

UBICOMP

Episode 1: Introduction

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What is it?

UBIQUITOUS COMPUTING



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Meaning

- Ubiquitous (allgegenwärtig)
- **Ubiquitous computing** is a term describing the concept of integrating computation into the environment, rather than having computers which are distinct objects. Promoters of this idea hope that embedding computation into the environment would enable people to move around and interact with computers more naturally than they currently do. (http://en.wikipedia.org/wiki/Ubiquitous_computing)
- Synonym Pervasive (durchdringend)
- **Pervasive Computing** “The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.” So began Mark Weiser’s seminal [1991](#) paper that described his vision of [ubiquitous computing](#), now also called pervasive computing. Pervasive computing represents a major evolutionary step in a line of work dating back to the mid-[1970s](#). Two distinct earlier steps in this evolution are distributed systems and mobile computing. Some of the technical problems in pervasive ... (http://en.wikipedia.org/wiki/Pervasive_Computing)

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Visions

- Any ideas?
- Taking examples from science fiction



Raumschiff Orion

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Visions: Examples

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Visions: Famous examples



Star Trek IV – Zurück in die Gegenwart, © 1986, Paramount Pictures

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Visions: Other examples?

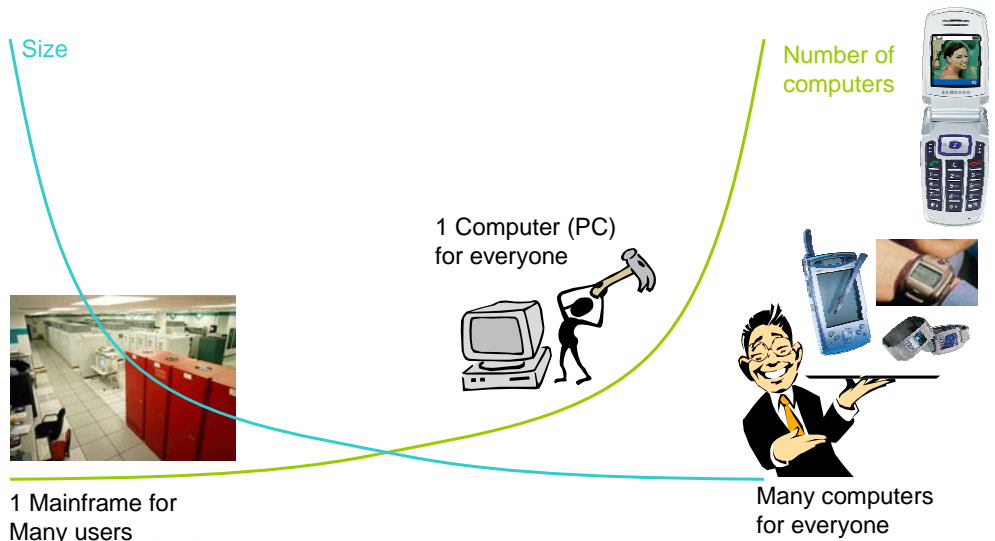
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Vision only?

- Examples for ubiquitous computing today?

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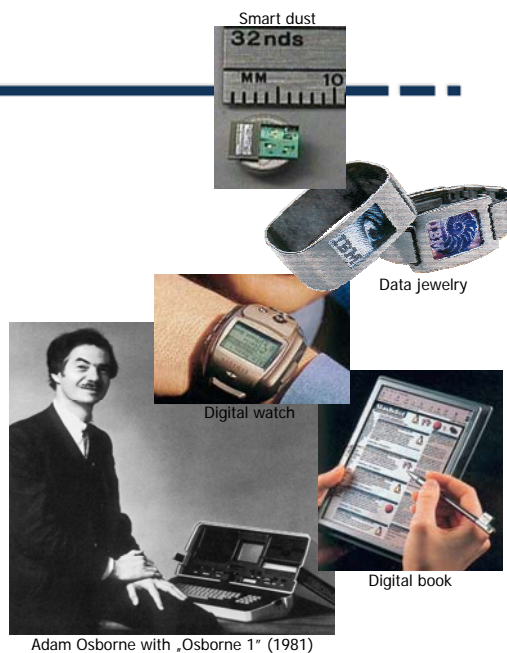
A clear trend



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Small computers

- Portable computer, well ...
 - General purpose
- Notebooks
- Sub notebooks
- Personal digital assistant (PDA)
- „Appliances”
 - Single Purpose + communication
 - Smart phone
- „Smart Dust”



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Computer size

- Hardware is getting smaller and smaller
 - What is the smallest computer you own?
 - What is the smallest computer you know?
- Smart Dust
- Nanotechnology
 - Michael Crichton, *Prey*, Harper Collins, 2002
- Limitations
 - Computational resources
 - Physical interconnection
 - User interface
 - Power consumption

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Resources (CPU, memory, ...)

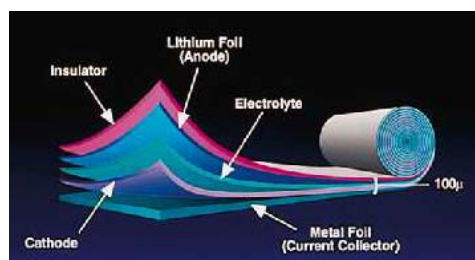
- No 2-3 GHz CPUs for embedded devices available
 - Trade-off between performance and power consumption
- No 2 GByte main memory
- No hard disc; flash memory instead
 - Gbytes available but expensive
- What performance have today's (your) mobile devices?
 - Processor speed?
 - Transient and persistent memory?
 - Hours of operation?



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Power consumption

- Battery technology doesn't keep pace with increase in computer technology
- Known technologies
 - Lithium ion or lithium polymer
- Future technologies
 - Fuel cell (notebook runs for 1 day?)
 - Star Trek technology should be discovered fast ☺
- Always on vs. Wake on wireless?
 - Power-aware computing and communication
 - New attacks: Sleep Deprivation Torture Attack



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Connecting computers

- Not by wire ☺
- Not by infrared either
- Wireless communication via radio waves
 - WLAN
 - Bluetooth
- Limitations
 - Reach
 - Bandwidth
 - Error rate
 - power consumption
- Any experiences?

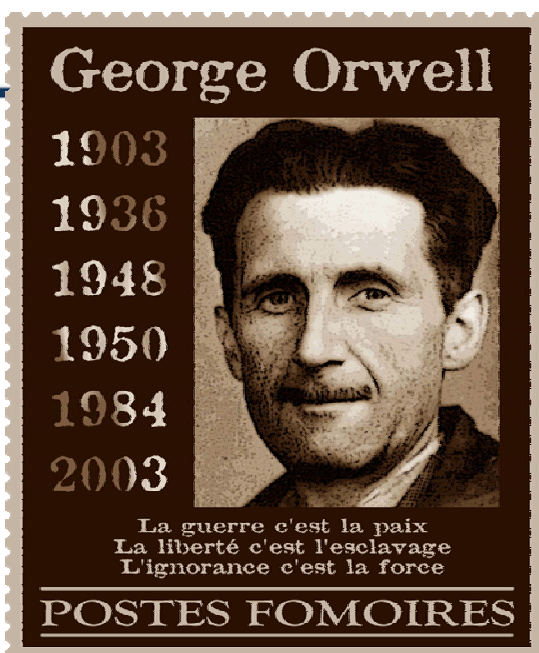


<http://www.flyingcircles.straylight.com/scifiborg.jpg>

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Social influences

- Ubiquitous = Big brother is watching you?
- Actual discussion about RFID tags
- Continuous surveillance



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Conclusions

- Small, lightweight, cheap, and mobile processors
 - In most everyday objects (embedded computing)
 - On your body (wearable computing)
 - Embedded in the environment (ambient intelligence)
- Visions ...
 - “Everything, always, everywhere”
 - all objects become smart
 - everything is connected (to the Internet)
- ... become true because
 - cheaper hardware (many, everywhere)
 - smaller hardware (mobile, everywhere)
 - wireless communication at (almost) no cost

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Phone calls for free?

Newsweek Technology & Science

Column / The Practical Futurist

Michael Rogers

✉ • E-mail the author | 📄 • Biography | 📧 • More by the author



Claudia Marseille

Will Telephone Calls Be Free?

The folks who shook up the music world with KaZaA want to make telephone calls free. Do they have a chance?

WEB EXCLUSIVE

By Michael Rogers

Newsweek

Updated: 1:36 p.m. ET Dec. 26, 2003

Dec. 16 - Technologists used to predict that in a true broadband Internet world the cost of sending voice telephone calls would become so low that it would no longer be worth billing for them. Now, in a flurry of year-end announcements, everyone from start-ups to Ma Bell herself has announced their intention to deliver voice over the Internet. So when does the free part start?



Skype

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Conclusions (contd.)

- Various research disciplines involved
 - hardware development
 - software development
 - HCI, psychology
 - Electrical engineering
 - Physics, chemistry, biochemistry
 - ...
- No mature research discipline yet
 - No textbook-like lecture possible
 - Self-contained lecture units (episodes)

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Planned episodes

- | | |
|----------------------------------|--|
| 1. Introduction | 11. Body Area Networks |
| 2. Ubiquitous Computing Paradigm | 12. Sensor Networks |
| 3. Communication | 13. Windows CE |
| 4. RFID | 14. Handy OS and other small operating systems |
| 5. Wireless LAN | 15. TCP/IP and UbiComp |
| 6. Bluetooth | 16. Distributed Algorithms for wireless networks |
| 7. Cellular Networks | 17. Middleware |
| 8. Location | 18. Shrinking HC Interface |
| 9. Ad-Hoc Networks | 19. Influencing the Society |
| 10. Fleetnet | |

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