Homework: User-centric Networking

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The University of Nottingham

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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

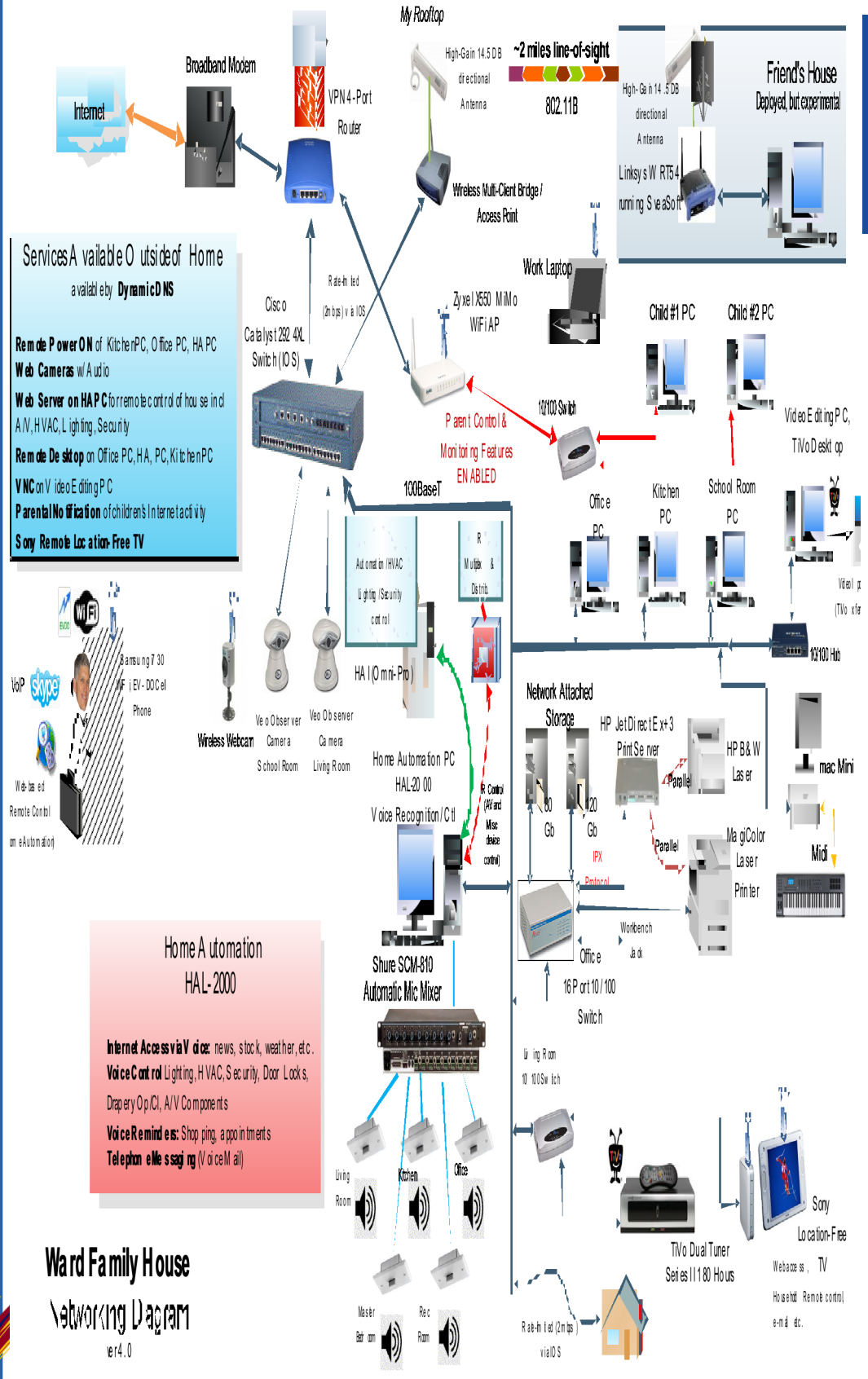
Why Homework?

300 million people worldwide have broadband connections to the Internet

51% of UK households now have a broadband connection

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

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



horizon 4
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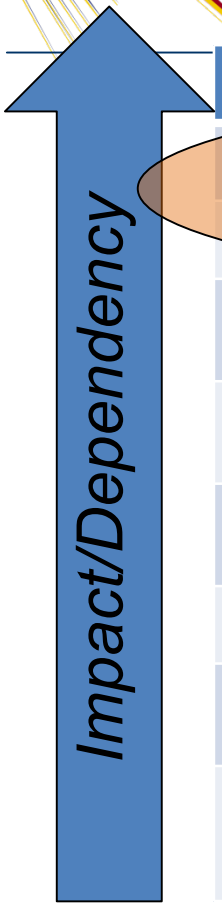
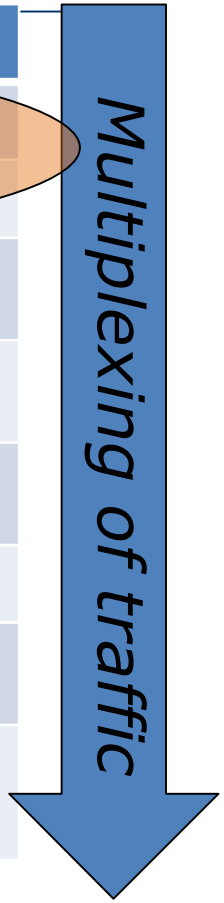
Lived reality is messy and complex

Usage spans layers



Layer	*Intent/purpose*	*Example*
User	Everyday living	Relax for an hour
Use	Particular task or activity	Watch a TV show
Application (software)	Provide service to user(s)/other apps.	YouTube
Application (protocol)	Standardised application-class communication	HTTP (for WWW), FTP, SSH, DNS, …
Transport	Generic data transport (e.g., reliable, large)	TCP
Network	Communicate globally	Internet Protocol (IP)
Link	Communicate over direct connections	Wireless Ethernet (802.11)
Physical	Get signal from A to B	802.11b PHY



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

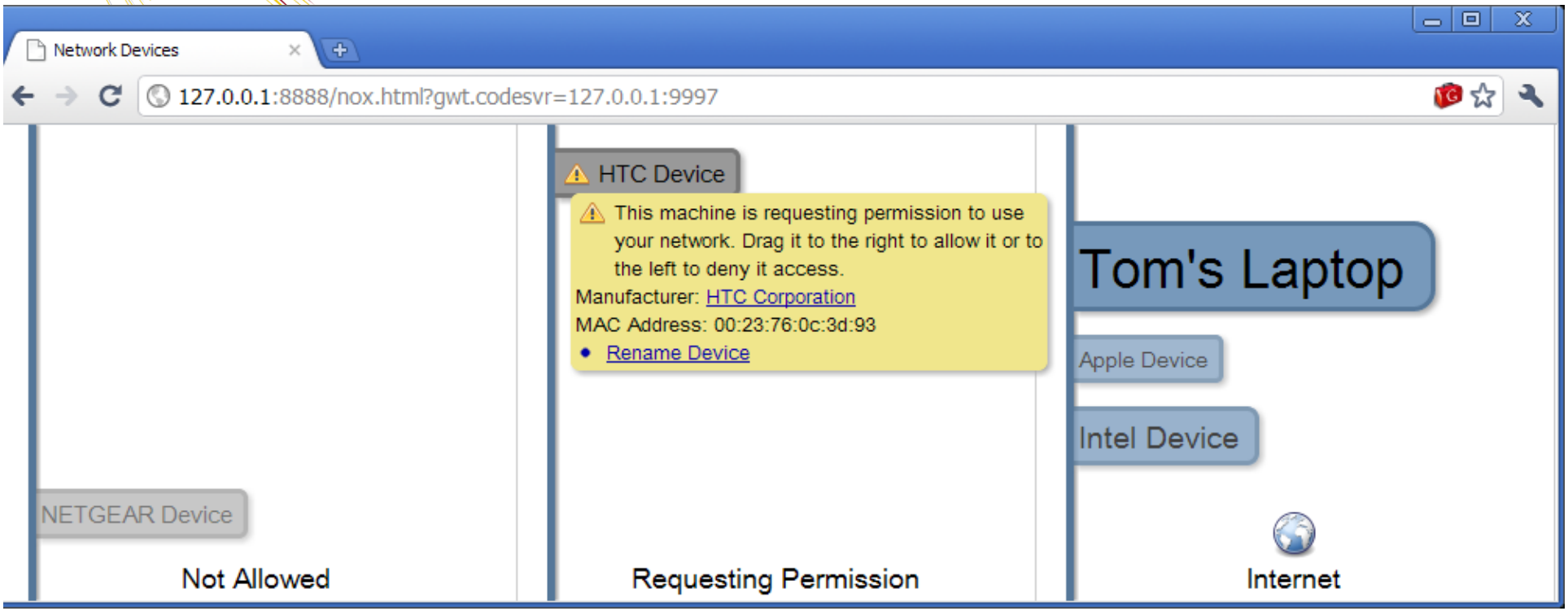
The Infrastructure Challenge (2)

- 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

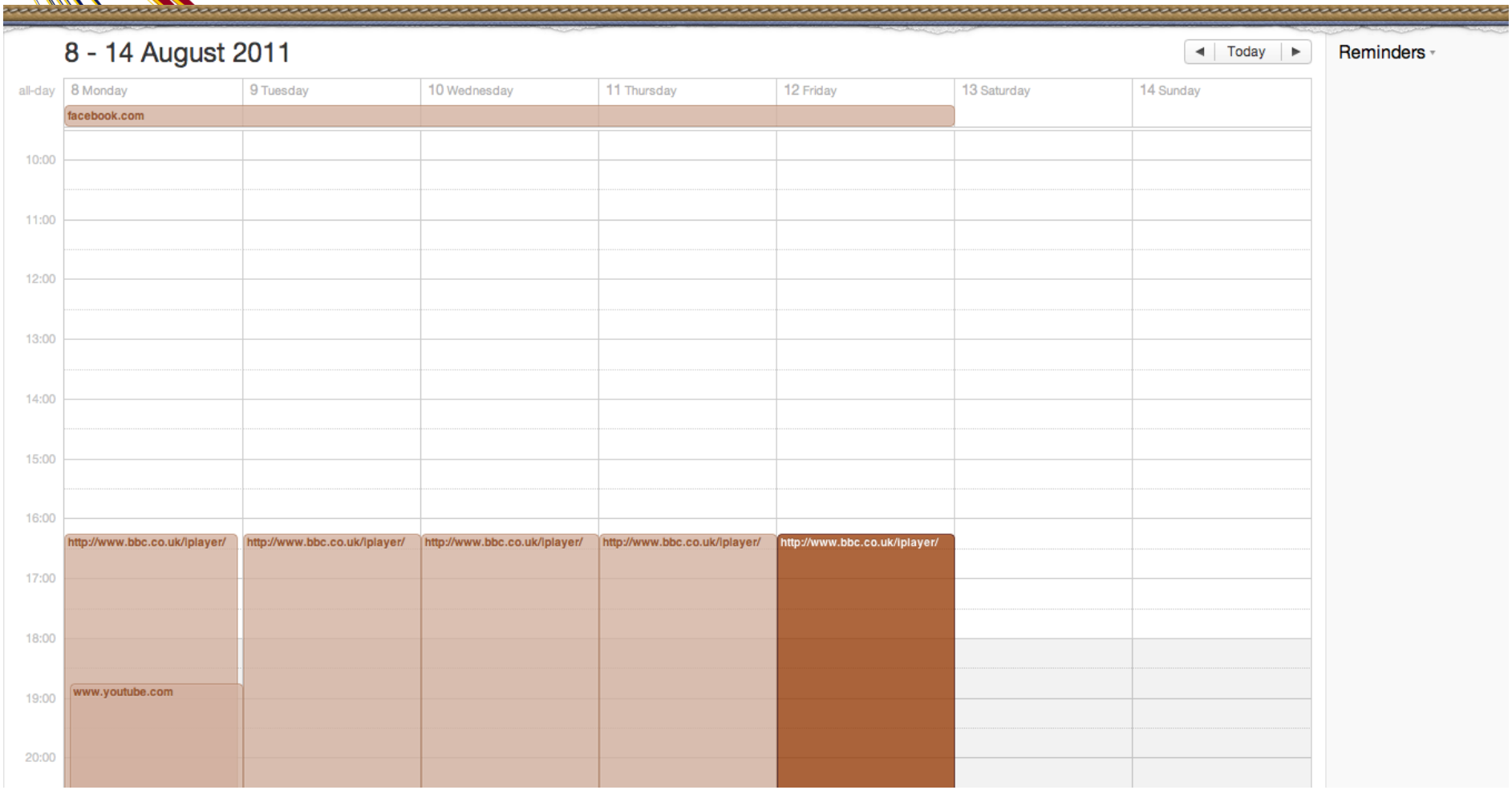
Interaction in the Infrastructure

- ***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

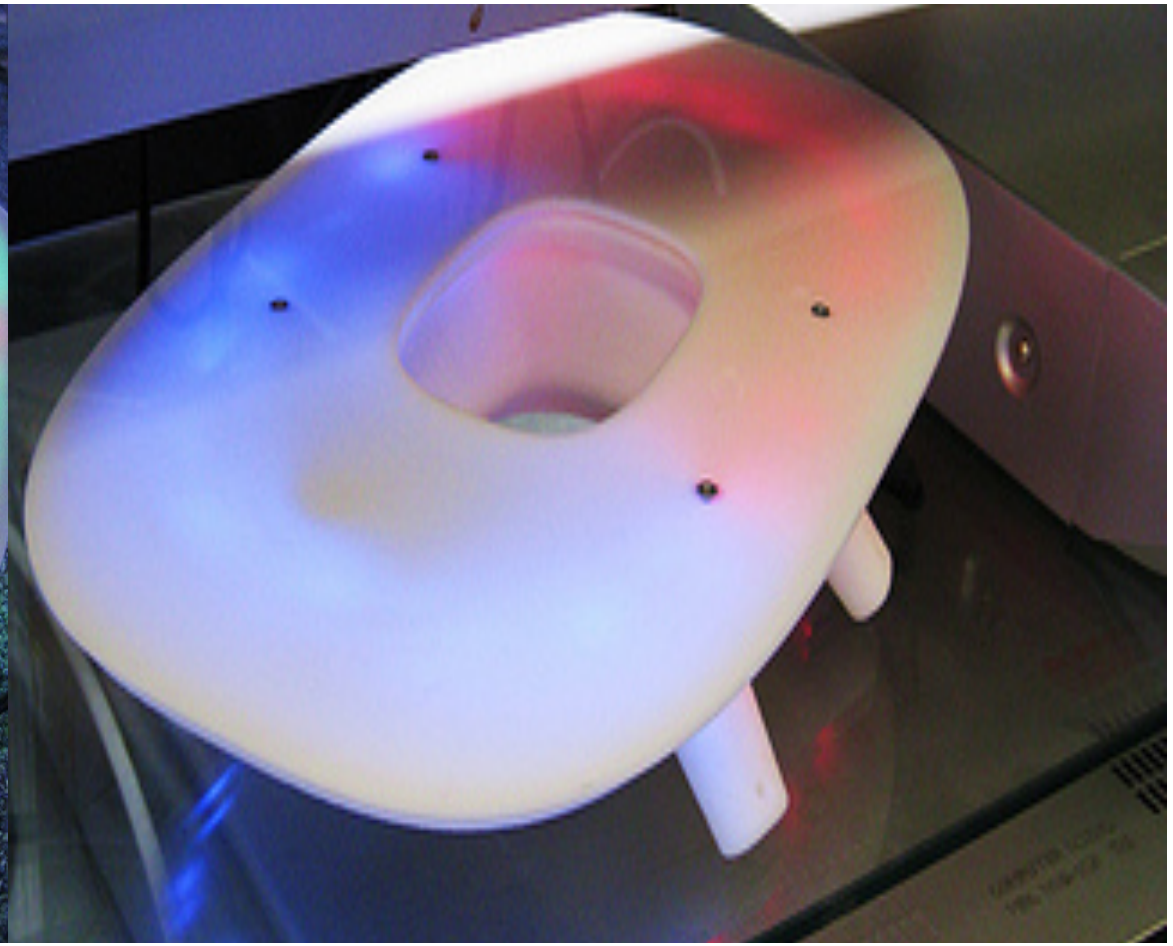


Controlling Localised Service



Contention Monitor

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?