IT@Home: Often Best Left to Professionals

Position Paper for CHI 2006 Workshop:
IT@Home: Unraveling Complexities of Networked Devices in the Home

A.J. Bernheim Brush
Microsoft Research
ajbrush@microsoft.com

ABSTRACT
In this position paper I argue that we should not expect everyone to do their own technical support. Rather devices should be designed so that some IT@Home tasks are as easy as possible and others require a professional (or very motivated home user). I divide IT@Home into three phases, *installing* a home network, *adding* new devices, and *maintaining* the home device ecosystem, and discuss the role of home users and professionals in each phase. I conclude with some research questions inspired by this perspective. Throughout the paper I draw on historical data from the introduction of other technologies into United States homes as a point of comparison to the current state of IT@Home.

INTRODUCTION
Computing technology in the home is moving away from a single computer to a more complex ecosystem with a variety of devices including multiple computers, wireless networks, and gaming consoles that connect to the internet. This leaves the home user with the *IT@Home challenge*: the need to install and maintain their devices and home networks. For example, setting up a (hopefully secure) wireless network, configuring a printer to be accessible from multiple computers, or making sure precious digital photos are adequately backed up.

In this position paper I argue that IT@Home should not primarily be considered a "do it yourself" (DIY) task, rather that many aspects of IT@Home are best left to professionals like the Geek Squad (www.geeksquad.com). Therefore, similar to how most people would call a plumber when their sink backs up, for IT@Home tasks like installing a wireless network it should be possible and economical to call a professional IT expert. Of course, I do not mean to imply that every home computing tasks should require a professional (e.g. plugging in a light does not require an electrician), but instead that it would be valuable to break the IT@Home challenge into tasks that are easy for home users and others that are best left to professionals (or really motivated DIYers).

In the rest of the paper, I first define and describe three phases of IT@Home: install, add, and maintain, and discuss which phases I believe should be tractable for home users to manage themselves. Next, I discuss some interesting research questions and directions that follow from breaking the IT@Home challenge into tasks for the home users and those for experts. Throughout the paper I compare the challenges of IT@Home to the past introduction of several new technologies into homes in the United States, including telephones and electricity.

THREE PHASES OF IT@HOME: INSTALL, ADD, AND MAINTAIN
As I describe the three phases, I will assume the household's goal is to have several computers in the home that can all share media and print to one printer, as well as a variety of other networked devices such as a media center computer for recording favorite TV shows, an Xbox 360 configured for online gaming, and a few digital picture frames scattered around the house.

Install: Best left to Professionals
While clearly all computers, software and devices require some installation, since the focus of this workshop is on complexities related to networked devices in the home, in the install phrase I am referring to installing a home network and connecting computers and other devices.

While wireless network routers make it possible to install a home network without running cables through your house the comments on the Amazon website (www.amazon.com) for Linksys™ and Netgear™ routers hint at the challenges many people have found in configuring and installing their wireless networks (much less ensuring they are secure). Many non-obvious problems lurk in the install. For example, my mother (a computer savvy person who worked in the industry for years), has struggled with convincing her wireless network and cordless phones to work simultaneously. While my wireless network works smoothly I have not been motivated enough to figure out how to get the printer on the network (once the obvious things did not work).

For all these reasons, I believe that the installation of a home network (wireless or wired) should generally be left to professionals. We should not expect home users to setup the network, ensure it is secure, configure the computers, and cope with any unanticipated problems. This matches historical precedent. For example, early telephones were installed for free and even after installation charges were

introduced during World War I, skilled technicians still did the installation [2, pg. 51]. Today, internet access using a cable modem, most large home appliances, and many other things for the home are installed by professionals. So just as most people would not install electrical wiring, new plumbing or a new washing machine, a home network should be treated with similar respect.

Add: Home user

However, once a home network is installed, configured and secure, adding new devices should be as easy as plugging in a new lamp. It should just work! By this I mean that home users should easily be able to buy a new device, bring it home and connect it to their home network. This includes both new devices owned by the family that will stay in the house and devices of trusted visitors that the family would like to enable for limited time periods. As part of adding a device to the network, the home user should also be able to easily control the level of access the device receives. For example, I may wish to give my mom's laptop access to the internet and our printer while she is visiting, but not my family's personal files.

This scenario is currently not reality, at least not for secure networks. For example, while my wireless network was easy to install, when I wanted to give a new laptop access to our network a forgotten WEP key led to lots of excitement. Luckily after much searching I found a backup disk we had made years ago and did not have to completely reset the router. However, it was frustrating that I had two computers that were already on the network and was physically sitting in the room with the router, but had no easy way to get access to the password. Truly it felt like a case where my toaster and fridge each had their own lock rather than relying on door locks to keep out intruders. It is even more interesting to consider how devices without keyboards (such as a networked alarm clock or picture frame) are easily added to a secure network.

Currently, a considerable challenge to easily adding devices arises from the fact that a wide variety of companies produce items for the home. The mere existence of the Digital Living Network alliance (DLNA) (www.dlna.org), which brings together many technology companies to work toward making the vision of interoperable devices in the home a reality [1], is proof that users face considerable challenges making technology for the home work together. These issues will need to be ironed out if we expect people to be able to easily buy and add devices to their home network.

Several historical and ongoing examples show that the DLNA has an important but difficult mission. For example, VHS and Beta video tapes battled it out in the market and currently a battle between HD-DVD vs. Blu-ray DVD formats is starting. Going further back, when electricity was introduced it was not initially clear whether alternating or direct current would be successful [4] although luckily this issue was resolved once it became clear that alternating current was the only economical way to deliver electricity to consumers. An interesting counter-example to competing technologies is the fact that most early telephones were owned by a single company (the network and the hardware in the home) [2].

Maintain: Professional and Home User

All complex systems require maintenance and coping with breakdowns. People take their cars for oil changes, get home furnaces serviced, and call plumbers when drains are badly clogged. However, many people clean their own gutters, seal their own outdoor decks, repaint their homes, and perform other maintenance tasks. Maintenance of home networks and devices is an area where tasks should divide between home users (if they want) and professionals.

While ideally computer networks should require very little maintenance, in reality there is always a security update to install, data to backup, viruses to scan for and other mundane tasks. These tasks should be easy enough for the home user to do, similar to adding ink the home printer. While Microsoft's automatic updating mechanism is a step toward this, and companies that will back up your data are only a web search away, there is still room for improvement here (both by building more secure software and making it easier for home users to verify that their devices are secure and up-to-date).

More interesting are the plethora of possible hardware and software problems that are confusing and hard to recover from (e.g. random hardware failure). The approach taken by large office copy machines (at least in the US) where the display tries to walk you through a problem (e.g. clearing a paper jam) before resorting to telling you to call for technical support seems like a reasonable model for coping with home support issues. For example, if a problem crops up with the wireless network, it should be easy to try a few fixes (e.g. rebooting the router), and also clear when the hardware has a serious failure (perhaps just with a red light on the front or small display). Designing devices with this approach in mind could lead in interesting directions.

DISCUSSION

This line of argument raises a number of interesting questions that deserve further study.

Why do families have a home network?

If we believe that some aspects of IT@Home should be easy for home users and others should require a professional, it is critical for us to have an excellent understanding of what motivates people to install home networks, what types of devices they add, and their approach to maintaining the devices and coping with failures.

While this certainly requires fieldwork in homes (as is no doubt happening), looking beyond current use to speculate on future possibilities is also necessary. A recent study from the Pew Internet Center [3] argues that broadband adoption

in the United States, while still growing, may be slowing. Overall, only 53% of Internet users have high-speed connections at home suggesting that many people may not have compelling reasons to need high-speed internet access (much less home networks.)[1]

Compared to the adoption of other technologies, the slowing adoption of high speed access is perhaps not surprising as it can take some time to figure out compelling reasons people need a certain technology. For example, in the early days of telephones, promoters experimented with broadcasting shows and encouraged the use of the phone for "home management." Considerable money and resources were spent convincing people that phones were a necessary part of life, both before and after using the phone for socializing was identified as one of the most compelling reason for people to buy them. [2]

We may be at a similar point in the adoption of the digital lifestyle, where the industry has not yet hit on what makes home networks so compelling that everyone has to have one. Or at the very least not yet made home networks easy enough to achieve to make them worthwhile for most people to contemplate.

What tasks should be easy?

In my discussion of the three phrases, I already advocated that adding devices should be easy and installing left to a professional. The maintenance phase however requires more reflection, informed by understanding home users and their goals, on which tasks should be easy and which should be left to a professional.

How to design for uninterested users?

My car helpfully turns on a warning light if my engine needs servicing. Designers of car interfaces rightfully assumed that I am personally uninterested in the details of what might have occurred. Note, (and this is important), this doesn't make me a "novice car user" or "stupid," this just means I'm uninterested in car maintenance.

While some computers and digital devices do provide higher level information, I think on the whole computers and other devices assume that the user is interested in knowing far too much detail. If we expect a large number of people to incorporate home networks and digital lifestyle devices into their home we have to assume their main interests are along the lines of "How do I make this device do what I want", and "Can I fix the problem myself or do I need help?" rather than "Did I choose the right media format for transferring information?", or "What network protocol is being used?" The trick is providing just the right amount of information.

[1] While broadband access is not the same as a home network, it seems likely to be a reasonable proxy for people interested in a digital lifestyle.

Can we take advantage of "Home" in IT@Home?

When thinking about how to make some aspects of IT@Home tractable for home users, specifically the adding of new devices to a home network, it may be helpful to take advantage of physical proximity of items in a home. Perhaps I can "introduce" new devices to the wireless router by bumping them together or using a physical token, rather than having to type in long and cryptic passwords. Or easily move files from one device to another by setting them on top of each other (e.g. from my mobile phone to the home server).

CONCLUSION

The main point of this position paper is to argue that normal home users should not be expected to handle all IT@Home support themselves. Much as professional plumbers help us when problems with plumbing arise and we call the phone company when the phone goes dead, many aspects of IT@Home, in particular installation and maintenance, are best left to professionals.

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REFERENCES

1. Overview and Vision White Paper, Digital Living Network Alliance, June 2004 http://www.dlna.org/about/DLNA_Overview.pdf, Accessed Jan. 2005.
2. Fischer, C. *America Calling A Social History of the Telephone to 1940*. University of California Press, Berkeley, CA, USA, 1992.
3. Horrigan, J. "Broadband Adoption at home in the United States: Growing but Slowing", presented to Telecommunications Policy Research Conference, Nov. 24, 2005, Pew Internet & American Life Project, http://www.pewinternet.org/pdfs/PIP_Broadband.TPRC_Sept05.pdf, Accessed Jan. 2005.
4. "Socket it to me!: How Electricity Came To Be", IEEE Virtual Museum, http://www.ieee-virtual-museum.org/exhibit/exhibit.php?id=159249&lid=1, Accessed Jan. 2005.