Networked Device Drivers

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• Motivation
• I/O Over the Network
• Architecture
• Demo
Small Devices

Zypad Wearable

iPhone

Netbook

Nanotech

Contact Lens Display (UW)
I/O

Camera
Space Navigator
RFID
GPS
Microphone
Big Applications

- Virtual Worlds
- Maps
- Augmented Reality

- Data/Computation Intensive, Context Dependent
The Cloud
We Propose a System Architecture For

- Cloud-based applications with a rich set of I/O devices
- User interaction with the cloud
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Current Network I/O


I/O Devices

- Camera
- Microphone
- Mouse
- Accelerometer
- GPS
- Temperature sensor
- Light sensor
- RFID
- Barcode reader
- Keyboard
- Biometric sensors
- Touch sensor
- Sound card
- Video card
We Need a Generic System for Remote I/O

- Flexible
- Easy to extend/edit
- Performance Sensitive
I/O Performance
I/O Architecture

device  driver  application

network

device  driver  application
Problem Statement

Once we move applications across the network, we must figure out how to connect the device to the application, taking into account:

• Heterogeneity of devices
• Transparency to applications
• Minimizing latency
• Supporting real-time constraints
• Supporting mobility
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Architecture
functions

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

• Transforming
  • Adding Timestamps
  • Averaging
  • Discarding Non-Recent Updates
  • Predicting Future Updates
Architecture
Functionality

• Functionality needs change on an application-device basis

• Device designers, application designers and users may all have different functionality needs
Automatic Customization

- Application Developer
- Device Developer
- User
Architectural Features

- Driver on Client is unchanged
- Middleware code added
- Add Networking functionality
- Modify driver on Server to use network instead of device
Middleware Example

Client:
- Middle
- average
- encrypt
- net

Server:
- Middle
- decrypt
- net

Connections:
- Driver
- Network
Google Earth
• Motivation
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• Preliminary Experiment
Preliminary : Space Navigator
Preliminary - Local
Preliminary - Remote
Summary

• New generation of I/O devices
• The Cloud
• We propose a new architecture to support remote I/O
Questions?