

“Unraveling the Technological Knot in Homes”

2009 UW/MSR Summer Institute
David Wetherall & Ratul Mahajan
(with thanks to Dina Papagiannaki)



Welcome!

- * UW/MSR Summer Institutes:
 - * Pick a research topic ripe for exploration
 - * Typically cross discipline boundaries
 - * Assemble a group of experts
 - * Exchange views to further the topic
- * We have:
 - * A shared interest in computing in the home
 - * A mix of experts in networks, systems, HCI, ubicomp, security, and AI, from academia and industry
 - * Three days to produce something useful
- * (self introductions)

Our topic in a nutshell: Managing computing in the home

- * We're in the midst of an explosion of computing devices in the home (TV/home entertainment, computers/ mobiles, sensing systems, etc., etc.)
- * These devices are often connected, raising issues of installation and maintenance, etc.
- * It is a mess for users, an expense for companies
- * The challenge is to create usable, inexpensive strategies to manage computing in the home
- * This hope is that this will lead to a wave of innovation in new products and services

A simple past



consumers



SENECA
CAMERA



Radio
Man



A complex present ... and confusing future

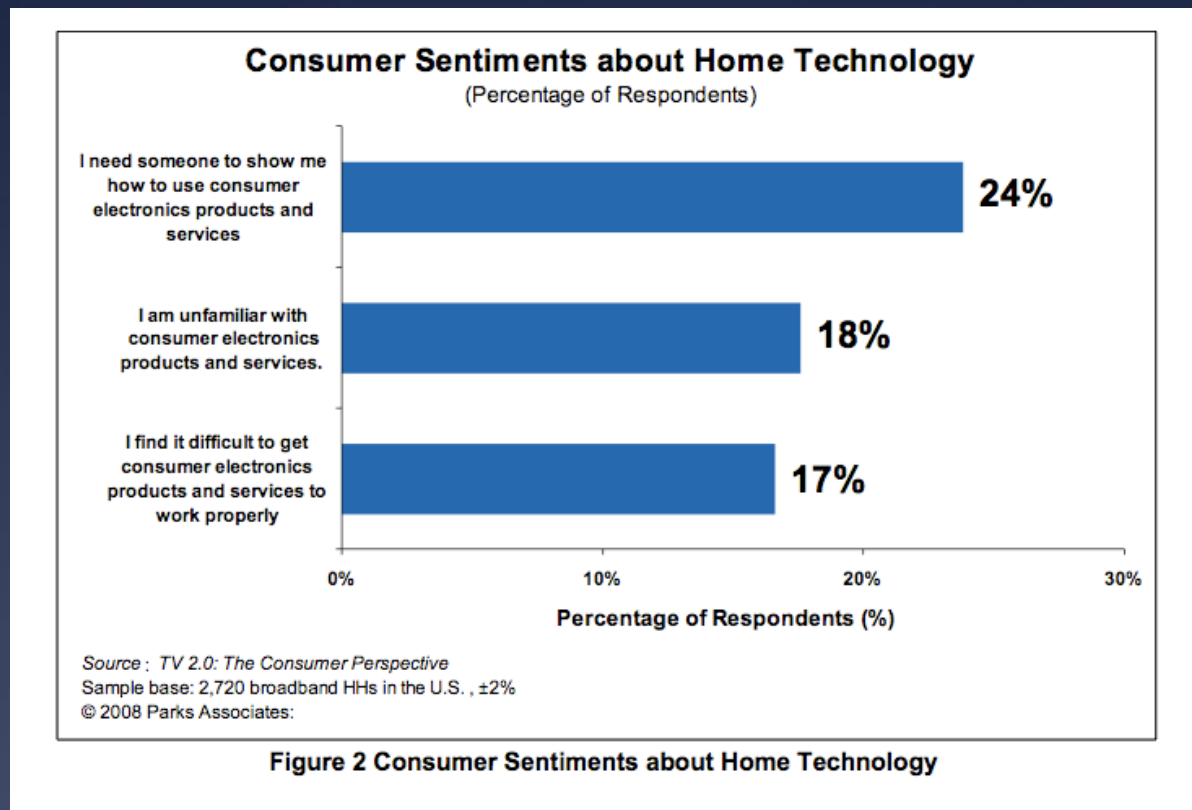


Complicating factors

- * Most users are non-technical
 - * No IT support
- * Devices are increasingly connected
 - * Via wireless, often dynamically and “24/7”
- * Many and varied devices
 - * With a growing amount of content to manage
- * Services can be in the home or in the cloud
 - * Difficult to know where the problem lies
- * Home computing is increasingly personal
 - * Healthcare, security, sensing, etc.

The trend is for these factors to get worse!

Consumers are often confused by home technology



“The average American is wasting 12 hours per month due to problems with their home computer.”

- Kelton Research, the "Cyber Stress" study, Jan 2007.

And they have modest needs now ...

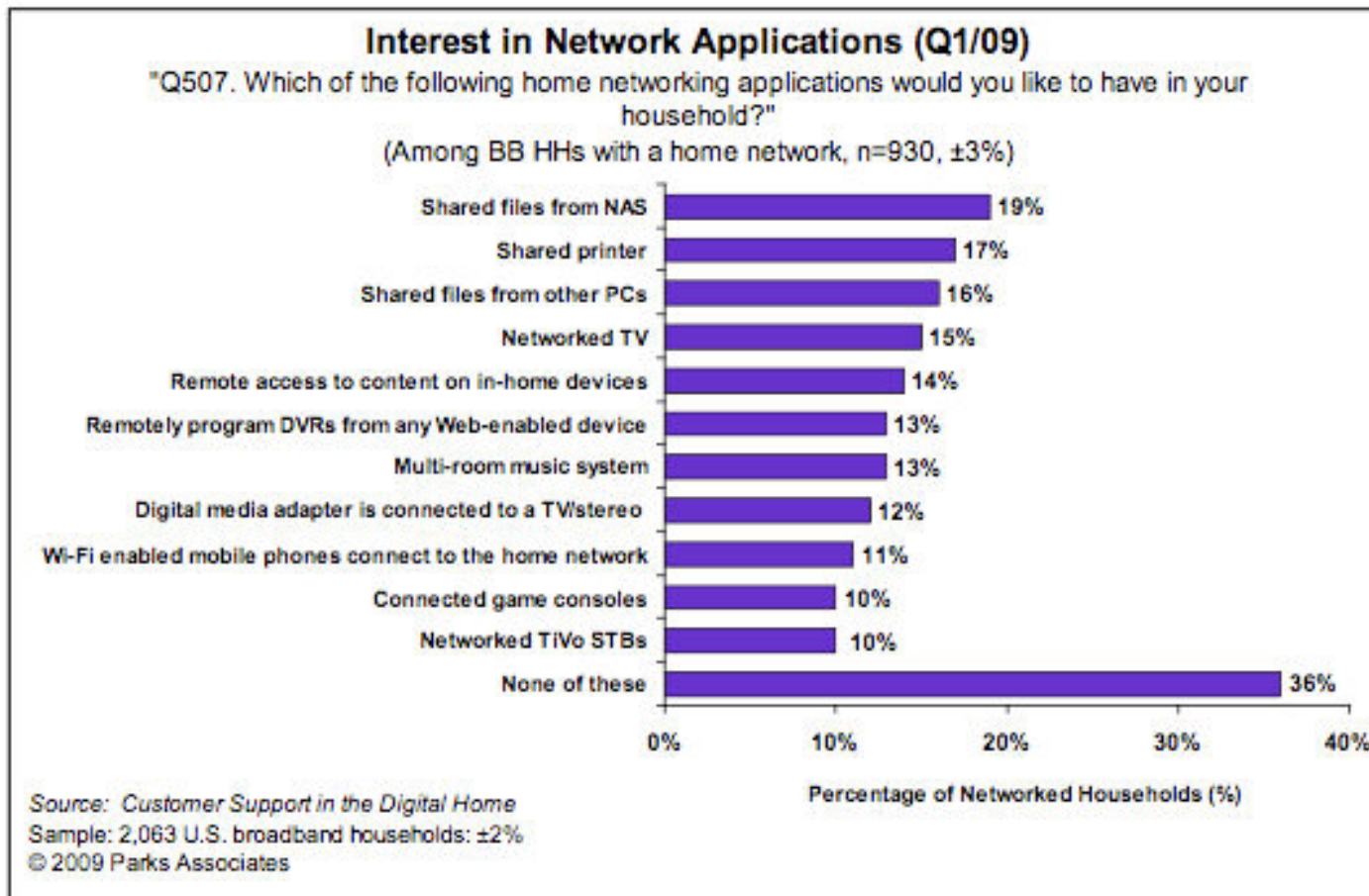


Figure 15 Interest in Networked Applications

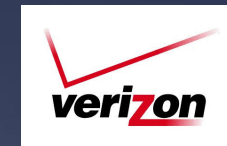
Providers need better ways to manage home technology

- * 20-50% broadband customer support calls today are unrelated to the broadband service!
- * Each call last 9-25 minutes at \$0.75-0.85/minute.
- * Total U.S. revenues for digital home support services are projected to grow from \$3.9 billion in 2009 to \$6.4 billion by year-end 2013.

From "Digital Home Tech Support: Analysis and Forecasts," Parks Associates, May 2009

How are we meeting this challenge in Industry?

- * Service offerings, remote diagnosis, standards, etc.
 - * AT&T and Verizon created home computing customer support centers
 - * Cisco purchased Linksys, Scientific Atlanta, Network Magic and Pure Digital, entering home network market but also CE space
 - * Geek Squad followed by a number of companies, like plumchoice
 - * Intel RPAT / Intel Connect service launched
 - * Alcatel-Lucent driving OMA-DM for management of cell phones

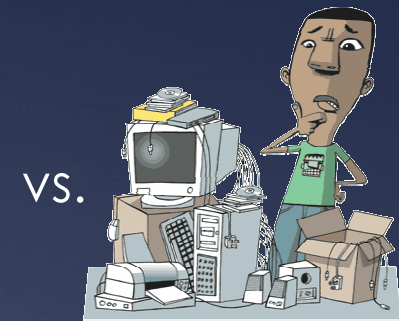


How are we meeting this challenge in Academia?

- * Look to the left, look to the right ...
- * This topic needs interdisciplinary research (over networks, HCI, security, ...).
 - * It lacks a well-defined community
 - * It is also difficult to know how to do effective research in this space.
- * Those are some of the reasons for this workshop.

An opportunity

- * Identify research directions and approaches that will let:
 - * Users introduce new kinds of computing into their homes that is easy to install, control and maintain as well as secure
 - * Vendors produce a rich variety of products and services for the home without large support costs



Some research questions

- * What does usable home technology require of the network architecture?
 - * Should users “connect devices”?
 - * What functions should reside in the cloud?
- * What is the balance between helping users and enabling experts?
 - * Do we need facilities for remote diagnosis?
 - * Do we need collaboration and AI?
- * How do we build home systems with deployment in mind?
 - * What do the different stakeholders care about?
 - * Is it all just a matter of the right standards?
- * What capabilities do home devices need to be well-managed?
 - * Do many problems go away with wireless networks?
 - * Do we need trusted hardware, identities, etc.?
- * How do we provide security in the home context?
 - * Is this different than for other mobile/PC computing?
 - * How does pervasive sensing change the situation?

What will make a difference?

- * We'd like you to think "outside the box"
- * If every device knew where it was ...
- * If we had remotely accessible instrumentation ...
- * If every device knew to where it belonged ...
- * If we had reliable gigabit wireless in the home ...
- * If every device had a trusted identity ...

Our goals for this Institute

- * To articulate the research agenda that will improve the management of computing technology in the home of the future
 - * Agree on a framing of the important problems
 - * Identify low-hanging fruit and dead ends
 - * Highlight needs of the research community
- * To create a groundswell of research in the area
 - * Through the above, and meeting fellow travelers

Agenda

* **Monday, July 27**

- * 8:00-9:00 am Breakfast (Pierside)
- * 9:00-9:30 am Welcome and introductions (Victoria)
- * 9:30-10:30 am *A Peek at the Problem* (Victoria)
- * 10:30-11:00 am Break
- * 11:00 am-12:30 pm *Usability and System Design* (Victoria)
- * 12:30-2:00 pm Lunch (Pierside)
- * 2:00-3:30 pm *Helping Users Help Themselves* (Victoria)
- * 3:30-4:00 pm Break
- * 4:00-5:00 pm *Leave it to the Experts* (Victoria)
- * 5:00-5:30 pm Breakout Planning (Breakout Leaders)
- * 5:30-6:00 pm Break
- * 6:00-8:00 pm Dinner (Seaview Terrace)

* **Tuesday, July 28**

- * 8:00-9:00 am Breakfast (Pierside)
- * 9:00-10:40 am *What is Different about the Home?* (Victoria)
- * 10:40-11:10 am Break
- * 11:10 am-12:30 pm *New Interfaces for Home Network Management* (Victoria)
- * 12:30-2:00 pm Lunch (Pierside)
- * 2:00-4:00 pm Breakout Groups I & II in parallel with kayaking (half participants in each)
- * 4:00-6:00 pm Breakout Groups III & IV in parallel with kayaking (half participants in each)
- * 6:00-8:00 pm Dinner (Pierside)
- * 8:00 pm continue break out sessions as needed (various locations)

* **Wednesday, July 29**

- * 8:00-9:00 am Breakfast (Pierside)
- * 9:00-10:30 am *"Adapting to Users and Other Lessons Learned"* (Victoria)
- * 10:30-11:00 am Break
- * 11:00-12:30 am Breakout Groups continue (various locations)
- * 12:30-2:00 pm Lunch (Pierside)
- * 2:00-3:30 pm *Eye to the Future* (Victoria)
- * 3:30-4:00 pm Break
- * 4:00-5:00 pm Debriefing from Breakout Groups (15 min each group) (Victoria)
- * 5:00-5:30 pm Wrap-up and Next Steps (Victoria)
- * 5:30-6:00 pm Break
- * 6:00-8:00 pm Farewell Dinner (Pierside)

Breakouts

- * Our breakout leaders are: Victor Bahl, Bruce Davie, Deborah Estrin, and Haym Hirsh. (Thanks!)
- * Monday, 5-5:30pm, topic discussion
- * Tuesday, 2-6pm four breakouts and kayaking
 - * Half of us kayak while the other half discuss
 - * Rooms also available after dinner if wanted
- * Wednesday, 11-12:30pm, breakouts continue
- * Wednesday, 4-5pm, report-outs (15 mins/group)

Output of the Institute

- * We intend to synthesize a brief workshop report based on the breakouts and discussion notes and disseminate it
 - * E.g., a short article in CCR
 - * We'll ask for interested parties afterwards
- * Other concrete suggestions and plans welcome!

Questions?

* On with the show!