INVENTING TECHNOLOGY FOR HOMES AND FAMILIES

Speaker: A.J. Bernheim Brush

Host: Lori Pollock

CRA-W

Computing Research Association

Women

Speaker & Moderator

A.J. Bernheim Brush

Dr. A.J. Bernheim Brush is a Senior Researcher at Microsoft Research. Dr. Brush's research area is Human-Computer Interaction with a focus on Ubiquitous Computing and Computer Supported Collaboration (CSCW). Dr. Brush is most well known for her research on technologies for families and her expertise conducting field studies of technology. Her current focus is home automation as co-leader of the Lab of Things project. She is a Senior Member of the ACM and was honored to receive a Borg Early Career Award in 2010. Her research has received 2 best paper awards and several best paper nominations.

Lori Pollock

Dr. Lori Pollock is a Professor in Computer and Information Sciences at University of Delaware. She earned her Ph.D. and M.S. in CS at the University of Pittsburgh. Her current research focuses on program analysis for building better software maintenance tools, software testing, energy-efficient software and computer science education. Dr. Pollock is an ACM Distinguished Scientist and was awarded the University of Delaware's Excellence in Teaching Award and the E.A. Trabant Award for Women's Equity. She leads the Partner4CS, a projects dedicated to integrating computer science in middle and high schools in Delaware through teacher professional development for the CS10K national efforts.

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Inventing Technology for Homes & Families

A.J. Brush, Senior Researcher
Microsoft Research

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Talk Roadmap

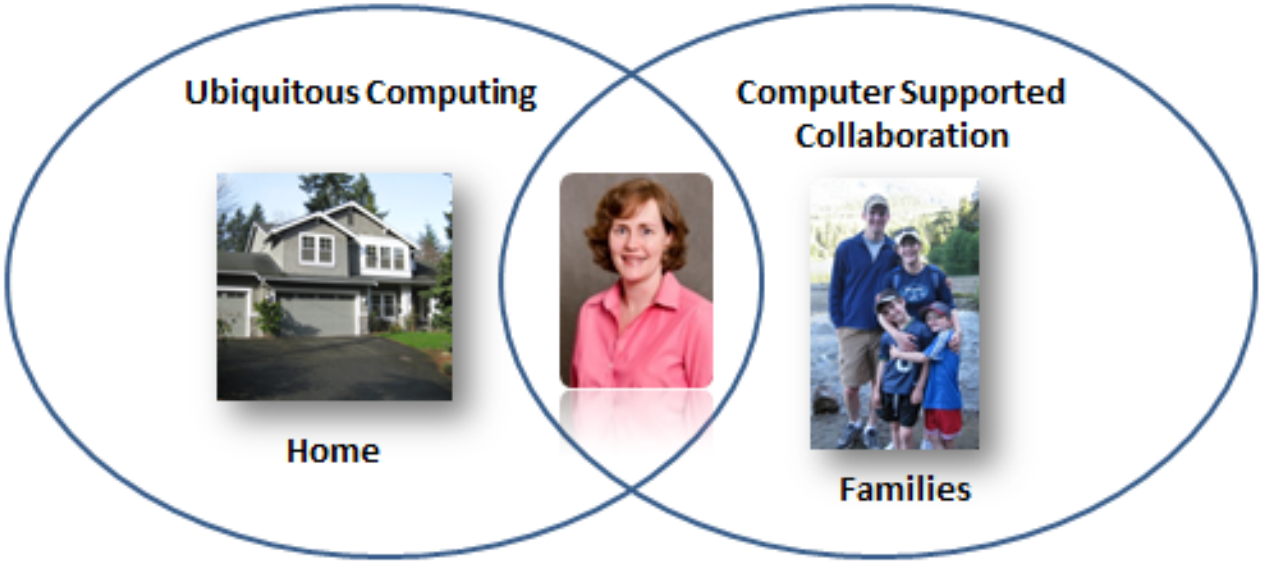
- My Research
- My Job
- My path to Microsoft Research
- Questions

My Research

Ph.D. in computer science from UW

Microsoft Research

Human-Computer Interaction (HCI)



I study and build technologies for homes and families.

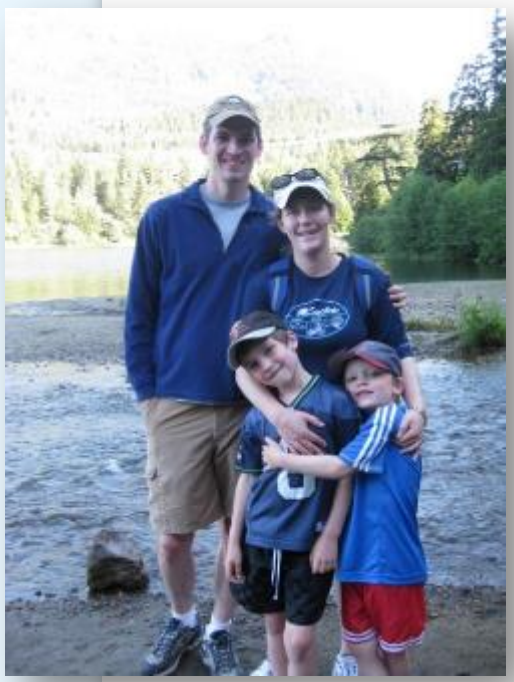
User-Centered Design

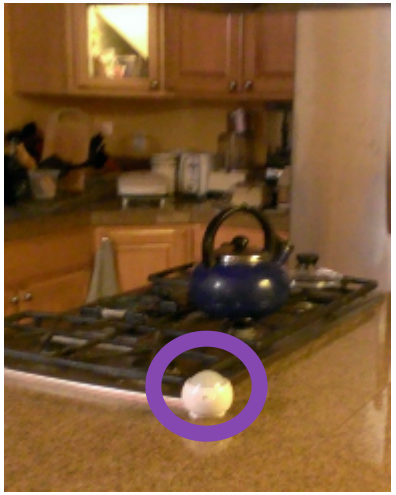
Process in which the needs, wants, and limitations of end users of a product are given extensive attention at each stage of the design process. (Wikipedia)

Understand Current Behavior and User Needs	Build Technology/ Prototype	Does it work? Use of Technology

Homes & families

Built-in prototyping lab



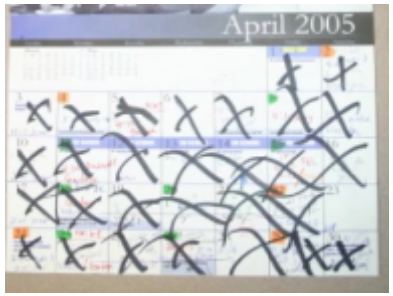


Family Calendaring: Simple Questions

- Are we free for dinner next Saturday?
- Can you pick up the kids when I have a late meeting?
- Are there any conflicts between soccer and music classes?
- When do I need a babysitter?
- Have we overbooked the van?

User-Centered Design

Understand
Current Behavior and
User Needs



Does it work?
Use of Technology

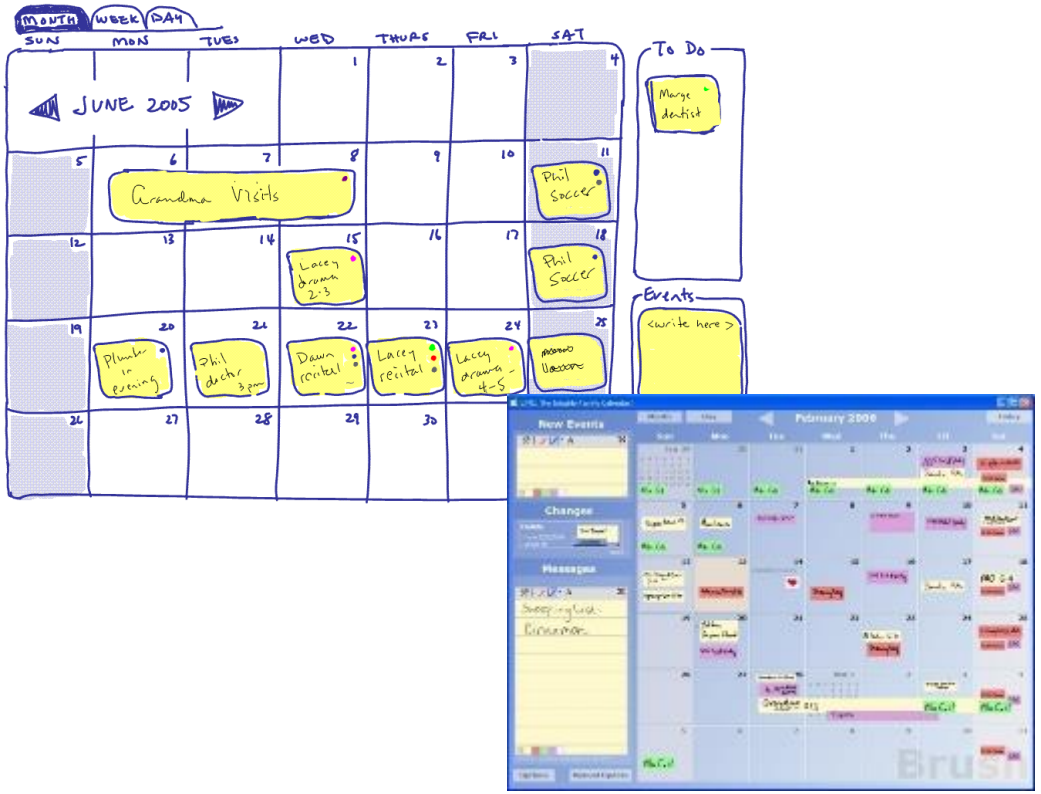
Does it work?
Use of Technology

Build Prototypes

Understand Current Behavior and User Needs

Build Technology/ Prototype

Does it work? Use of Technology



Main Findings

Simplicity and Creativity

- People have their own routine
- People need ‘simple’ in the home

Mobility

- Rarely are people at the calendar

Coordination

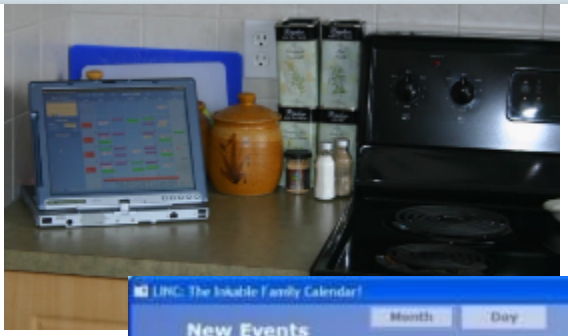
- Done through conversation not calendar
- Calendar provides awareness

Build Digital Prototype

Understand
Current Behavior and
User Needs

**Build Technology/
Prototype**

Does it work?
Use of Technology



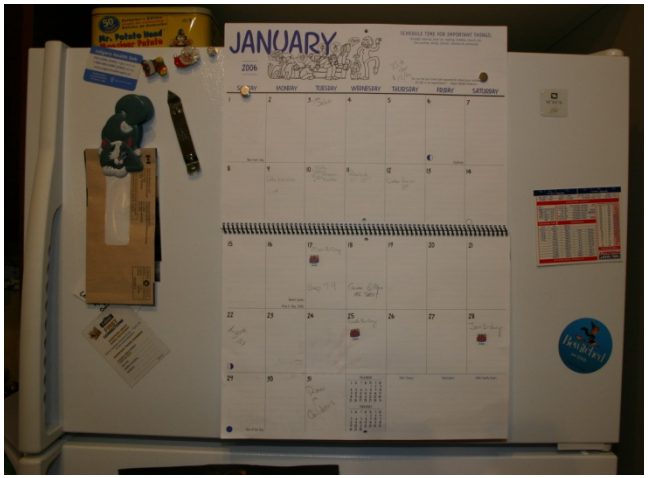
Does it work?

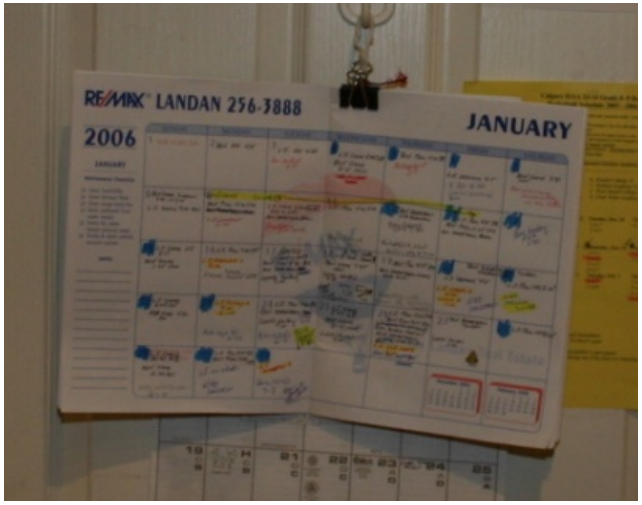
Understand
Current Behavior and
User Needs

Build Technology/
Prototype

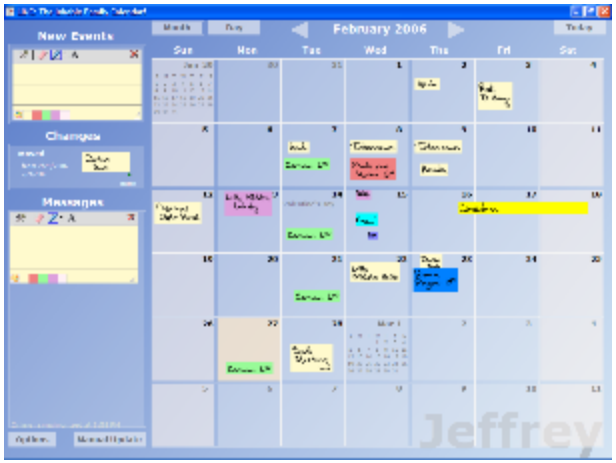
Does it work?
Use of Technology

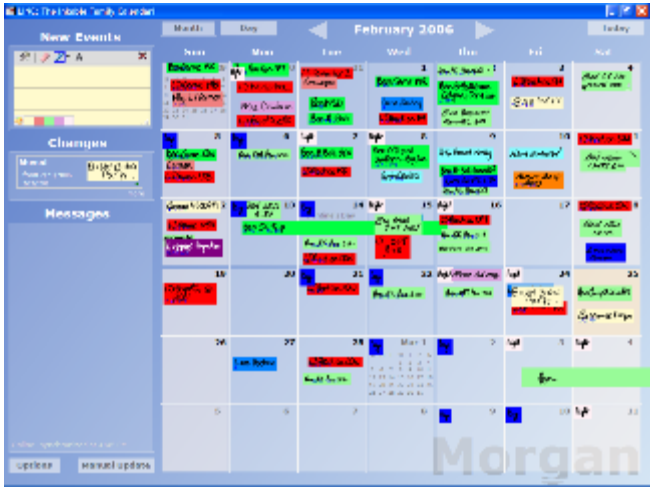
Field Study – Four Families

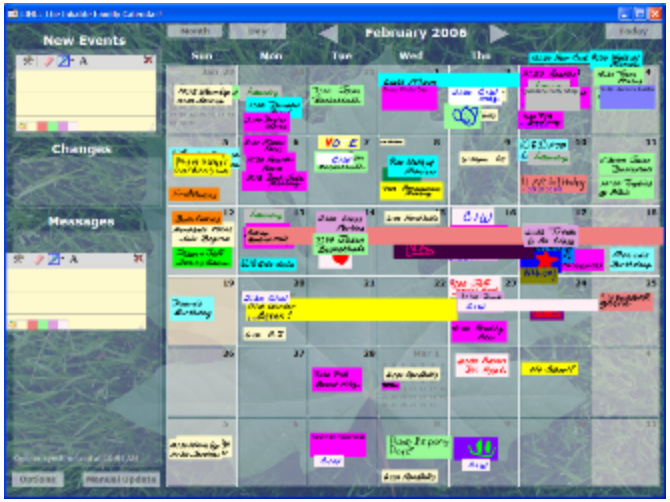


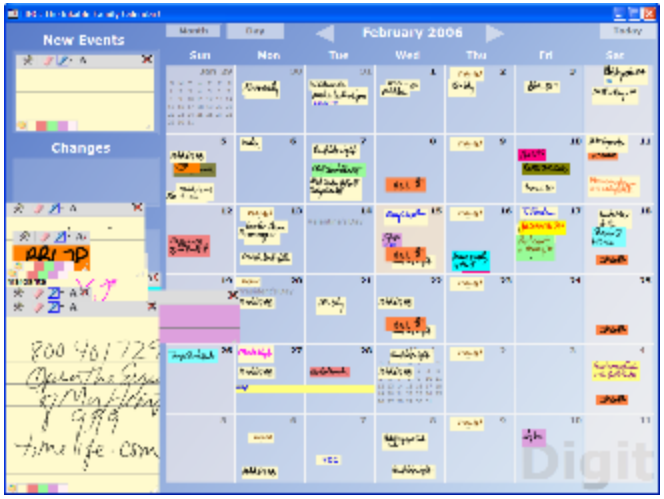


Four weeks later



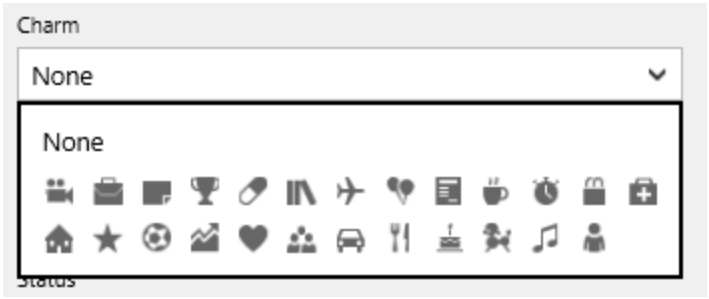




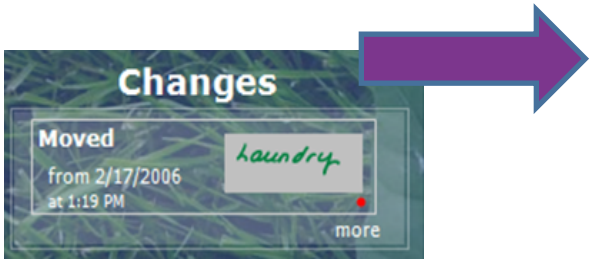


Family Calendar Learnings & Impact

Personalization



Outlook.com calendar charms



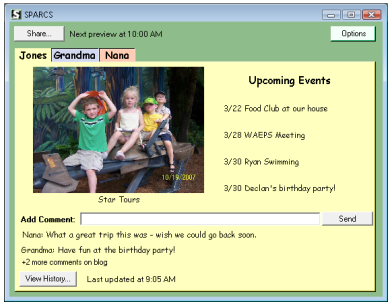
Family room on Windows Phone

From Applications to Infrastructure

Family Coordination & Connectedness

2004 - 2010

LINC



SPARCS

Video Playdate

Use and Sharing of Technology

2007 - 2011

Yours, Mine, Ours

Family Accounts

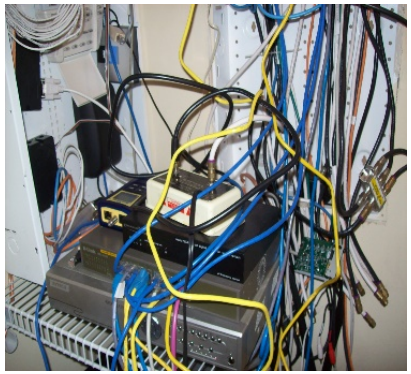
Speech@Home

Phone Sharing

Home Automation

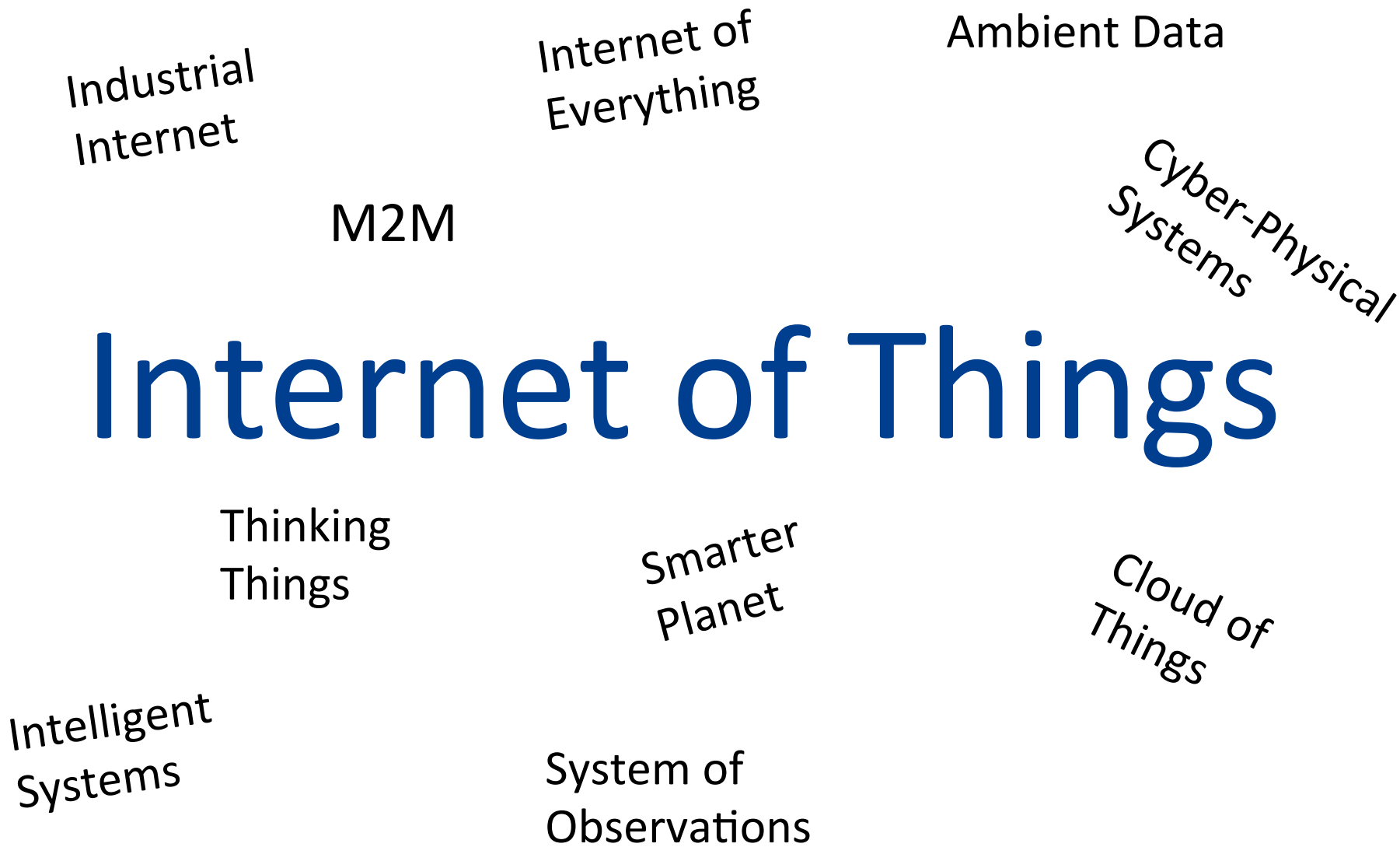
2009-Present

PreHeat: Controlling Home Heating with Occupancy Prediction



Home Automation in the Wild

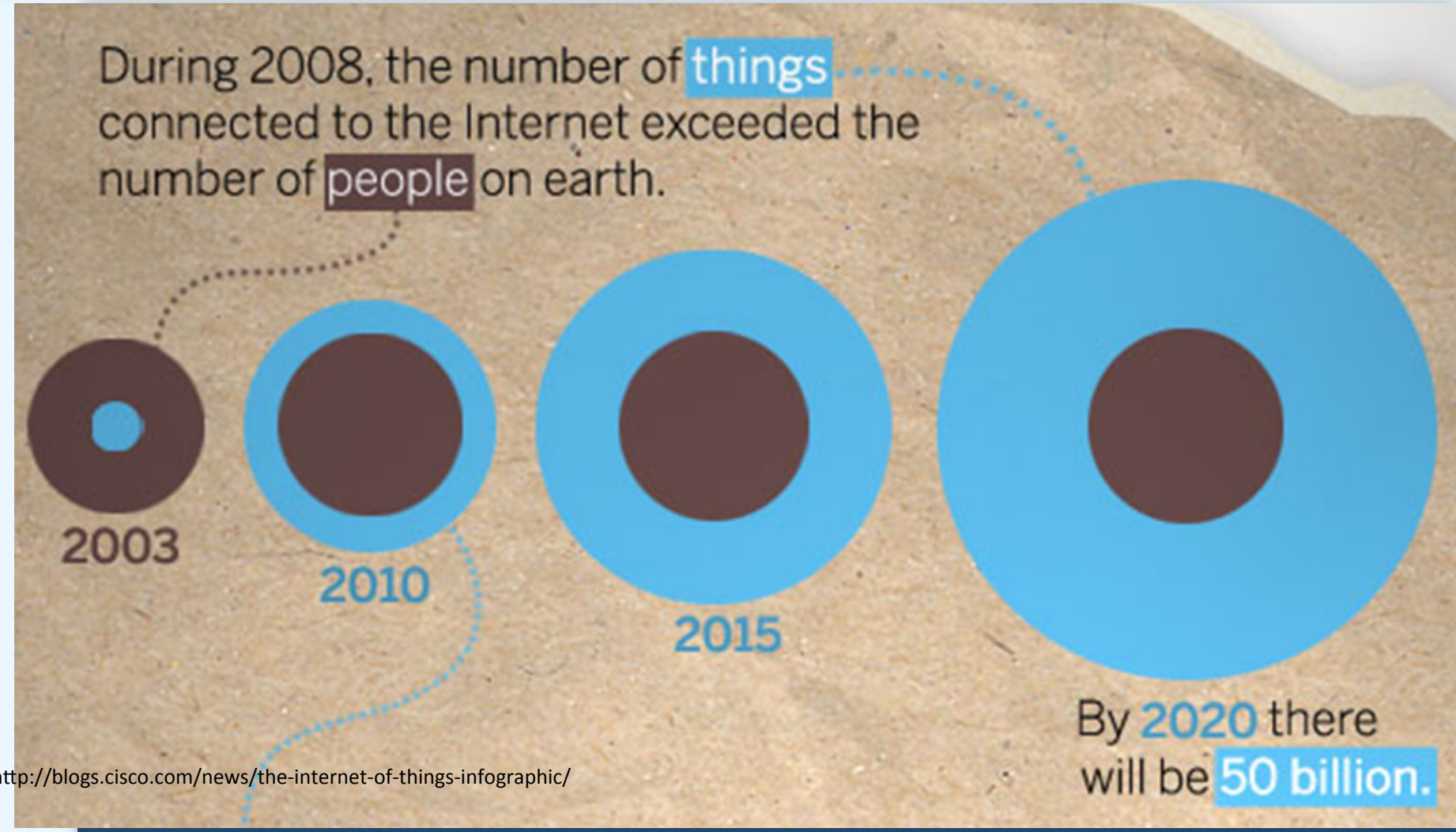
LoT
LAB of THINGS


Industrial Internet
Internet of Everything
Ambient Data
M2M
Cyber-Physical Systems
Internet of Things
Thinking Things
Smarter Planet
Cloud of Things
Intelligent Systems
System of Observations

Internet of Things

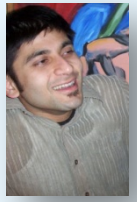
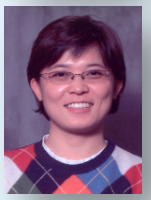
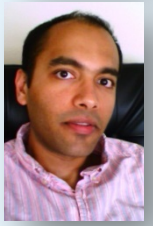
Networks of low-cost sensors and actuators for data collection, monitoring, decision making and process optimization. - McKinsey Global Institute

Connected things everywhere



http://blogs.cisco.com/news/the-internet-of-things-infographic/

Home Automation in the Wild

Understand Current Behavior and User Needs

Build Technology/ Prototype

Does it work? Use of Technology

Motion sensor

Door sensor

Camera

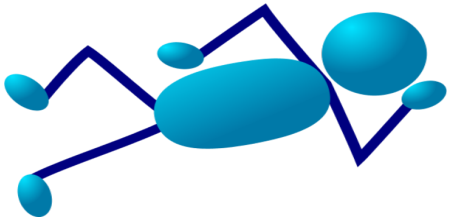
Programmed light switches

Wall Panels

Phone Access

Why automation?

Convenience



"It allows me to be lazy"

Peace of mind

"I can track things when I'm not there and know that…it's…secure"

Control

"I like just being in control"

Home automation pain points

Setup

Extensibility

Cost of ownership

Manageability

Existing abstractions for home tech

Network of devices

Setup and management is still hard
- Users must manage each device/task
- Developers must deal directly w/ h/w

Appliance

Extensibility is still hard
- Closed set of tasks
- Closed set of devices

Remote monitoring

Climate control

Home Automation

Understand Current Behavior and User Needs

Build Technology/ Prototype

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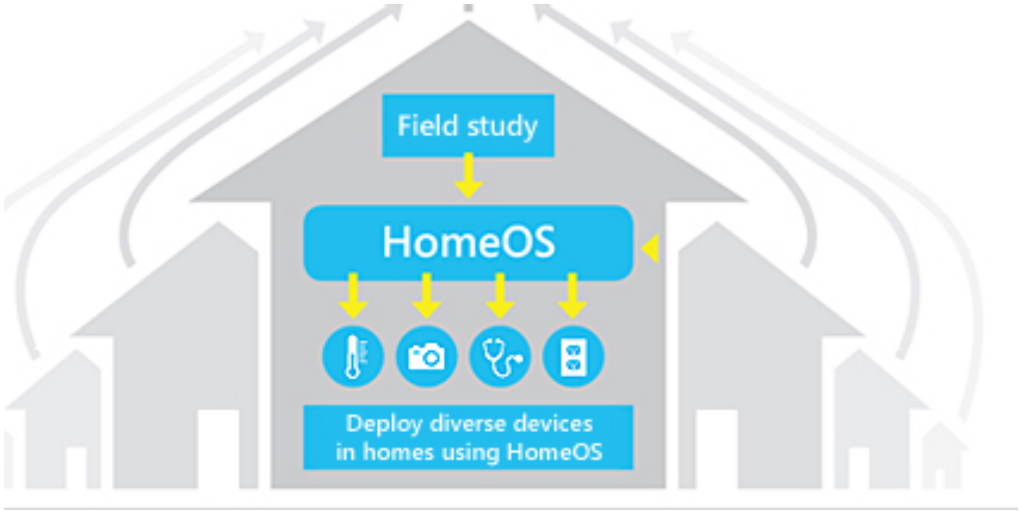
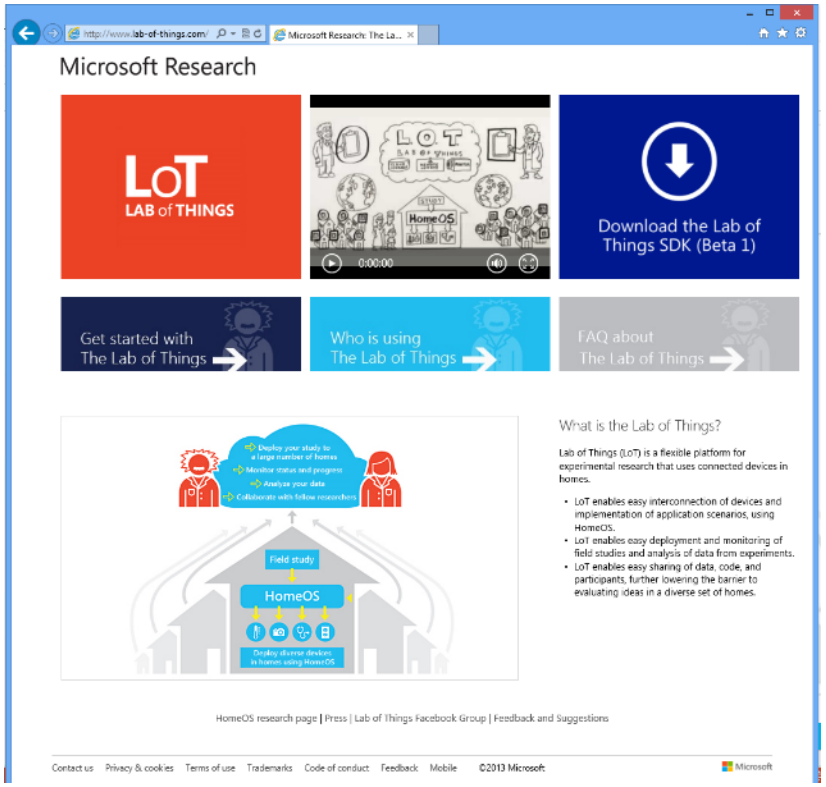


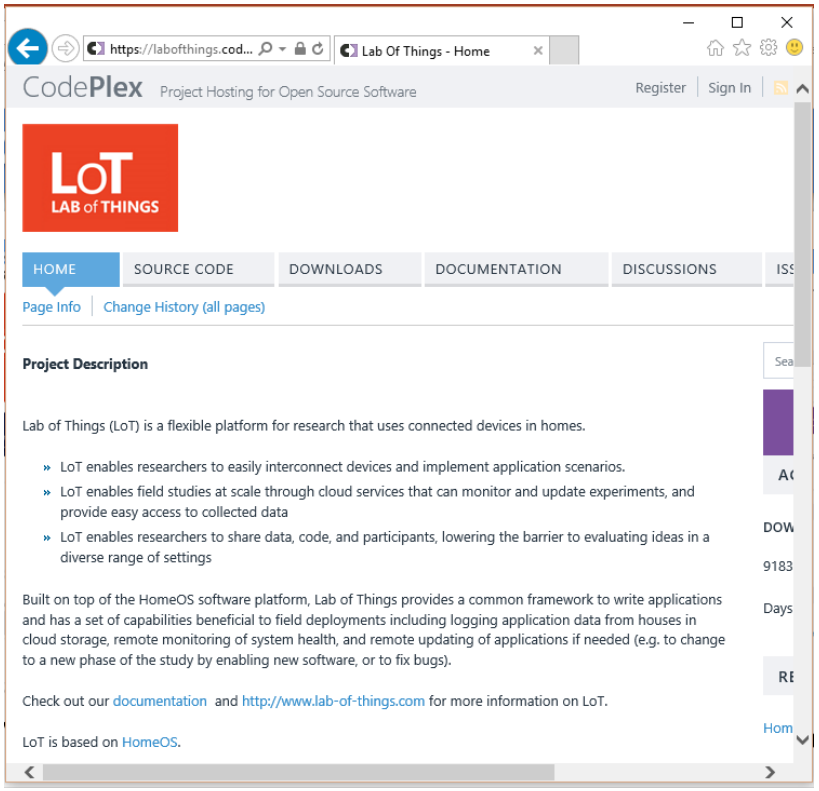
Present a PC-like abstraction

- Devices =~ USB peripheral
- Scenarios =~ application
- Application use high-level APIs

The home needs an operating system (and an app store), HotNets 2010

Lab of Things





http://www.lab-of-things.com

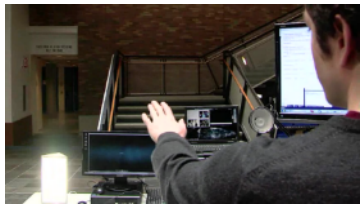
https://labofthings.codeplex.com/

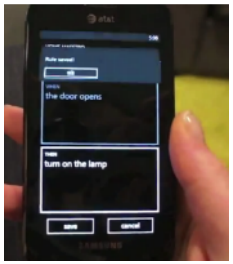
Lab of Things Usage

Understand Current Behavior and User Needs

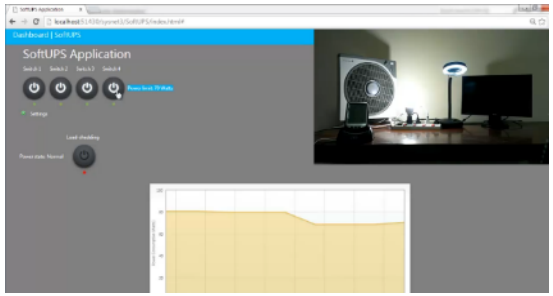
More than 9,000 code downloads
Used by hundreds of student developers
Ongoing academic research deployments

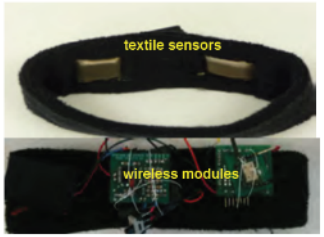
Build Technology/ Prototype





Does it work?
Use of Technology





My Job

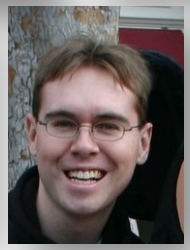
Microsoft Research

- Established in 1991
- More than 850 researchers
- MSR is a small part of Microsoft (< 1% of employees)

http://research.microsoft.com

To advance the state of the art in computing through a combination of basic and applied research.

Awesome people!



How am I evaluated?

Research impact

- Publications/academic influence

Product impact

- "Shipping"/Influence

Patents

- Intellectual Property

Service

- Research Community & Diversitv

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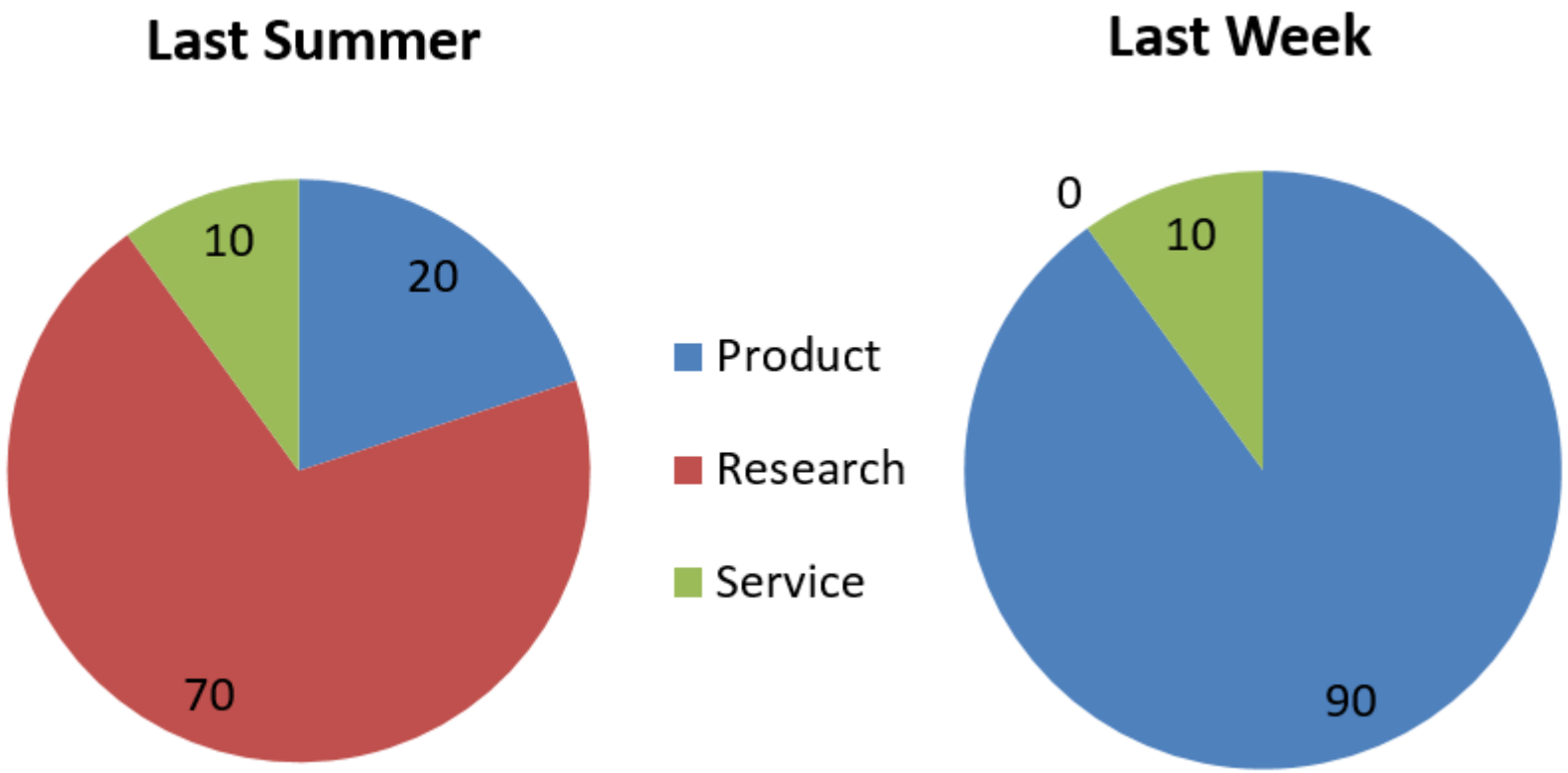
How do I spend my time?

Things I do:

- Projects
- Go to meetings/answer email
- Consult to Product Groups
- Service (Internal/External)
- Travel to conferences/meetings

How do I spend my time?



Changes over time

How did I get to MSR?

Thanks

User-Centered Design

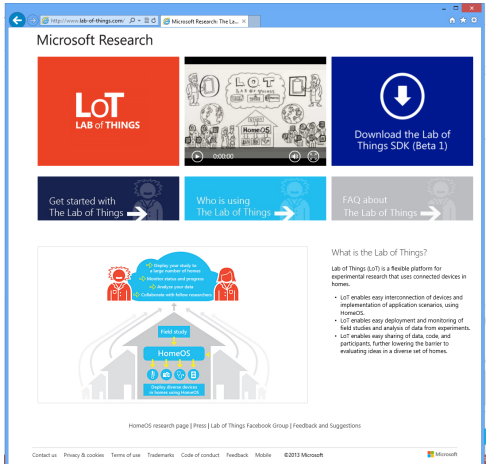
Understand Current Behavior and User Needs

Build Technology/ Prototype

Does it work? Use of Technology

More information:

ajbrush@microsoft.com
http://research.microsoft.com/~ajbrush
http://www.lab-of-things.com



Join our community!

Mentoring Session:

Graduate School in CS: Why go and how do I get there?

Let's Review:

Why should I consider Graduate School?

- You want to solve big and important problems
- You love to be creative and want a lot of independence and control over the choice of problems you address
- You want to make important and long-lasting contributions to the field
- You would enjoy being an expert on a particular area in computer science
- Starting salaries for Bachelor's degrees are high; starting salaries for M.S. are often higher
- Your chosen career (e.g., professor or research scientist) requires it

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Resources

Visit **CRA-W.org** for more resources for all levels of your career

Join our CRA-W mailing list, **CRA-W Updates**, by going to bit.ly/1McQCDd

Follow @CRAWomen to find out about upcoming events or programs

Don’t forget to take the survey after this event – give us feedback!

If you are attending Grace Hopper, come by our booth #S-14 in Exhibit Halls A-B