

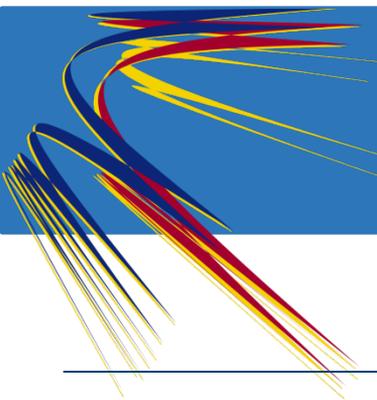
Homework: User-centric Networking

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<http://www.homenetworks.ac.uk/>

with University of Glasgow, Imperial College London,
BT, Microsoft Research, Georgia Tech



Acknowledgements

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- Project partners as well as University of Nottingham:
 - University of Glasgow, Imperial College London
 - BT, Microsoft Research
 - Georgia Tech
- Ethnography and technology deployment to 24+ households
- Part of a wider agenda concerned with the redesign of (technology) infrastructure for use in domestic contexts

Why Homework?

300 million people worldwide have broadband connections to the Internet

Home networking gear is **the most returned** consumer electronics item stores (25%)

51% of UK households now have a broadband connection

Consumers cite technical complexity as **the largest barrier** to home networking



Services Available Outside of Home
available by **Dynamic DNS**

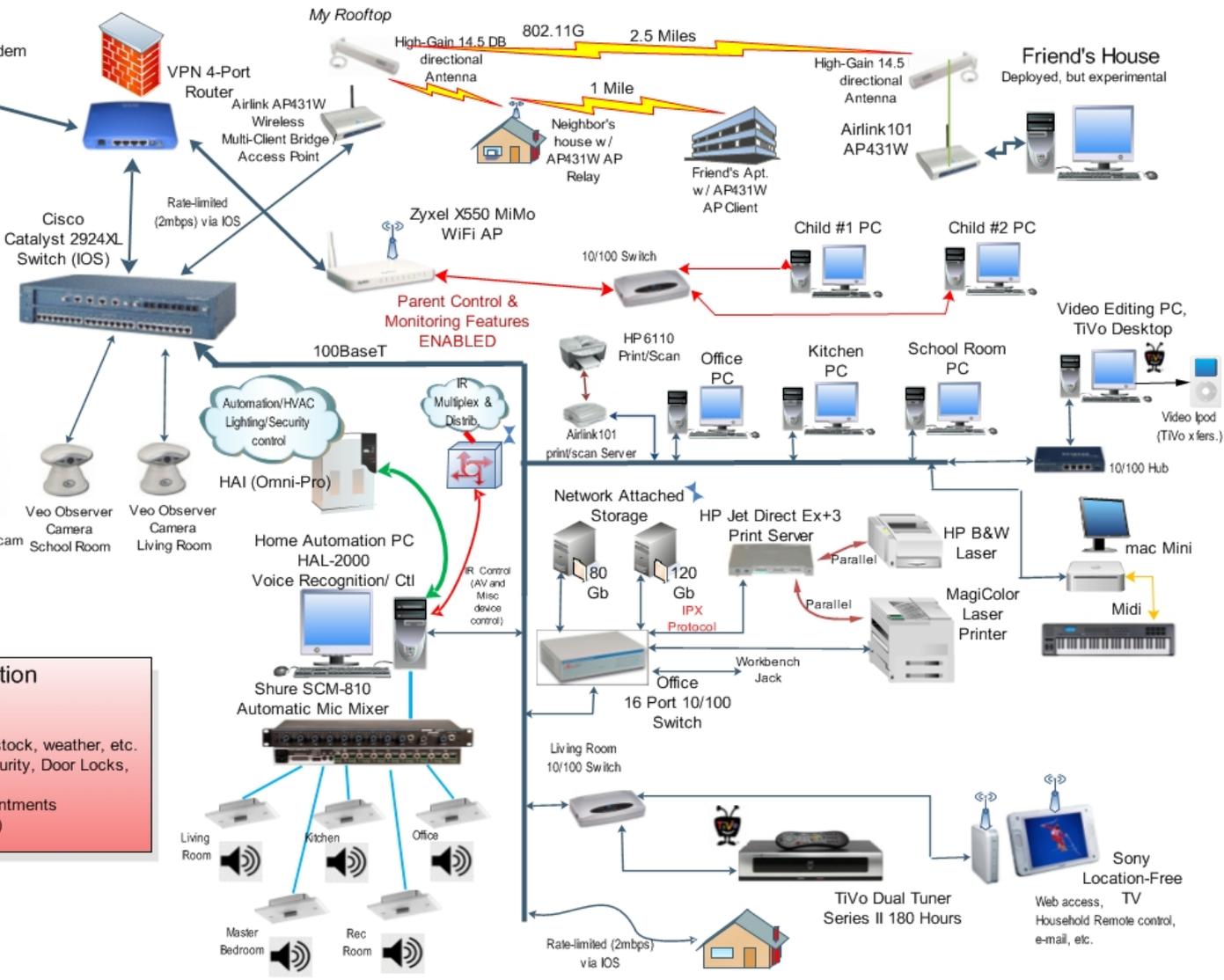
- Remote Power ON of KitchenPC, Office PC, HA PC
- Web Cameras w/ Audio
- Web Server on HA PC for remote control of house incl A/V, HVAC, Lighting, Security
- Remote Desktop on Office PC, HA, PC, Kitchen PC
- VNC on Video Editing PC
- Parental Notification of children's Internet activity
- Sony Remote Location-Free TV



Home Automation HAL-2000

- Internet Access via Voice: news, stock, weather, etc.
- Voice Control Lighting, HVAC, Security, Door Locks, Drapery Op/Cl, A/V Components
- Voice Reminders: Shopping, appointments
- Telephone Messaging (Voice Mail)

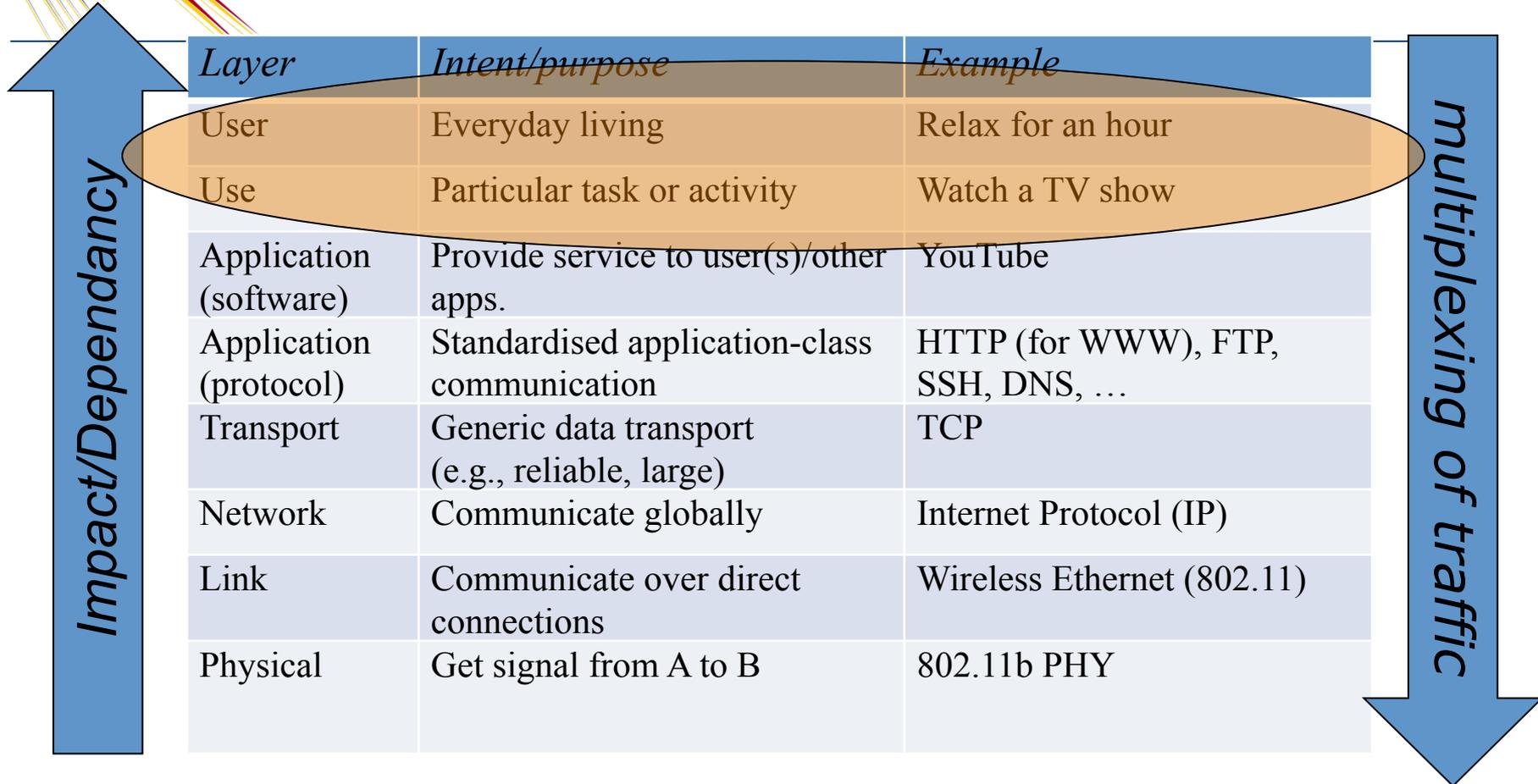
Ward Family House
Networking Diagram
ver 5.0

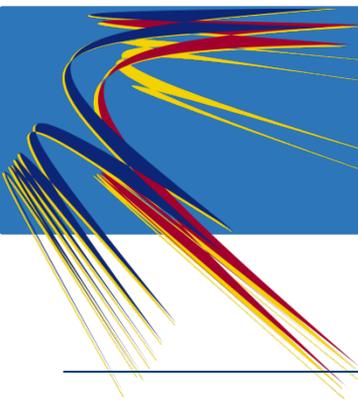


Lived reality is messy and complex



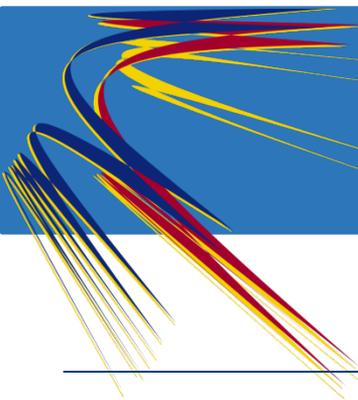
Usage spans layers





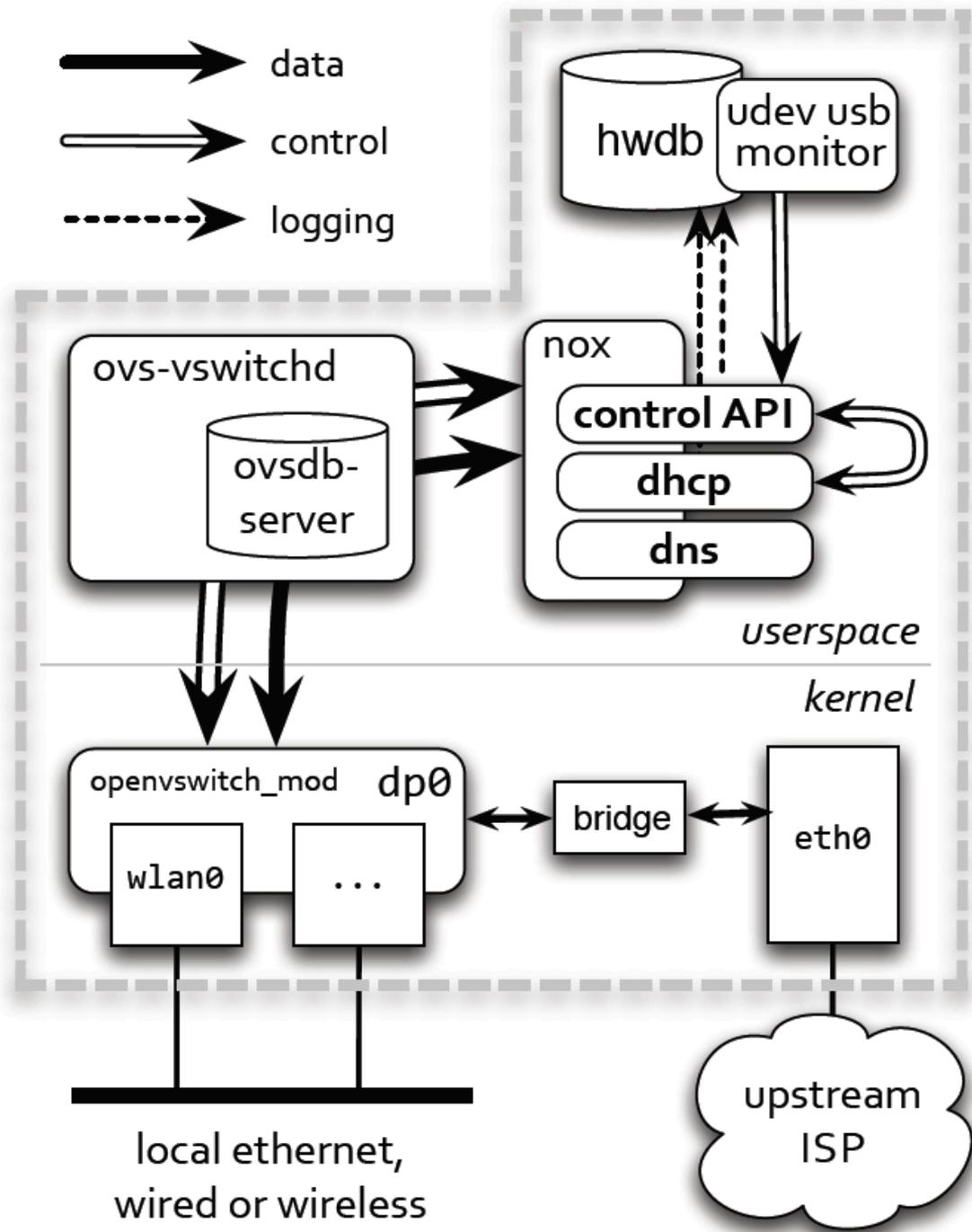
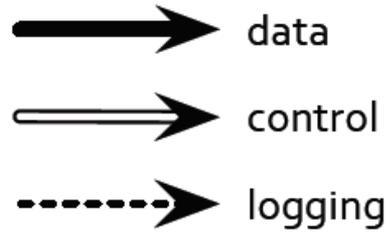
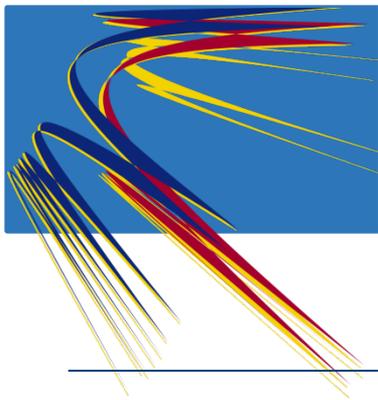
The Infrastructure Challenge (1)

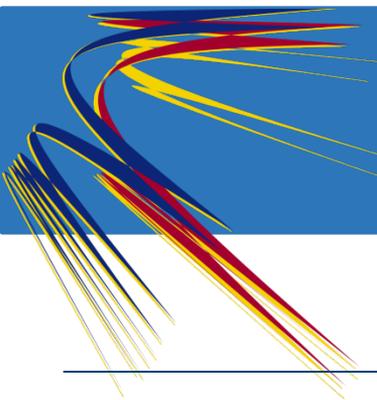
- Monitoring consumption
 - Mechanisms to capture usage information at an appropriate level of abstraction
 - Techniques to make measured traffic more readily available to the user
- Performance and activity
 - Mechanisms to allow real time flow monitoring and alert users of these issues as they occur



The Infrastructure Challenge (2)

- **Prioritization**
 - Mechanisms to prioritize and control traffic associated with different devices and activities in real time
 - Human situated judgment is essential and users need to be linked to these mechanisms
- **Policing the network**
 - Lightweight mechanisms to manage how people get on and off a network, and what exactly they may or may not do when on the network





Interaction in the Infrastructure

- **Putting people in the protocol** by embedding user interaction in existing infrastructure protocols
 - Amending DHCP to involve the user in granting leases
- **Bringing services closer to users** by allowing greater control and configuration
 - Running a local DNS service that can access greater contextual information
- **Exploiting the physical arrangement of the home** by manifesting the infrastructure in the home
 - Using physical plug in tokens (USB keys) to manage access to the infrastructure and encode permissions

People in the Protocol

Network Devices

127.0.0.1:8888/nox.html?gwt.codesvr=127.0.0.1:9997

NETGEAR Device

Not Allowed

HTC Device

⚠ This machine is requesting permission to use your network. Drag it to the right to allow it or to the left to deny it access.
Manufacturer: [HTC Corporation](#)
MAC Address: 00:23:76:0c:3d:93
• [Rename Device](#)

Tom's Laptop

Apple Device

Intel Device

Internet

Controlling Localised Service

8 - 14 August 2011

◀ Today ▶

Reminders ▾

all-day	8 Monday	9 Tuesday	10 Wednesday	11 Thursday	12 Friday	13 Saturday	14 Sunday
	facebook.com						
10:00							
11:00							
12:00							
13:00							
14:00							
15:00							
16:00							
17:00	http://www.bbc.co.uk/iplayer/						
18:00							
19:00	www.youtube.com						
20:00							

Contention Monitor



Tom's Mac Air



Kevin's Laptop



SqueezeboxController



Devices

Programs

macromedia-fcs



http-alt



imaps

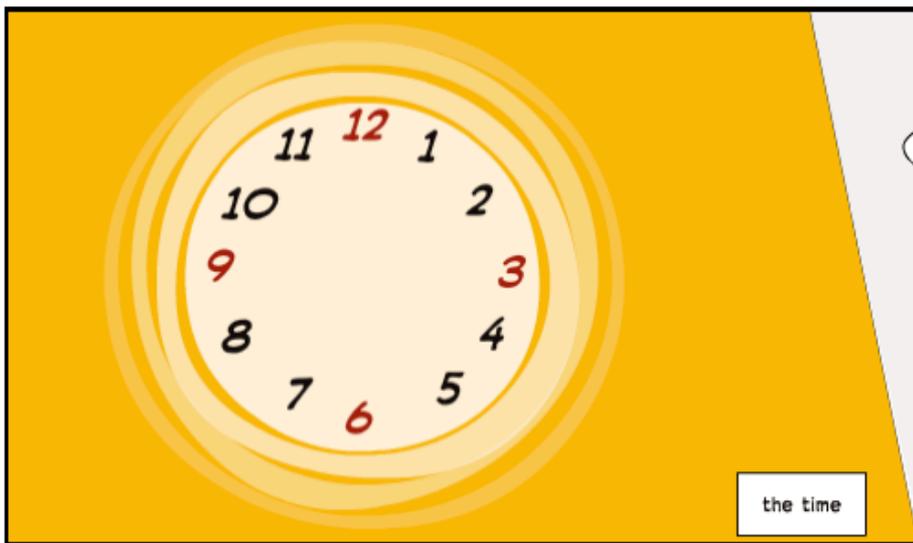
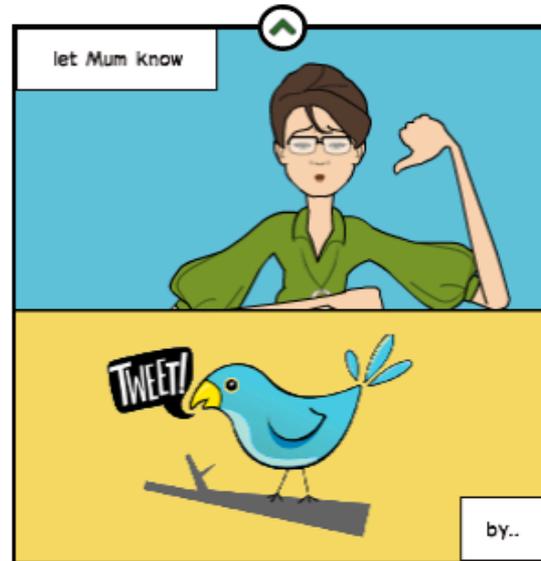
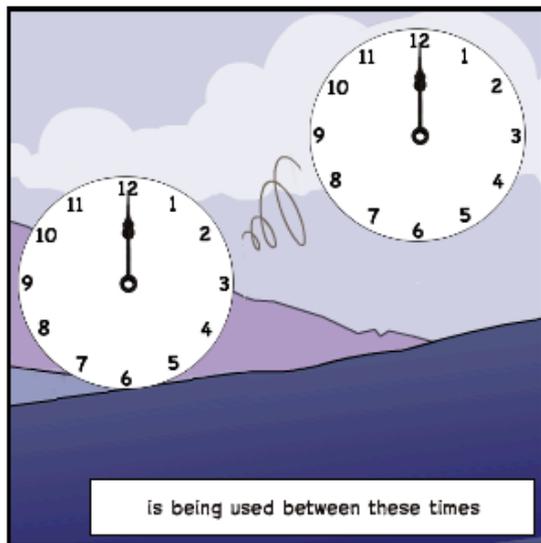


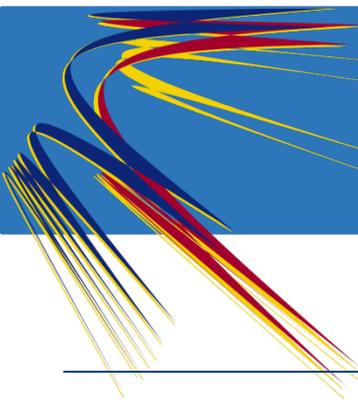
Devices

Programs

Physical Displays







Fundamental Challenges

- Home networks have become mundane
 - Another channel through which everyday life happens
 - Really no longer special
- But the (software) technology has not made this leap!
 - Still managed in terms of protocols and services
 - *Shopping, not the web, not HTTP*
 - The user doesn't draw a distinction between service (name resolution) and the network (IP forwarding)
- To do better we need the enabling technologies to allow these top-to-bottom connections to be made
 - Making the network *intelligible* (**not** intelligent)

Reflecting Broadly

- Designing to meet these challenges needs *multiple skillsets*
 - Ethnography, HCI, Systems, Networking, ...
- This requires *greater dialogue* between communities
 - Just throwing results over the fence *doesn't work*
 - Engineers must know about ethnography (a bit)
 - Ethnographers must know about technology (a bit)
- Else we will continue to make useless things
 - By imposing ridiculous demands, or
 - By implementing unusable/inappropriate technology

Questions?

- www.homenetwork.ac.uk
- (Other things I'm doing:
 - <http://perscon.net/>
 - <http://openmirage.org/>
 - <http://horizon.ac.uk/>)