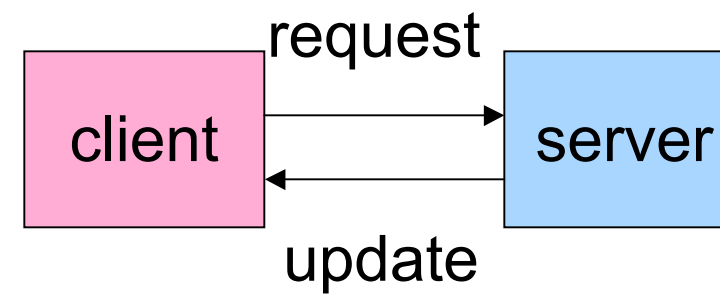 - Video

Why Thin Clients?
Security & Data Loss

- A lost laptop doesn't mean lost data
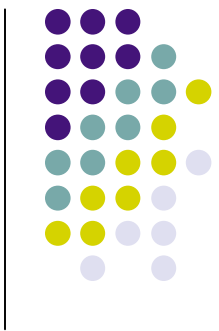- Helps companies stay compliant with privacy laws such as HIPAA
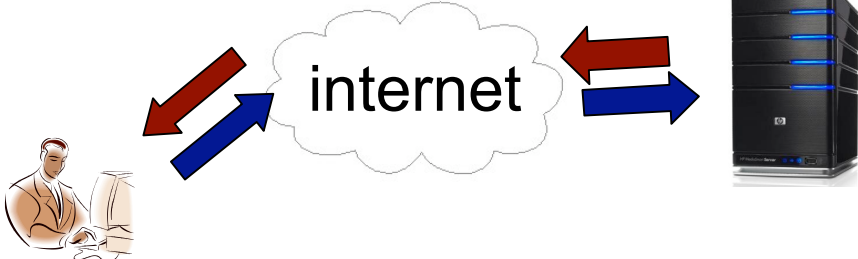
What Is VNC

Server Push

Client Pull

- VNC is a widely-used thin client system with several available open-source implementations.
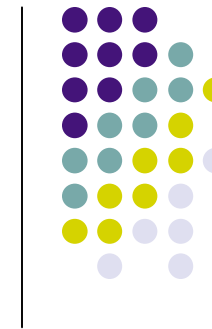
Latency and Performance

Desktop

Thin Client

internet

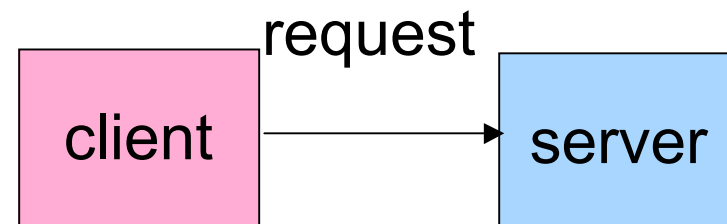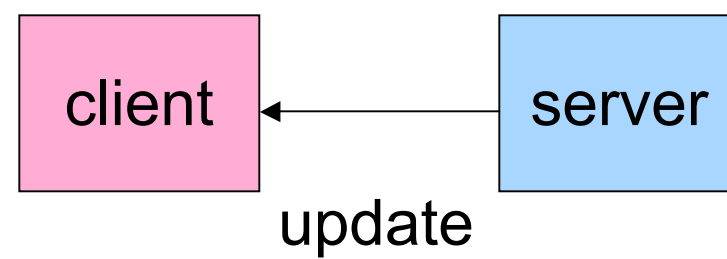# Defining Performance

1. Client requests new update

request

| client | → | server |

2. Client waits

| client | | server |

3. Server sends update

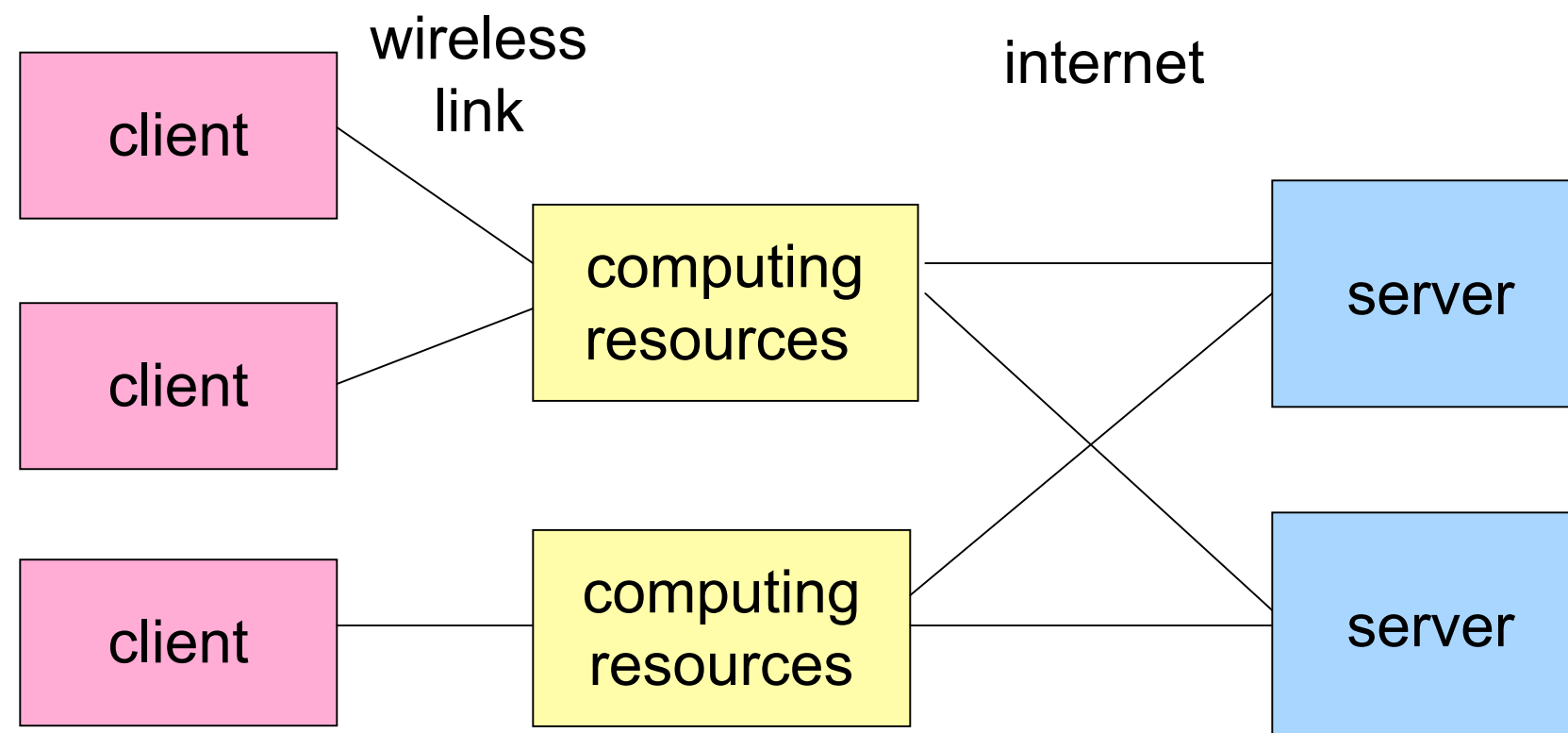| client | ← | server |

update

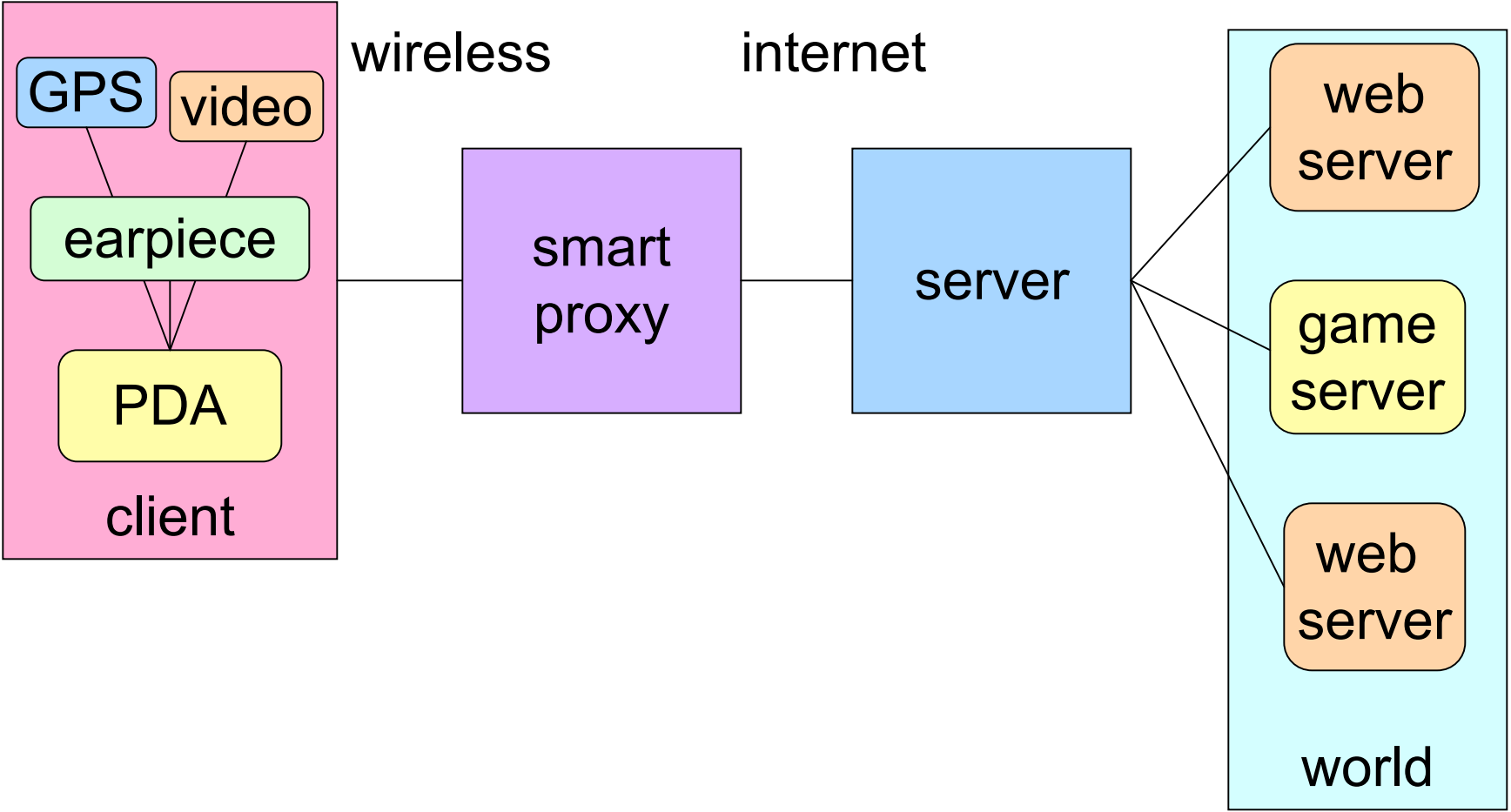**4. Client processes update**

| client | | server |
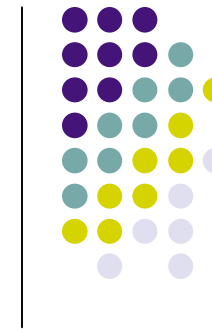
- Introduction
- The Smart Proxy Architecture
  - Resource Assumptions
  - The Smart Proxy Architecture
  - The Proxy & VNC
  - Example
- Results & Conclusion

Resource Assumptions: Active Wireless Spaces

Smart Proxy Architecture
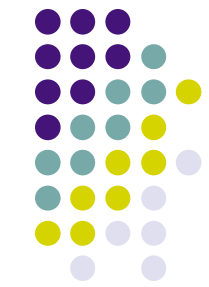
The Proxy and VNC

- The Smart Proxy sends requests to the server at the rate the client is processing them, without waiting for an update from the server
- This lets the Smart Proxy adjust for time delays between the client and server

Example

```
                200 ms
[client]--------------------[server]
```

- Client sends request - 200 ms
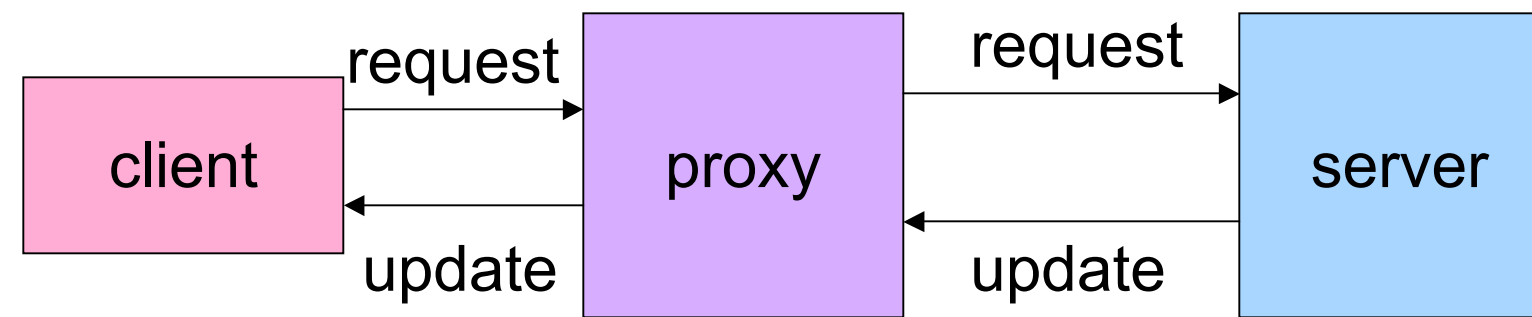- Server processes - 5 ms
- Server sends update - 200 ms
- Client processes - 5 ms

Total time = 410 ms

Example

15 ms   185 ms

```
┌──────────┐      ┌──────────┐      ┌──────────┐
│          │      │          │      │          │
│  client  │──────│  proxy   │──────│  server  │
│          │      │          │      │          │
└──────────┘      └──────────┘      └──────────┘
```

- Proxy processes - 5 ms
- Proxy sends update to Client - 15 ms
- Client processes - 5 ms
- Client sends request - 15 ms

Total time = 40 ms
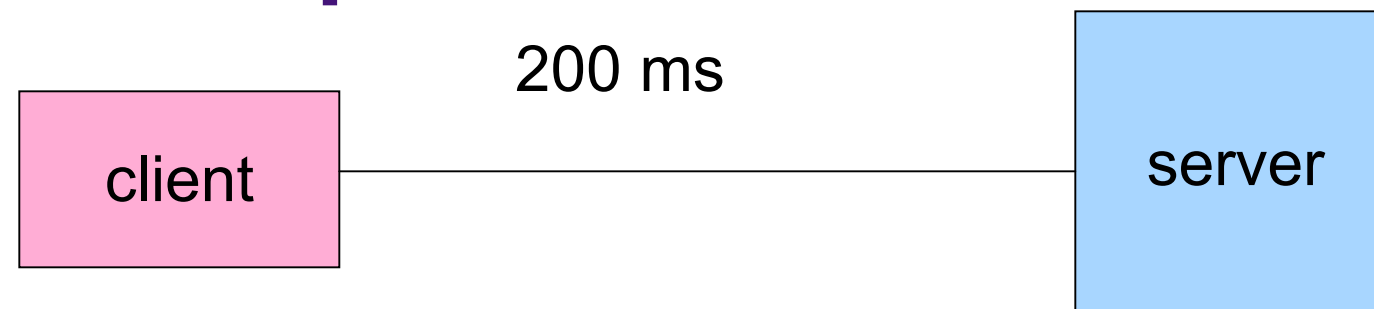
Example
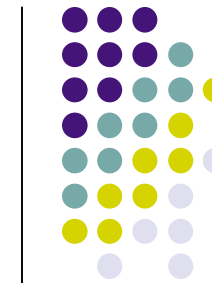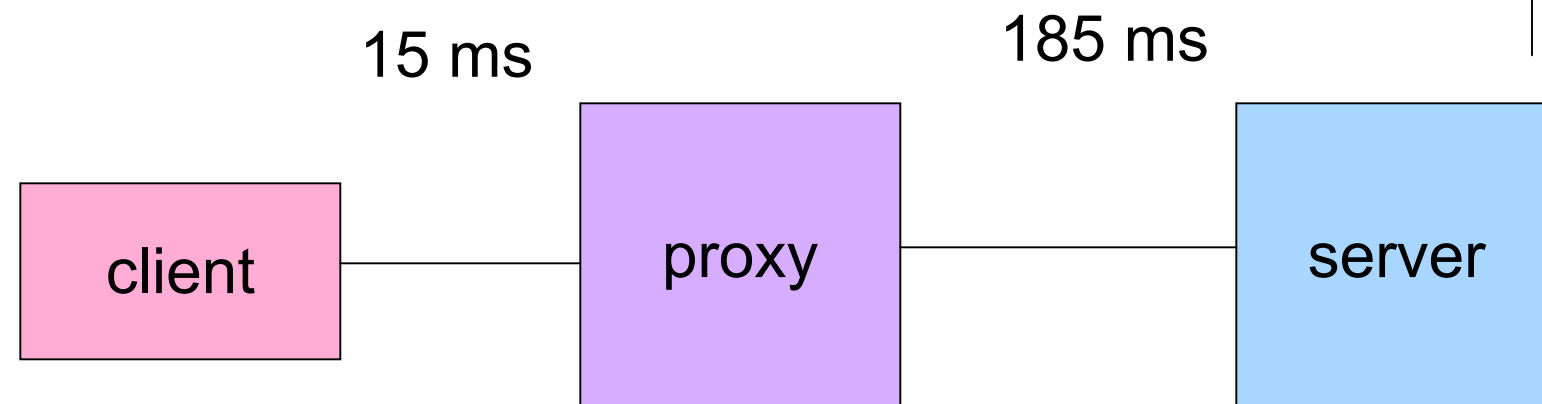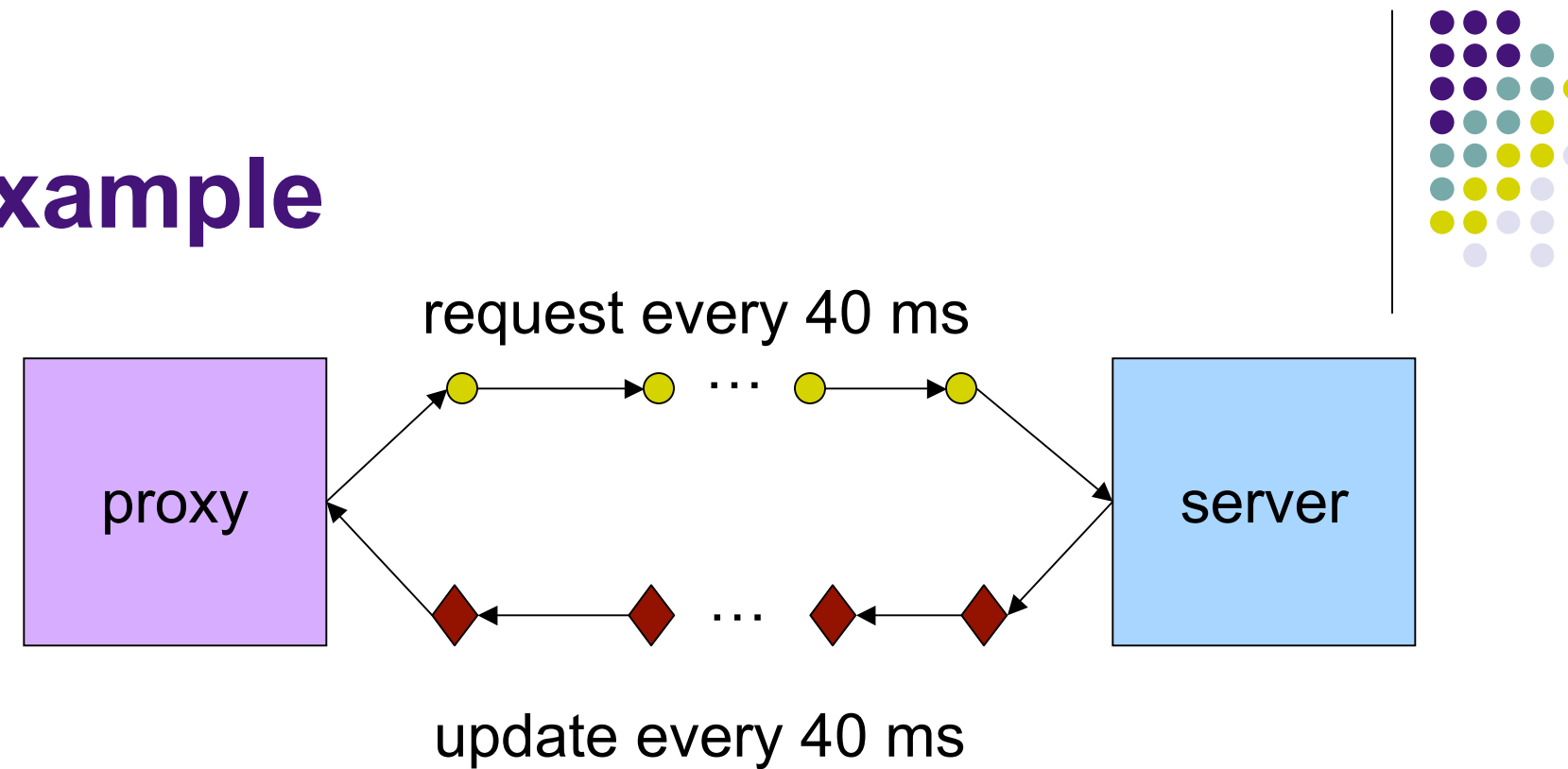
request every 40 ms

proxy

server

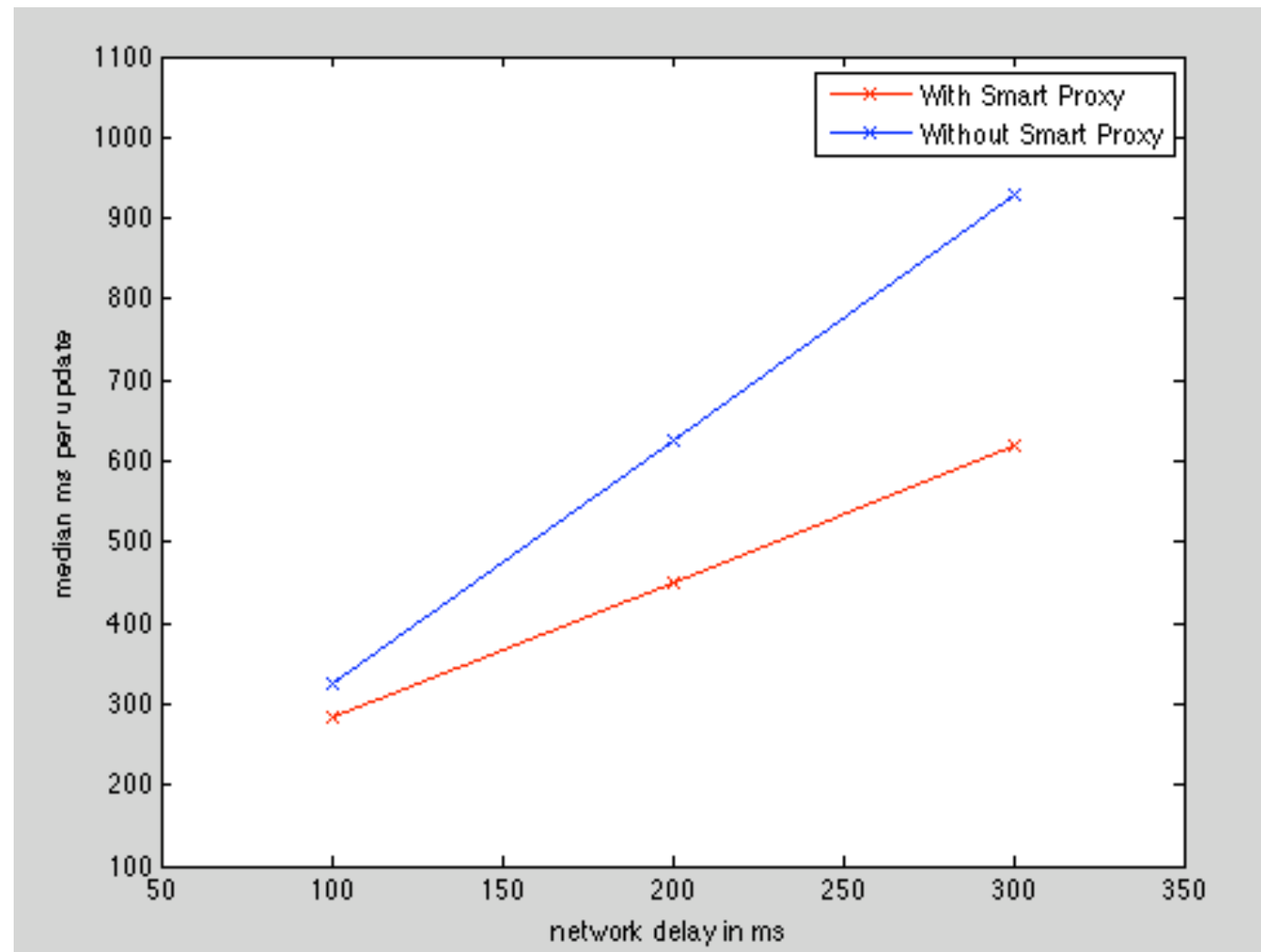update every 40 ms

- The proxy sends requests to the server at the same rate the client is processing them, without waiting for a response from the server

Results

Conclusion

- We can improve VNC performance by having a Smart Proxy mediate the update rate over network delays.

- Faster thin clients can help us integrate powerful computing into our mobile lives.