Networked Device Drivers

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- Motivation

- Architecture

- Recent Work

- Next Steps

I/O

Camera

Space Navigator

RFID

GPS

Microphone

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

  - T. Richardson, Q. Stafford-Fraser, K. Wood, and A. Hopper. Virtual network computing. Internet Computing, 2(1):33–38, 1998.

  - R. W. Scheifler and J. Gettys. The x window system. ACM Trans. Graph., 5(2):79–109, 1986.

- Extending USB over network

  - T. Hirofuchi, E. Kawai, K. Fujikawa, and H. Sunahara. USB/IP: a peripheral bus extension for device sharing over IP network. In Proceedings of the annual conference on USENIX Annual Technical Conference, page 42. USENIX Association, 2005.

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

  - T. Hudson, A. Seeger, H. Weber, J. Juliano, and A. Helser. VRPN: a device-independent, network-transparent VR peripheral system. In Proceedings of the ACM symposium on

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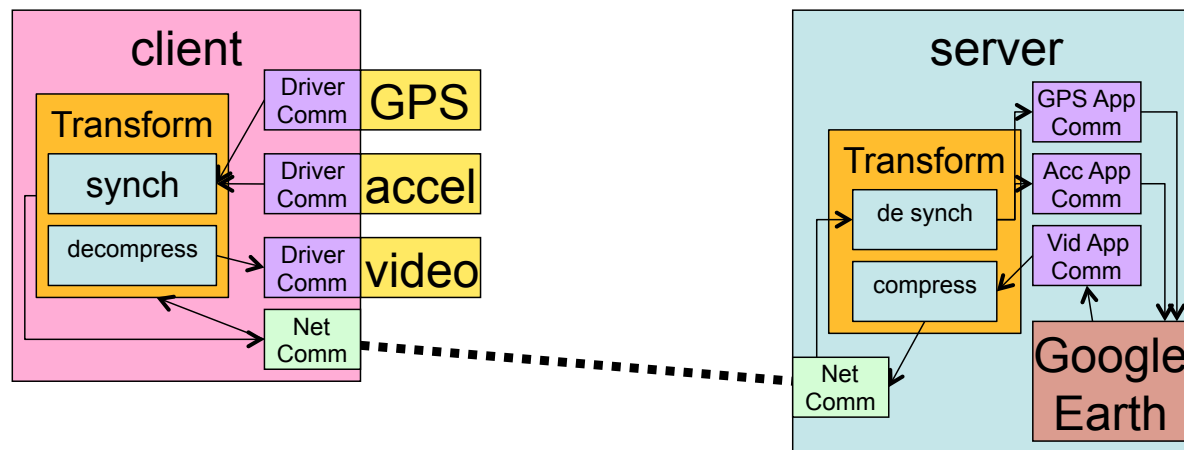
- Next Steps

Architecture
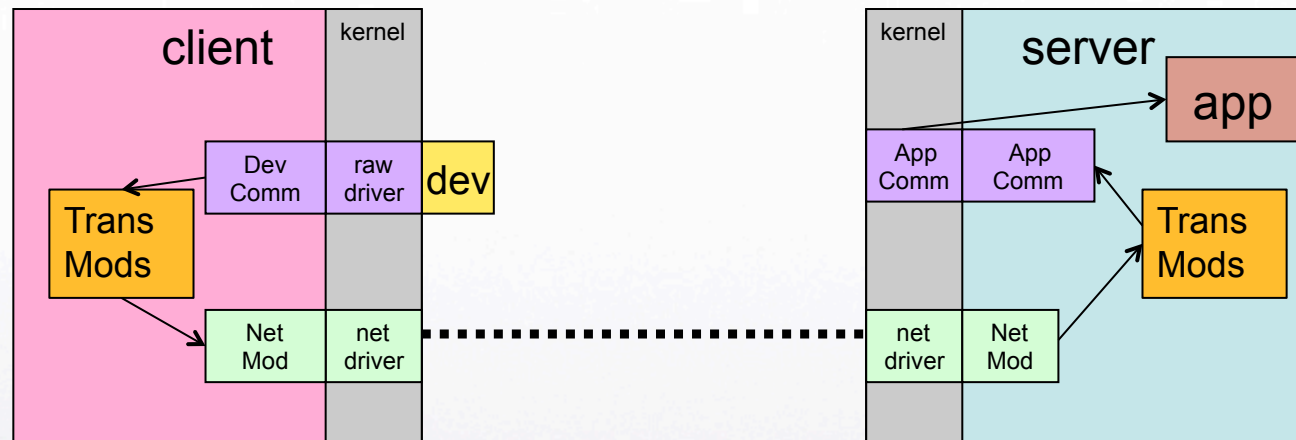
Functionality

- 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

- Motivation

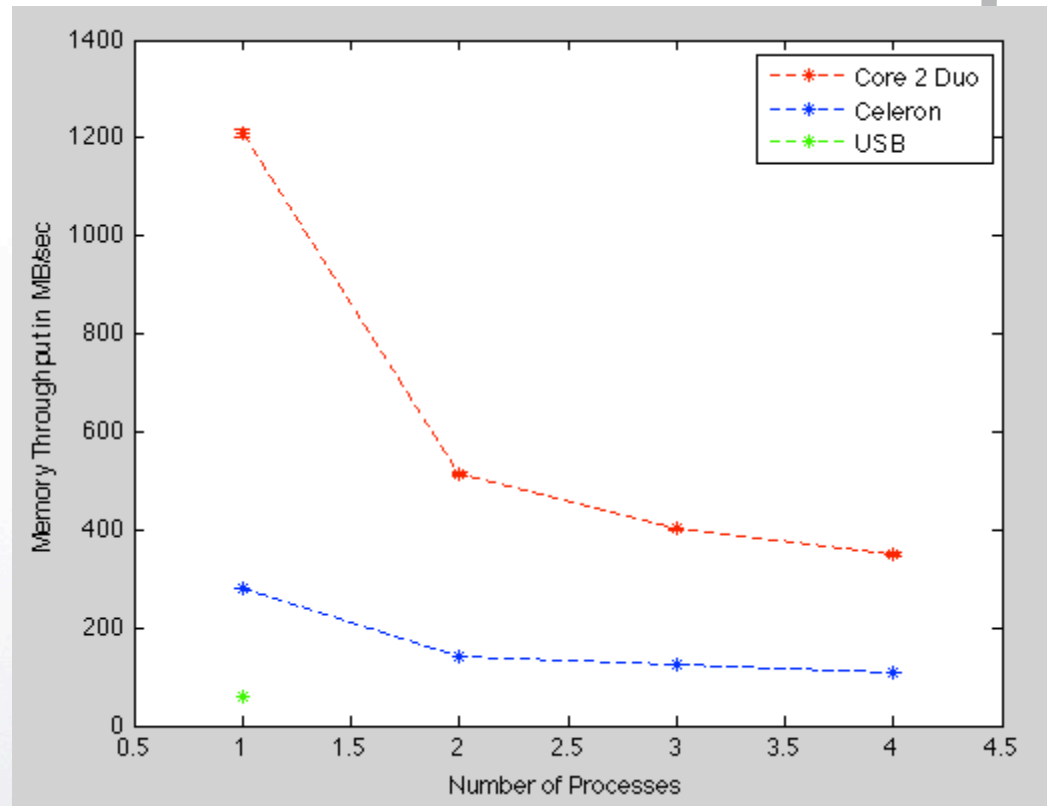- Architecture

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Feasibility Study

- User-level

- Processes

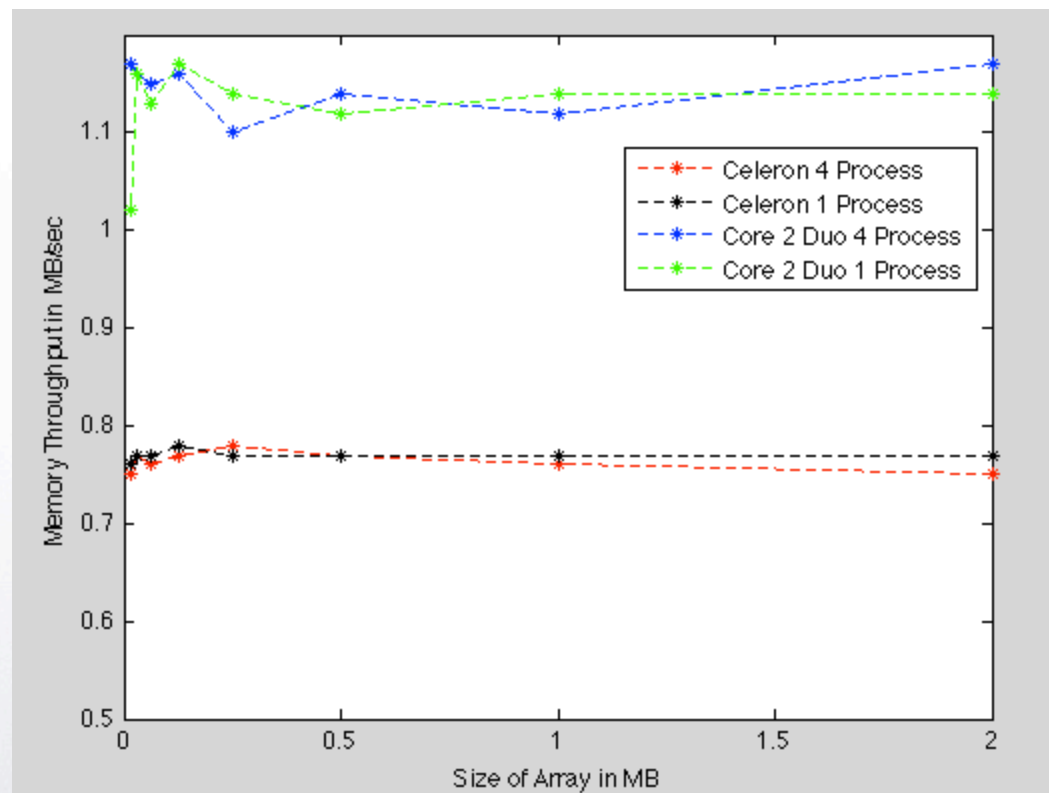- Pipes

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