Networked Device Drivers

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• Motivation
• Architecture
• Recent Work
• Next Steps
The Cloud
We Propose a System Architecture For

- Transparent solution for cloud-based applications with a rich set of I/O devices
- Allow for processing of I/O stream, including to adjust for the network
Past Approaches

- **VNC & X**

- **Extending USB over network**

- **Application-specific architectures, e.g., virtual reality**
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Architecture

Client

- Trans Mods
- Dev Comm
- Net Mod
- raw driver
- net driver

Kernel

Server

- Trans Mods
- App Comm
- Net Mod
- net driver

App

dev
Functionality

- Functionality needs change on an application-device basis
- Device designers, application designers and users may all have different functionality needs
Transformation

• Caching
• Polling
• Buffering
• Encrypting
• Compressing
• Synchronizing Multiple Datastreams

• Averaging
• Discarding non-recent
• Updates
  • predicting future updates
• Application Specific Functionality
Example
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Feasibility Study

- User-level
- Processes
- Pipes
Experimental Set-up

- Dell Optiplex 320
  - Intel Celeron
  - 533 Mhz Memory Speed

- Dell Optiplex 755
  - Intel Core 2 Duo
  - 800 Mhz Memory Speed
Multi-Process Pipes

Throughput in Multiple Process, Updates Sent At Once
Encryption
Space Navigator
Transformation

- Averaging
- Compression/Decompression
- Encryption/Decryption
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Webcam
Deployment System

- Want a way for users to automatically customize and deploy networked drivers.
Summary

• We are developing an easily modified/extended architecture for I/O over the network.
Questions?
Simple Experiment

- An array of random characters is created
- A timestamp is added to the array
- It is passed between processes using pipes
- In the last process, a new timestamp is taken and the difference is measured
Interval Updates

![Graph showing memory throughput vs number of processes for Core 2 Duo and Celeron processors.](image-url)