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Research Faculty Summit 2012

ADVANCING THE STATE OF THE ART

An “operating system” for connected devices in the home



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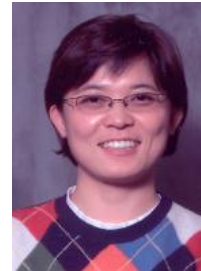
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Connected devices for the home

Inexpensive

Need “no new wires”

- Use regular voltage or batteries
- Wireless communication

Use maturing, reliable standards

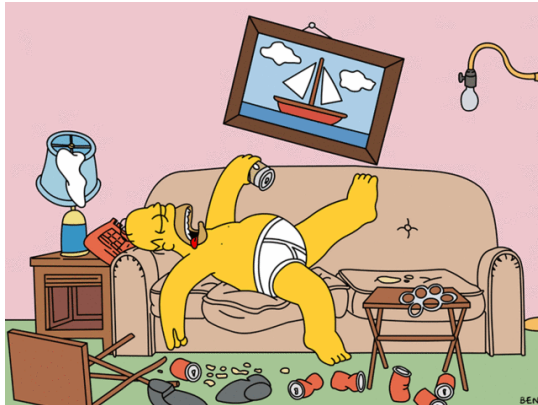
- Z-Wave, ZigBee, Powerline





Why smarthomes?

Convenience



"It allows me to be lazy"

Peace of mind



"I can track things when I'm not there and know that...it's...secure"

Control



"I like just being in control"

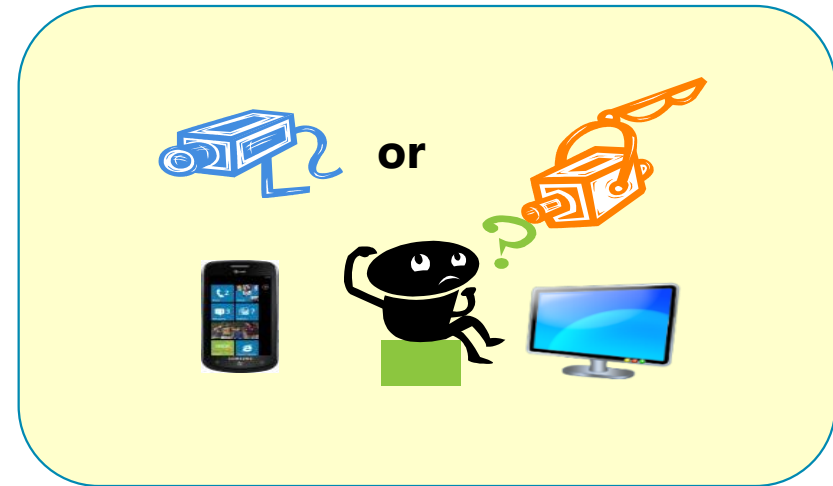


Why not smart homes?

Manageability



Extensibility





Existing abstractions for home tech

Network of devices

Management is still hard

- Users must manage each device/task
- Developers must deal directly w/ h/w

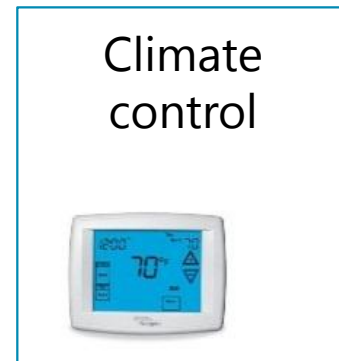


Appliance

- Monolithic systems

Extensibility is still hard

- Closed set of tasks
- Closed set of devices



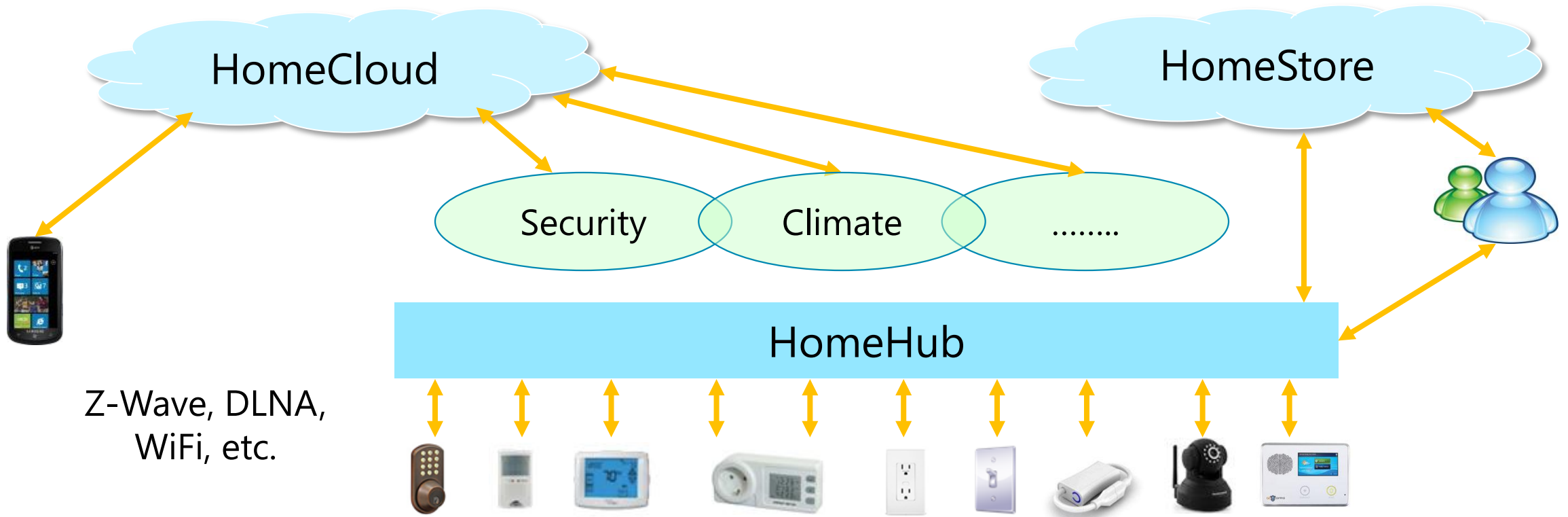


Our abstraction

Organize the home as a PC

- Networked devices = ~ peripherals
- Tasks over these devices = ~ apps in high-level APIs
- Adding devices = ~ adding a peripheral and driver
- Adding tasks = ~ installing an application
- Managing networked devices = ~ managing files

HomeOS overview



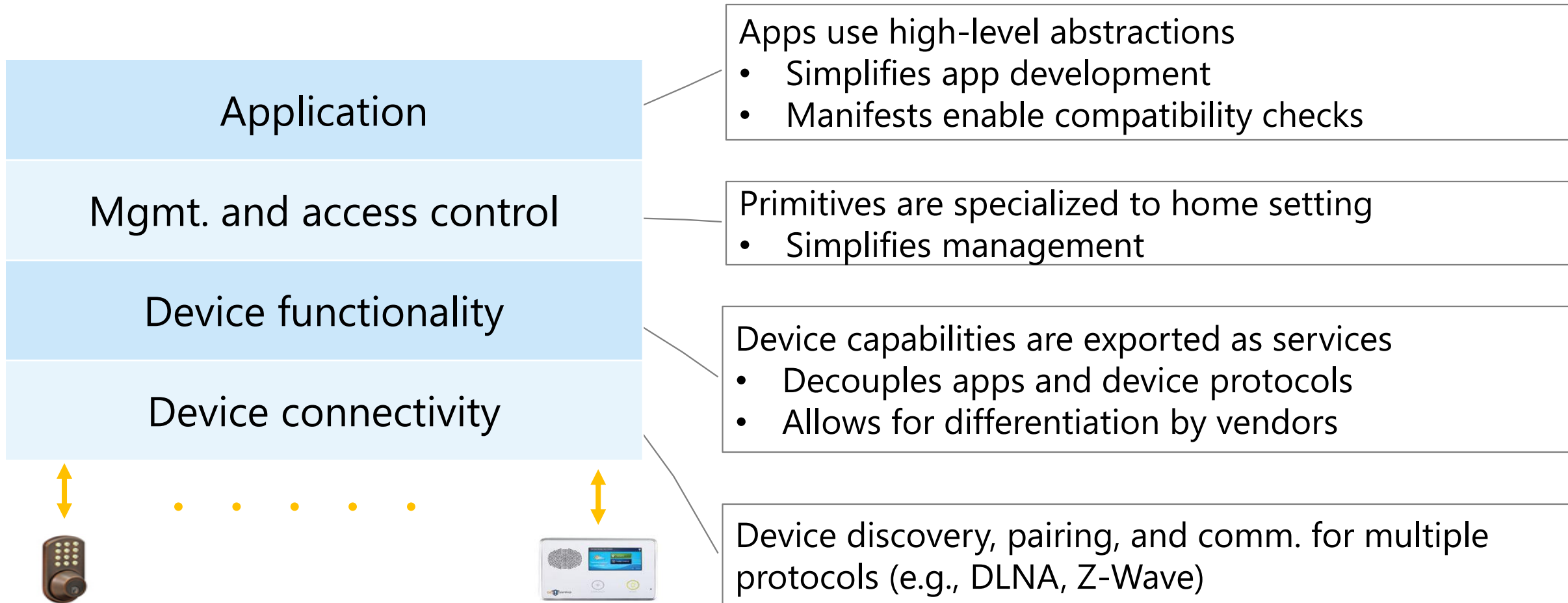
HomeHub centralizes all devices for users and apps

HomeStore helps find compatible devices and apps

HomeCloud enables remote access and control



HomeOS layering model



[An operating system for the home, NSDI 2012]



Prototype

Software module based on .NET and C#

- 20K lines of code (~3K kernel)
- 18 diverse apps (~300 lines per app)

Support for several protocols and devices

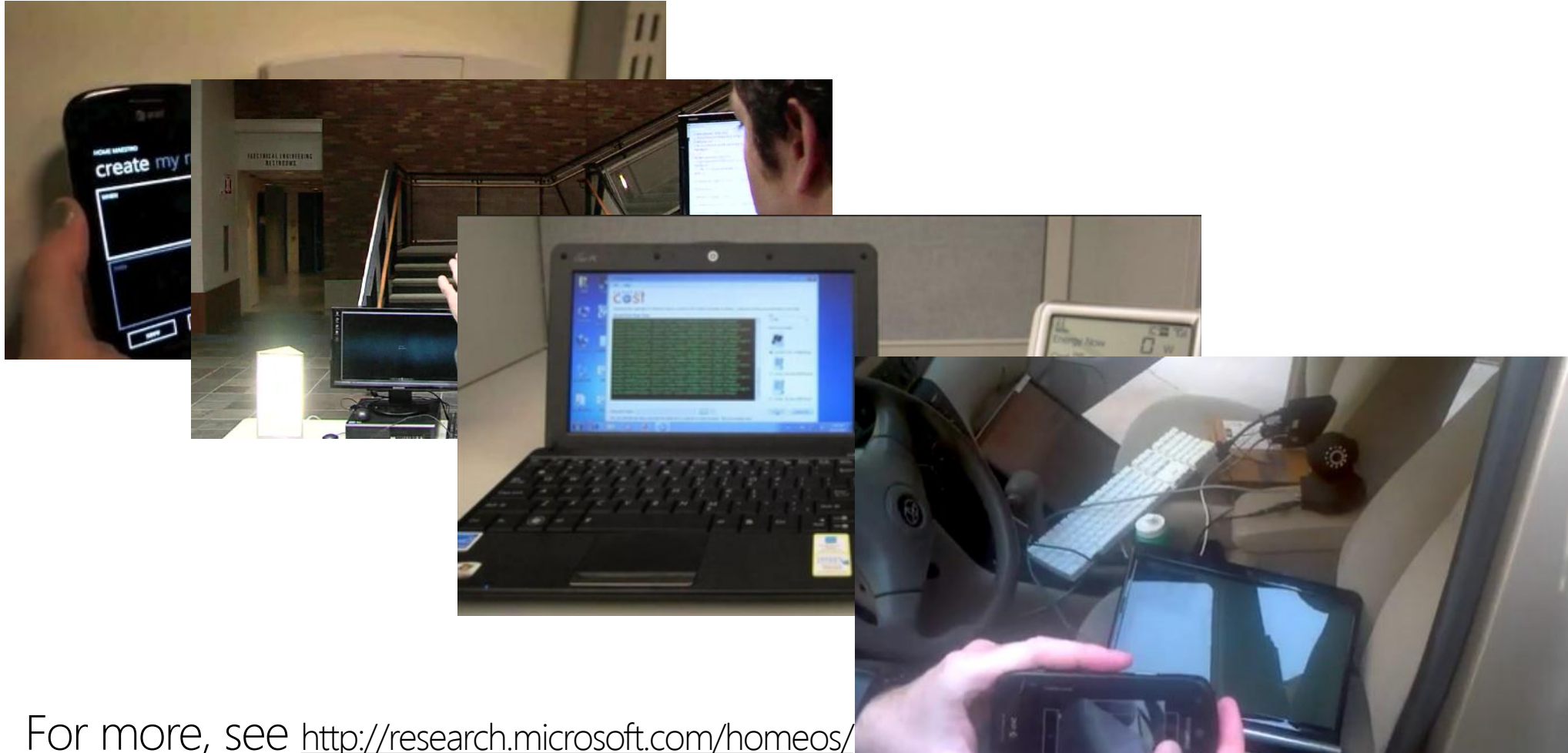
- Z-Wave, UPnP, DLNA, custom (HTTP)
- Dimmers, light switches, cameras, motion sensors, d/w sensors,

In-lab and field evaluation

- Deployed in 12 homes
- 50 students across 12 institutions have developed apps and drivers



Sample 3rd party applications



For more, see <http://research.microsoft.com/homeos/>



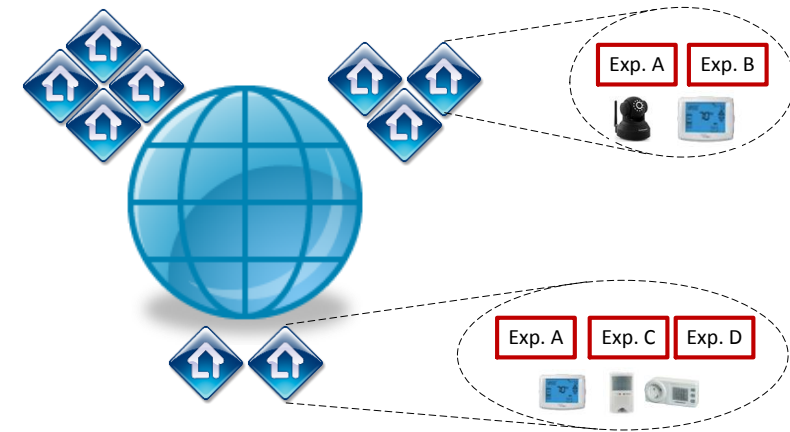
Ongoing and future work



Predictable control



Sensor data privacy



**HomeLab: Shared
research testbed**



Offers a PC-like abstraction for devices in the home

- Simplifies management for users
- Simplifies extension by users and developers

<http://research.microsoft.com/homeos/>

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