View the home as a computer

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The home computing environment

Video Recording

Climate Control

Camera-Based Entry

Remote Lock

Problems faced by users

Easily give the babysitter access to the DVR content, but not the printer

Add devices that are compatible with existing devices and eliminate guess work

2. Enabling cross-device functionality
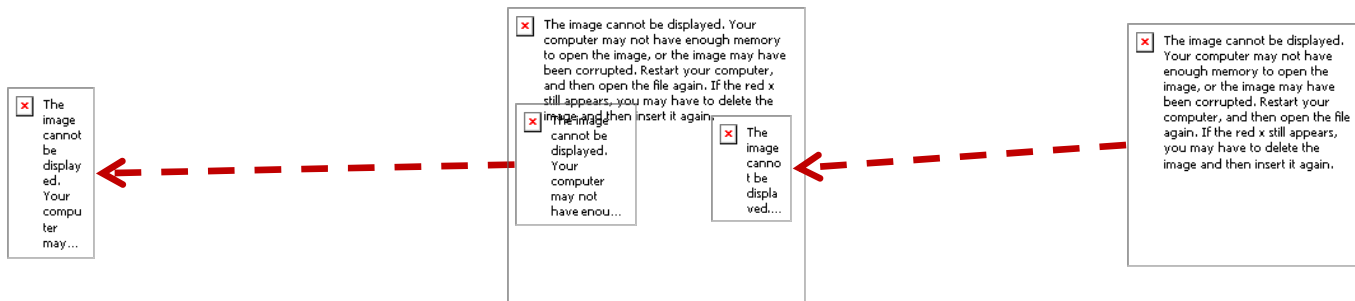
Check on your house from your phone using home computer's webcam

Transfer the audio from the car to home speakers to continue listening

Traditional view of home computing

The home is a network of devices
- Similar to the Internet and enterprise networks

Resulting solutions are poor fits
- Management: DNS, Kerberos, Active directory, etc.
- Cross-device function: interoperability protocols

Interoperability is insufficient
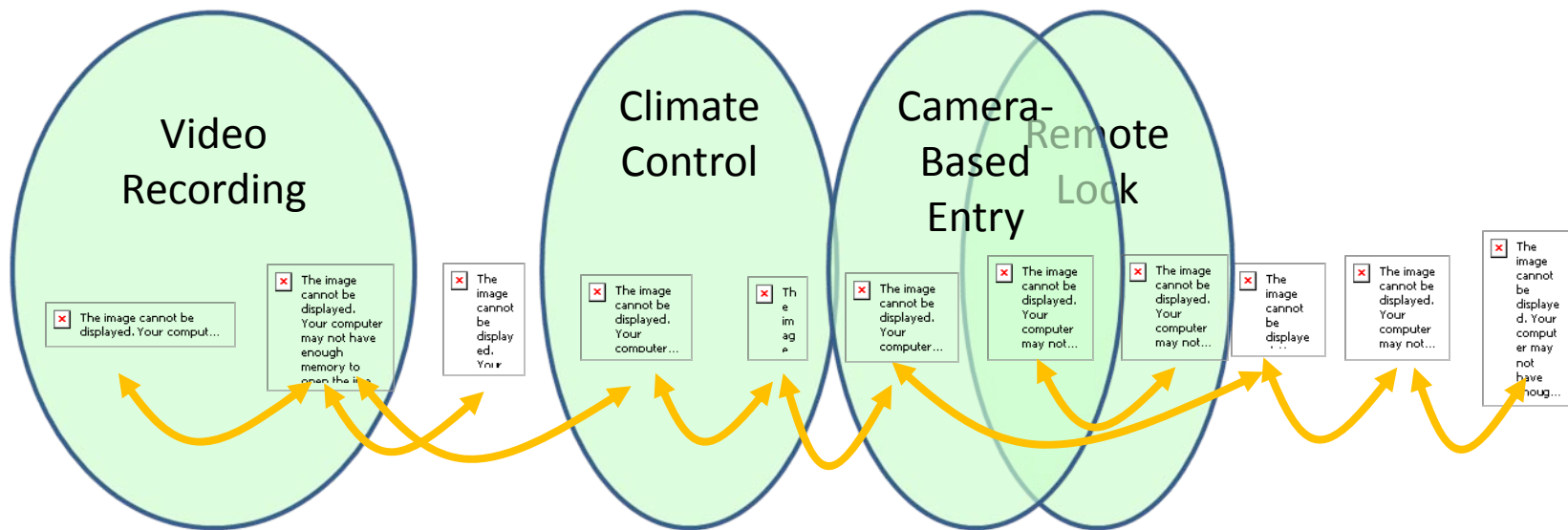
Does not handle coordination, topological heterogeneity, and user control

The home as a computer

Networked devices =~ peripherals

Software that uses devices =~ apps

Managing networked devices =~ managing files

Conducting cross-device tasks =~ running apps

HomeOS: An OS for the home

HomeStore

Video Rec.

Remote Unlock

Climate

HomeOS

Z-Wave, DLNA, WiFi, etc.
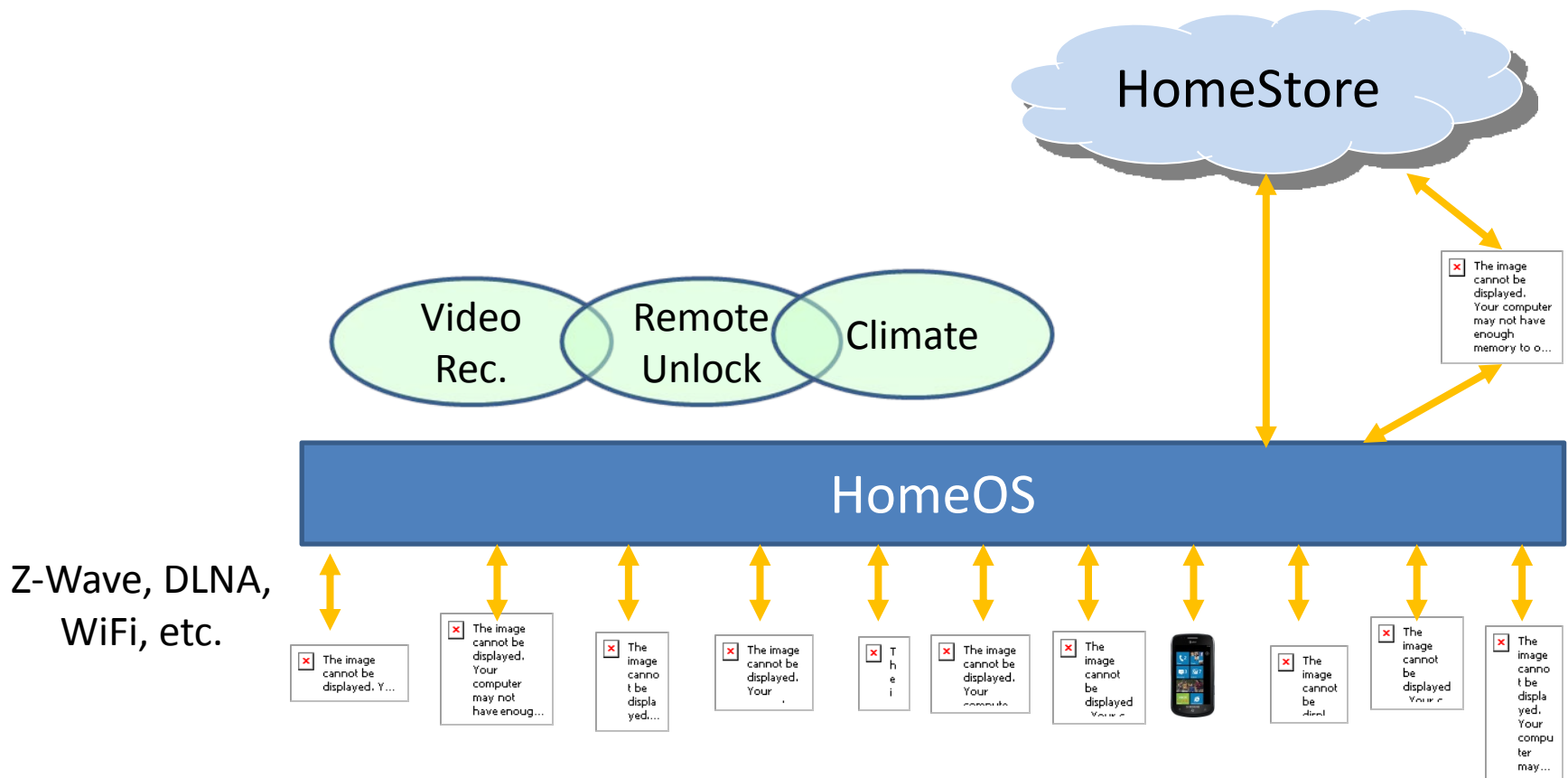
HomeOS logically centralizes all devices in the home

Users interact with HomeOS rather than individual devices

Apps (not users) implement cross-device functionality using simple APIs

HomeStore helps users find compatible devices and apps

HomeOS layering model
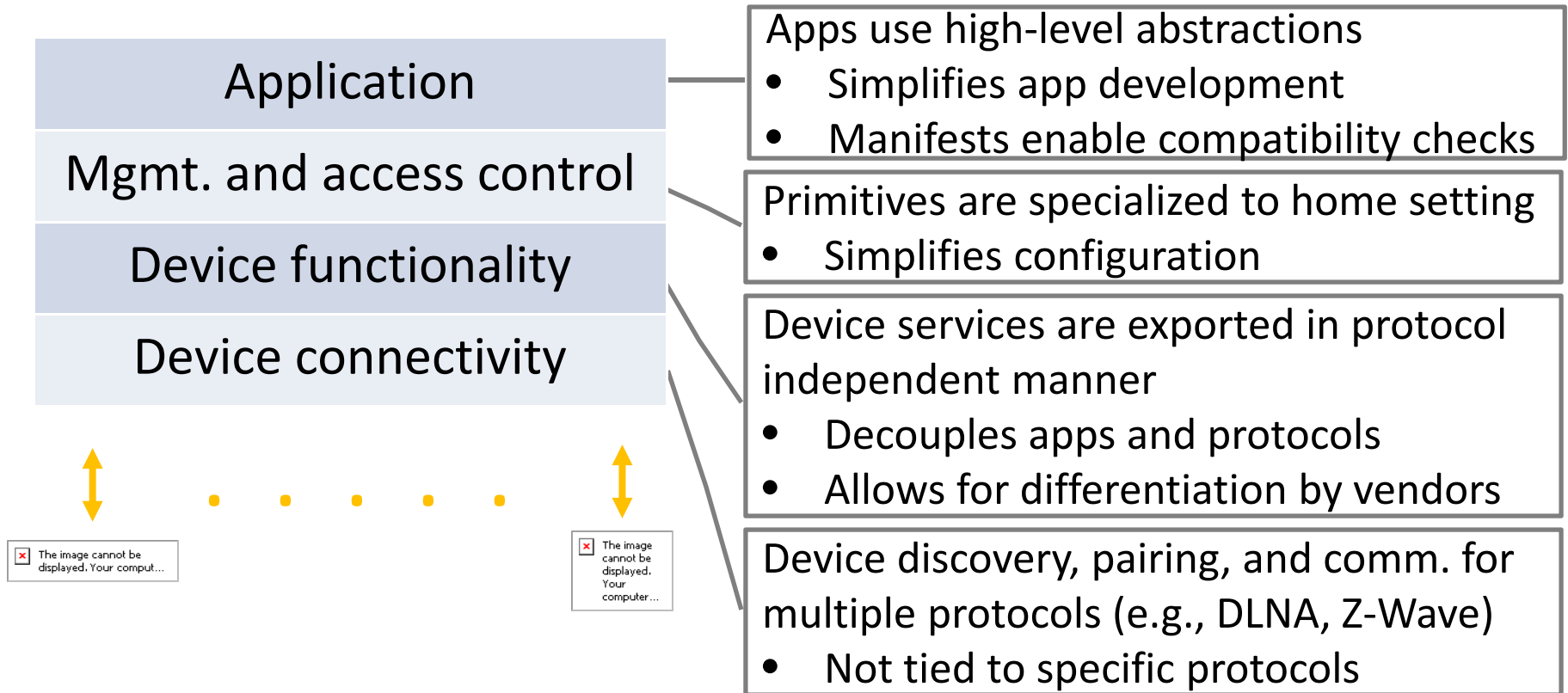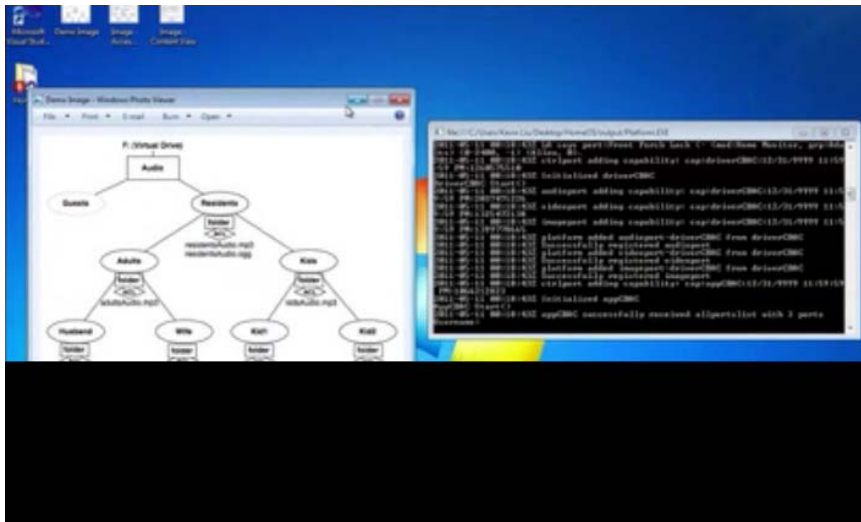
| Application |
| Mgmt. and access control |
| Device functionality |
| Device connectivity |

Apps use high-level abstractions
- Simplifies app development
- Manifests enable compatibility checks

Primitives are specialized to home setting
- Simplifies configuration

Device services are exported in protocol independent manner
- Decouples apps and protocols
- Allows for differentiation by vendors

Device discovery, pairing, and comm. for multiple protocols (e.g., DLNA, Z-Wave)
- Not tied to specific protocols

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Experience with HomeOS

S f
nce
evi
v se

41 student developers across

ers, IM, appliance controllers).

t-based control, face-recognition

oft.com/homeos/ for demos

ty and programmability

Experience with HomeOS: The good

Users could manage their deployment

Users particularly liked the ability to organically grow their technology

Developers found the programming abstractions and layering to be "natural"

Experience with HomeOS: The bad

Users found it hard to diagnose their deployments
- Interoperability protocols reveal limited information

Interoperability protocols can be fragile
- Particularly hurts in the face of decentralized data plane

Not all device features are exposed over the network
- Hinders rich application development

Control of the home can be unpredictable

Conclusions

View the home computing environment as a computer

- Move away from viewing it as a network of devices
- Simplifies management and application development

HomeOS is one way to realize the view

- Experience points to both the promise and the challenges of realizing the view