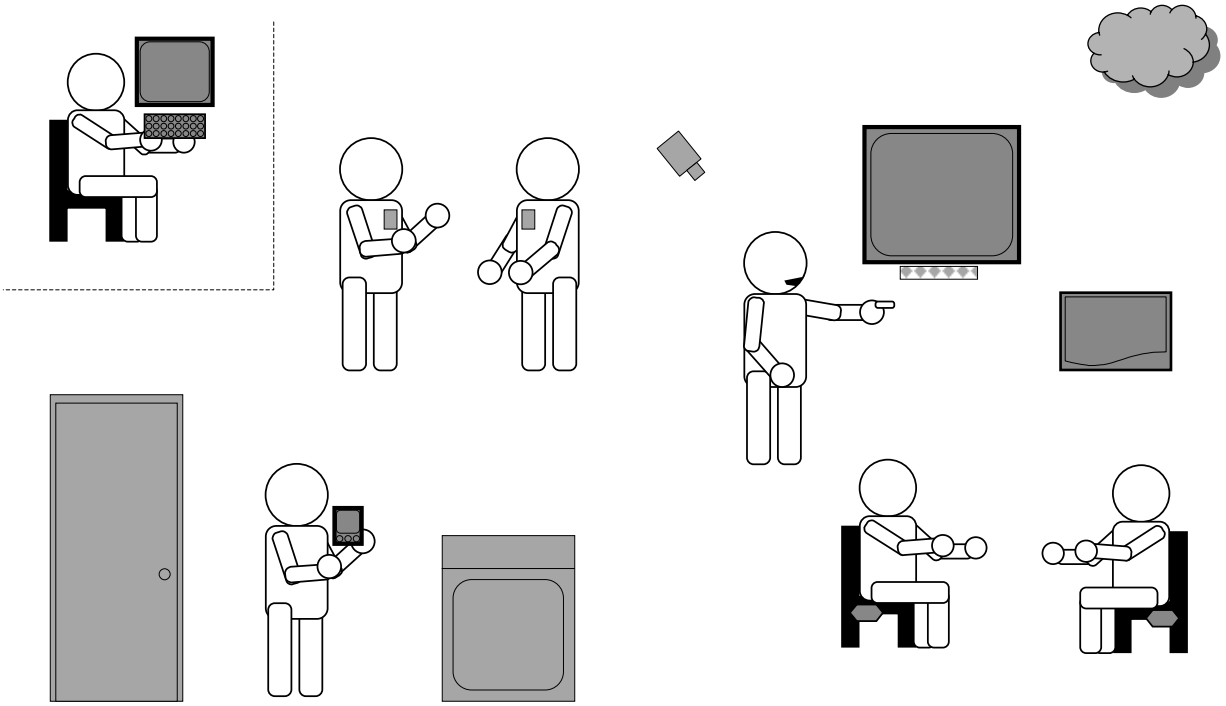
Managing Ubiquitous Computing

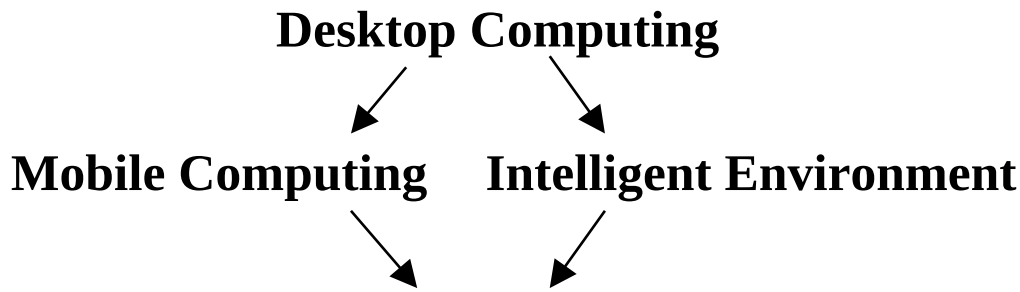
Steve Shafer

Ubiquitous Computing group

Ubiquitous Computing



Ubiquitous Computing



The Ubiquitous Computing Equation:

Ubiquitous Computing =
Mobile Computing +
Intelligent Environment

Let There Be Light

- **Flip a switch**
- **Touch screen on wall computer**
- **Use pocket computer**
- **Say “Turn on the lights”**
- **Make a funny gesture**
- **It’s dark outside**

Ubiquitous computing gives new options

Long-Term Issues

- Attention
- Complexity
- Privacy
- Security
- Extensibility

Attention

How to signal a person about an event?

- Nature and parameters of the event
- Available devices in environment
- Policies governing environment
- Preferences of person
- Person's current activity and attention

Challenge: How not to bother people

- "Ambient" information

Complexity (to users)

- Lots of decisions for system to make
- Lots of devices to manage
- Need some degree of automation
  - "Behavior Rules"
  - Where do they come from?
  - How do you manage them?
  - "What will happen if I sit in that chair?"

Privacy

- System is expected to make lots of decisions for / about you
- System needs lots of information
- "Who" gets that information?
  - Maybe you give explicit permission
  - Maybe you post information
- Good intentions, lousy practices

Security

- **This is a story about delivery of services on the network**
- **How do you know who you're talking to?**
- **Ubiquitous computing requires …**
  - **… very dynamic connectivity**
  - **… exchange of lots of personal data**
  - **… lots of exposure to fraudulent access**

Extensibility

Interoperability

- **All domains are one domain**
- **Need for standardization**

Configuration

- **Tools for creating intelligent spaces**
- **Tools for managing devices & processes**

Debugging

- **Oy, oy, oy!**

How Will Issues Be Addressed?

- Industry is moving forward
- Some mechanisms are emerging
  … though sometimes controversial
- Trial and error
- Slow growth of capabilities gives time to develop solutions
- Unified v. diversified

How We Steer Technology

- Introspection
- Demo and Discussion
- User Studies
- Business Case
- Marketplace
- Literature
- Standardization
- Legislation
- ?

Managing Ubiquitous Computing

Mobile Computing + Intelligent Environments

- **Maximize access to computing**
  - **Communicating with people**
  - **Access to information**
  - **Control things**

- **Make it ubiquitous**
- **Minimize burden on attention**
- **Minimize need for arcane knowledge**
- **Keep information where it belongs**