Some Ubicomp Projects I have known.

And some ways to think about them.

John_Barton@hpl.hp.com

The Critical Issue in Ubicomp Research: How Do We Build Knowledge?.

- We build on other peoples work
  - Wireless LAN, PDAs, vision, speech, …
- How can they build on ours?
  - Start by understanding what “ours” is.
- Categories and relationships
  - Or misrepresentations and distortions?
- Categories aid understanding
  - even through exceptions.

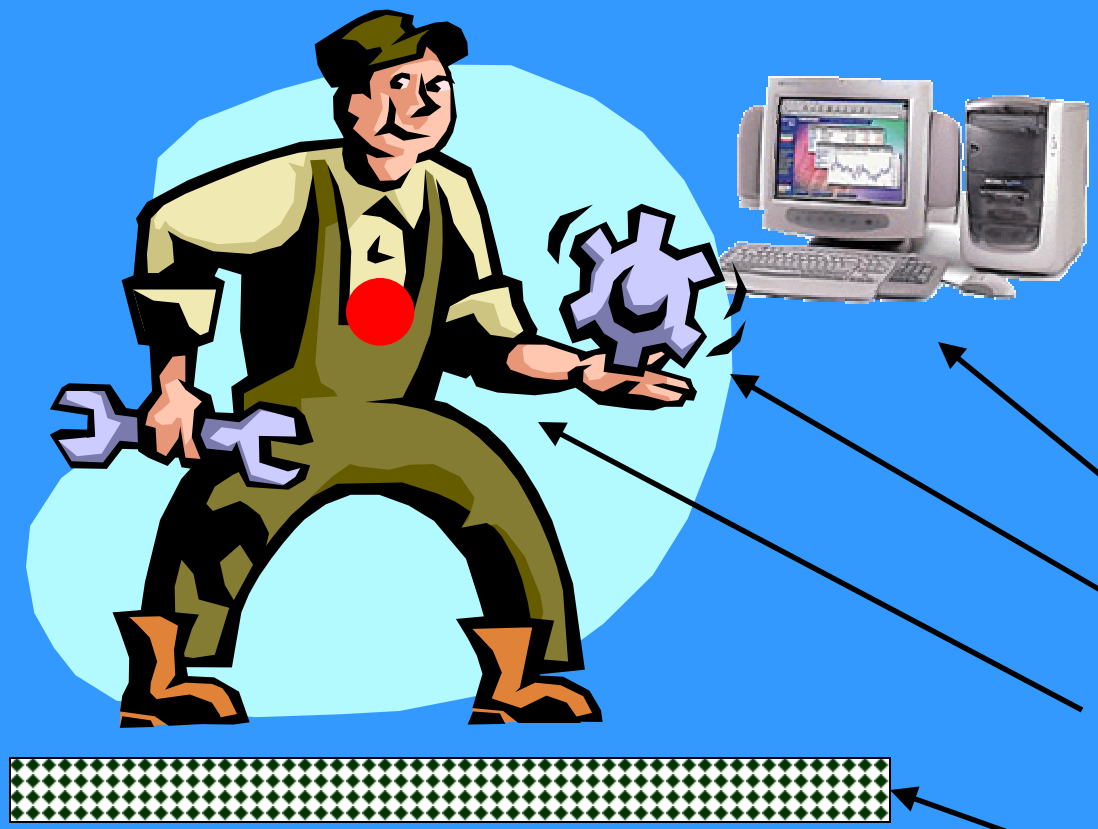
"If I have seen further ...

it is by standing on the shoulders of giants." (Newton)

Ubicomp Comparisons

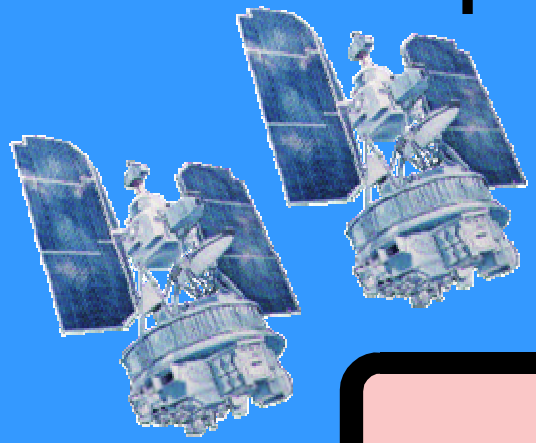
- **Physical Scale**
- Communication vs Computation Focus
  - Social vs Personal
- Component Systems:
  - Central, Distributed, Autonomous, or Unaffiliated.
- Depth of Physical Integration
- Degree of Spontaneous Interaction
- Embedded, Mobile or Both

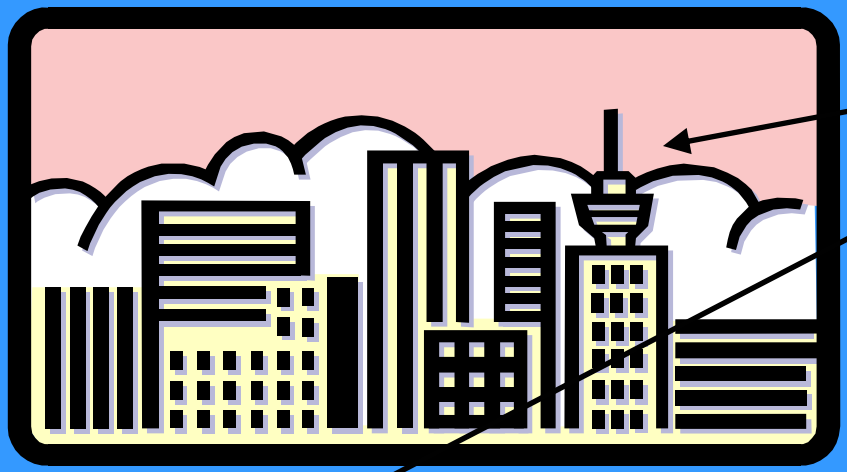
Ubiquity On Many Scales



- Global
- Environmental
- Spatial
- **Personal**
- Handheld
- Wearable
- Embedded

Ubiquity On Many Scales





- Global
- Environmental
- Spatial
- “Personal”
- Handheld
- Wearable

Ubicomp Comparisons

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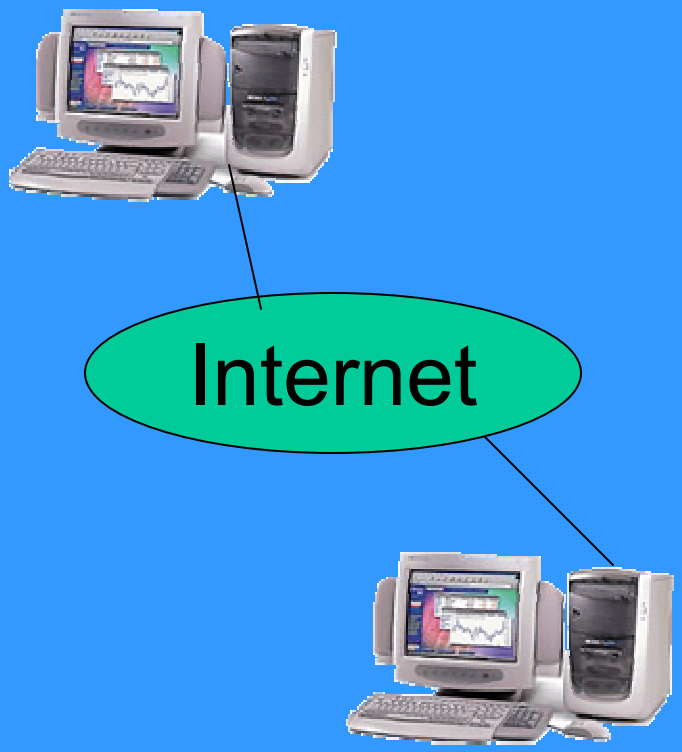
Existing Ubiquitous Systems: Cellphones

- Global Physical Scale
- Communications Focus
  - Mostly social
- Central System
  - Some “smart” phones
- Little physical integration
  - Soon E911
- Low spontaneity in system
  - Users create spontaneity
- Mobile

Existing Ubiquitous Systems: Personal Computers

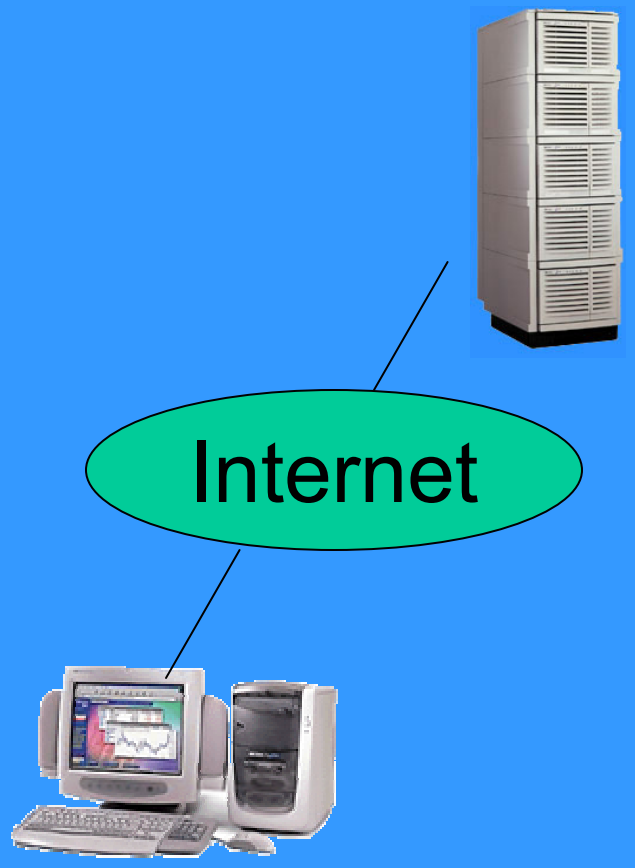
- "Personal" Physical Scale
- Computational Focus
  - Mostly personal
- Autonomous System
  - Almost distributed now.
- Little physical integration
- Notoriously unspontaneous
- Some mobility

Existing Ubiquitous Systems
E-mail



- Global Physical Scale
- Communications Focus
  - Mostly social
- Autonomous Systems.
- Little physical integration
  - Some email event systems
- Spontaneous
- Some mobility
  - Laptops, RIM, some phones

Existing Ubiquitous Systems WWW



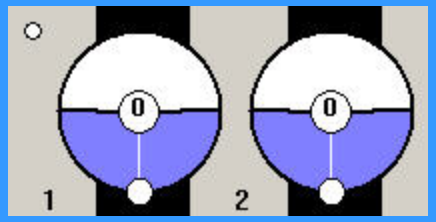
- Global Physical Scale
- Computation Focus
  - Mostly social
- Autonomous Systems.
- Some physical integration
  - Amazon books; webcams
- Spontaneous
- Some mobility
  - Laptops

Ubicomp Project Comparisons

- Kind of System
- Innovation Focus:
  - Technology (a new thing)
  - System (a new way to put things together)
  - Human Factors (shaping systems for people)
  - Tools for Ubicomp Research

Phidgets

Univ. Calgary, Saul Greenburg and Chester Fitchett



Simple GUI for controls

Interface kit

“building blocks that help a developer easily construct physical user interfaces. “

Simple hardware kits

Phidgets

- Kind of system:
  - Embedded, computational, about physical integration, unaffiliated, fixed.
- Focus of Innovation:
  - Tool for research
  - Human Factors: new affordances for embedded systems.

•http://www.phidgets.com/

Social Media

Video

Jim's stuff

Our room

chat

video

chat

photo

chat

music

Susie's Room/Location

Photo

Susie's stuff

Game

Audio

Mark's stuff

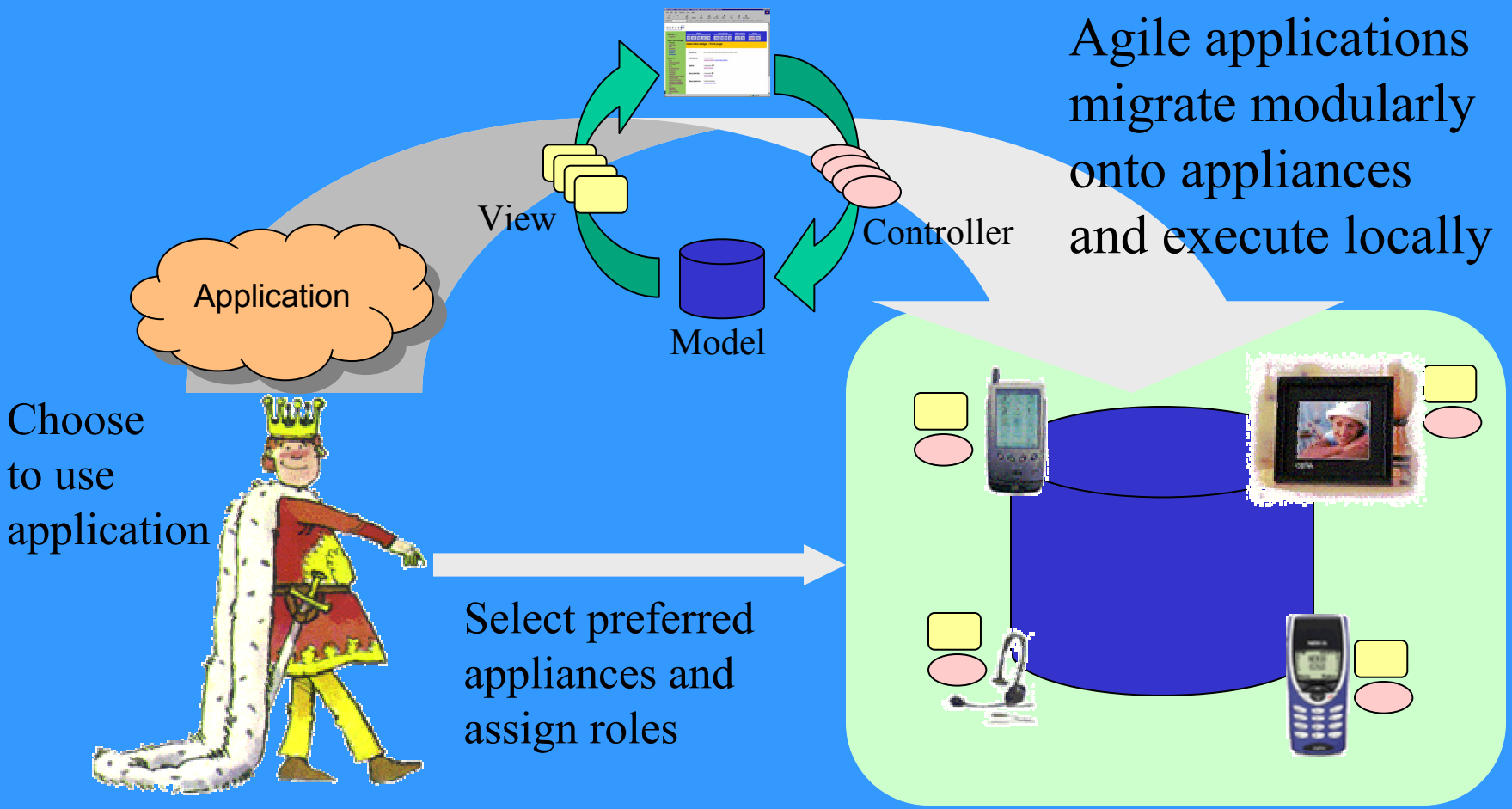
Jeff's stuff

Chat

Slide from Jim Rowson, HPL

Slide from Jim Rowson, HPL

Our Approach: Agile Computing



Agile Web, HPL

- Kind of System
  - Spatial, social communications, incidental physical integration, intends to be spontaneous, autonomous systems (shared data), mobile
- Focus of Innovation
  - Infrastructure for using shared data.

Stanford iroom

- 5 Large Embedded Displays
- Laptops can join in
- Heterogeneous handheld devices
- Coordination:
  - hardware and software
  - minimal adaptation (COTS)

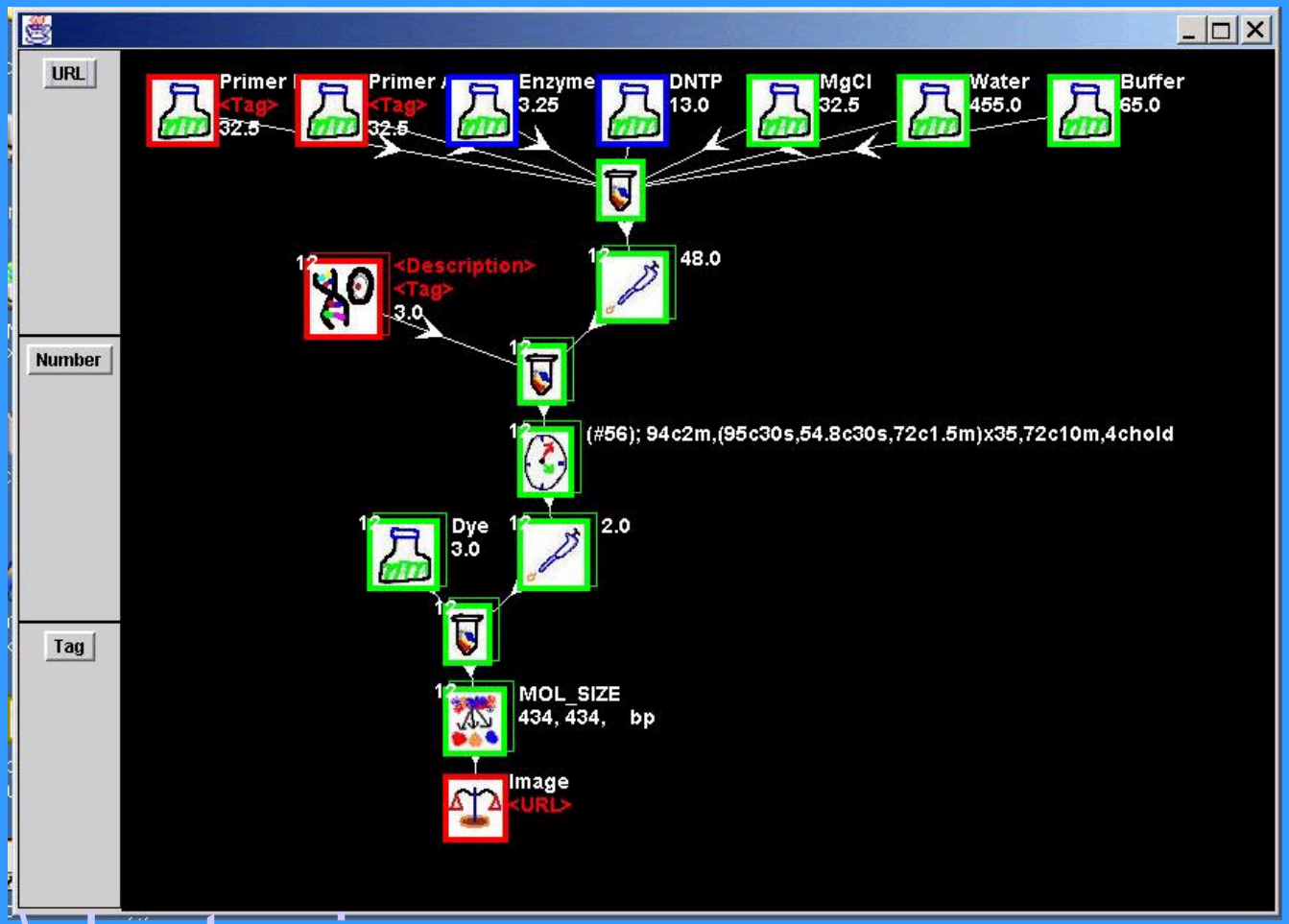
Stanford iroom

- Kind of System:
  - spatial, social computation, deep physical integration, some spontaneity, coordinated autonomous systems, fixed.
- Focus of Innovation:
  - Coordination Technology
  - Human factors for space affordance.

http://graphics.stanford.edu/projects/iwork/index.html

Labscape, Univ. Washington

Biology Lab with Sensors And PCs



- labscape\short.avi

Labscape

- Kind of System:
  - Environmental, computational, deep physical integration, low spontaneity, central system, fixed.
- Focus of Innovation:
  - Human factors: adaptation of computing technology for physical workspace.

•http://labscape.cs.washington.edu/

Georgia Tech Aware Home

Observers

Users

Technology

Georgia Tech AwareHome

- Kind of System:
  - Spatial, Computation focus, Central system, Deep physical integration, low spontaneity, embedded.
- Innovation Focus:
  - Human factors: embedding personal computation in a home.

•http://www.cc.gatech.edu/fce/ahri/

UC San Diego ActiveCampus Project

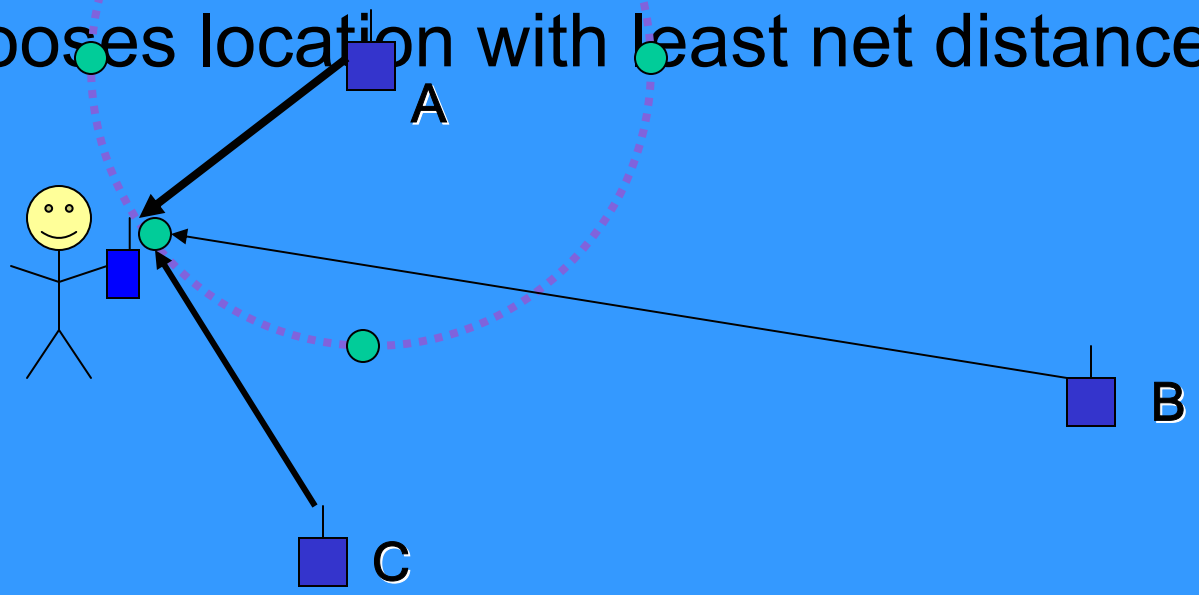
- Sustaining university community
  - learn through communication
  - increasingly busy, distracted
  - opportunities out of sight
  - physical, not virtual, community
- Issues for applying ubicomp
  - inventing the “killer app” for a physically proximate community
  - small form factor design
  - scalability and sustainability
  - component architecture to facilitate change & innovation
- Living laboratory of 100’s of users built with help of HP

Slide from Bill Griswold

UC San Diego ActiveCampus

Geo-Location by Trilateration

- Designed for simplicity
  - Fast, maintainable, retargetable
- PDA observes AP signal strengths, estimates distance to each AP
- Selectively searches sphere around closest
  - Chooses location with least net distance error



UCSD Active Campus

- Kind of system:
  - Environmental, mostly social with mixed computation/communications, location integration, some spontaneity, distributed system, mobile.
- Focus of Innovation:
  - Human Factors: application of handheld communicators to education.

•http://activecampus.ucsd.edu/

Project Oxygen, MIT

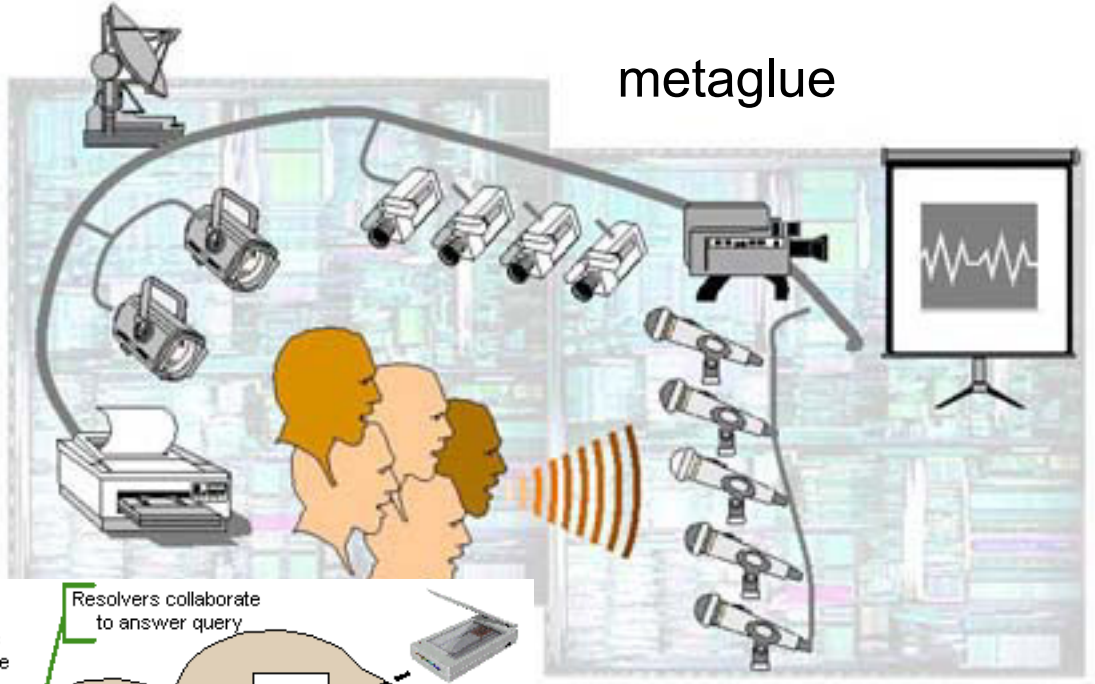
Backpaq

H21

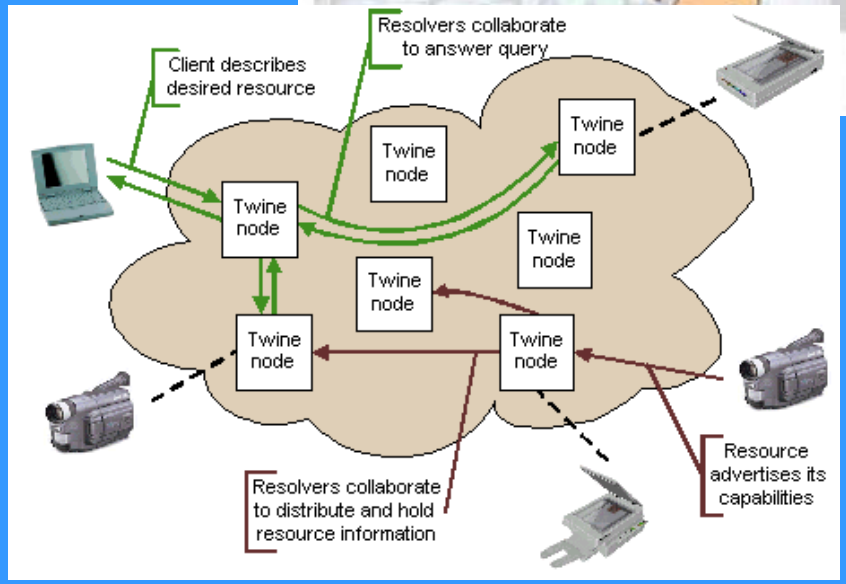
GRID

N21

metaglue



E21



Twine/INS

Project Oxygen MIT

- Kind of System
  - Multiple scales, various levels of physical integration. Some spontaneity, mostly distributed systems with autonomous services, mobile and fixed.
- Focus of Innovation
  - Mostly new technologies and infrastructure
  - Bonus: integration of technologies

•http://oxygen.lcs.mit.edu

Ubicomp Is?

- Beginning to See Clearer Definitions.
- Categories possible
  - Maybe even useful ;-)
- Now to make the big transition:
  - Beyond “Related Work” to Reuse.
  - “Novelty” is not enough.

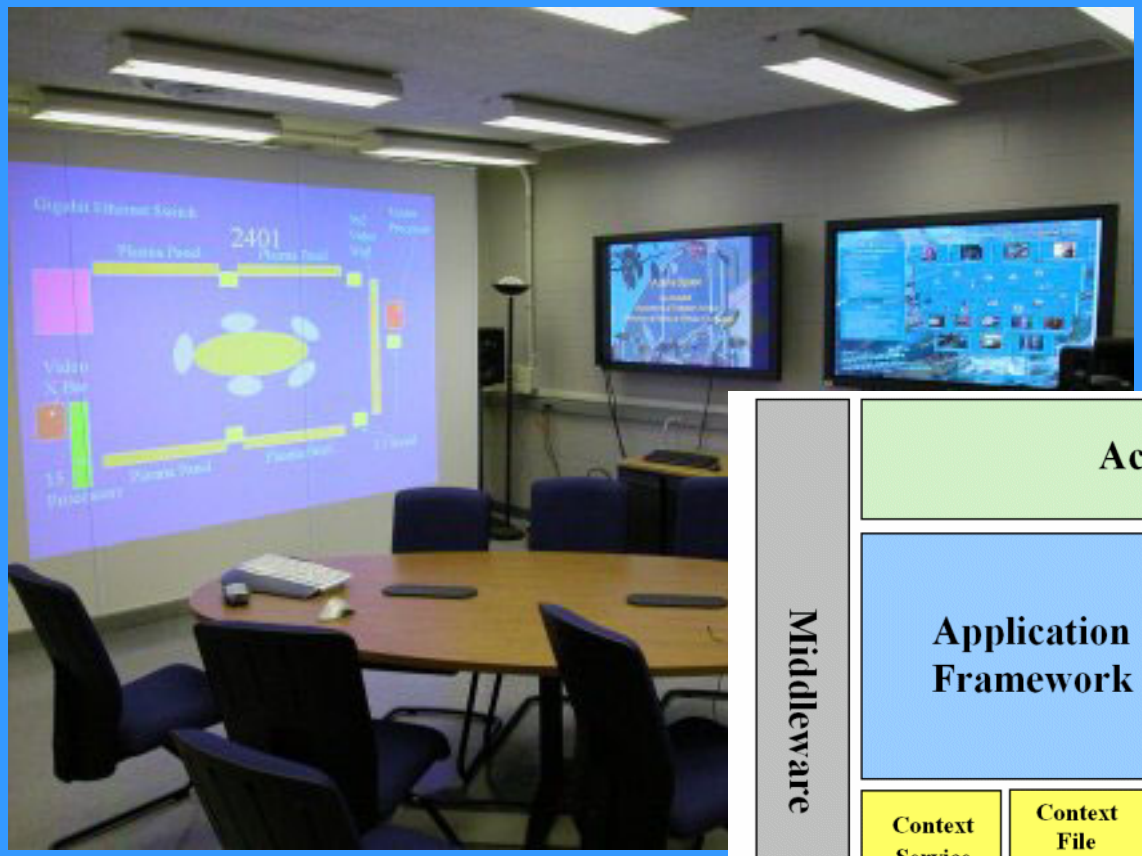
http://www.cooltown.com

http://handhelds.org

http://www.exploratorium.edu/guidebook

Gaia

University of Illinois at Urbana-Champaign



Gaia brings the functionality of an operating system to physical spaces