Introducing Pervasive and Ubiquitous computing.

Mark Weiser

Father of Ubicomp.

a.k.a calm technology, invisible, pervasive…. Why?

Weiser joined PARC (then Xerox PARC) in 1987 and became manager of its computer science laboratory in 1988, the same year he pioneered the concept of ubiquitous computing.

Class activity

Form small groups (2-3-ish)

Discuss preparation: the five most important ideas in

The Computer for the 21st Century
Weiser, M. (1991). The Computer for the 21st Century. Scientific American, 265(3), 94-105
(18961 citations)

Imagine it is 1991

What was computing like in 1991?

- Beginning of desktops:
  - Macintosh (128k mem, 1.44M 3.25" floppy disk)
  - PC/Windows (16k mem, 1.2M 5.25" floppy disk)
- Wifi not available until 1997
- Ethernet (cat 5 cable) appeared in 1990
  - (Metcalfe Turing Award 2023)
- Internet extended to Australia in 1989
- No network based phone or video calls
- Mainly character based screens
- "Timesharing" was common

In this context, Weiser's paper was very futuristic.

Why focus on this paper?

Weiser, M. (1991). The Computer for the 21st Century. Scientific American, 265(3), 94-105

The seminal paper on Ubiquitous/Pervasive Computing, defined the field

What does seminal mean?

The Computer for the 21st Century

Weiser, M. (1991). The Computer for the 21st Century. *Scientific American*, *265*(3), 94-105
(18961 citations)

- More than 30 years old! Got many things right … but not perfect.
- Suggests that the future is not just "personal" devices but computers that vanish into the background, always available.
  - How do computers vanish into the background?
- "People will simply use them unconsciously to accomplish everyday tasks."
  - How? Examples?
- Describes research at Xerox PARC into new computing devices and form factors
  - demonstrated the forerunner of the smart phone, tablet, wall size interactive displays
  - PARC was where Ethernet, the networking technology used everywhere today, was invented.

Introduces the notion that context is very important for future computer services

In groups of 2-3, Discuss what context is and the implications for building systems and for their power and risks.

Central Ideas (note: many are predictions of the future of computing with examples of current, i.e., 1991, research)

- Computers become invisible - vanish into the environment.
- Computers become ubiquitous - large numbers in the environment carrying out tasks on our behalf.
- Interaction with computers becomes "natural", not necessarily screen/keyboard based (WIMP - Windows, Icons, Menus and Pointers (or maybe Windows, Icons, Mouse, Pull-down menus).)
- Many different form factors for computers: tabs/pads/boards
- Context is utilised by computers (location, people etc)
- Storage will expand massively.
- Networking is critically important

Quotes

- "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it."
- "We are therefore trying to conceive a new way of thinking about computers, one that takes into account the human world and allows the computers themselves to vanish into the background."
- "But like the wires in the walls, these hundreds of computers will come to be invisible to common awareness. People will simply use them unconsciously to accomplish everyday tasks."
- "Sociologically, ubiquitous computing may mean the decline of the computer addict."
- "Most important, ubiquitous computers will help overcome the problem of information overload."

Drilling down to academic impact

Citations

Look carefully at these and make notes about discipline areas for the next class activity

The Computer for **the 21 st Century**

M Weiser - Scientific american, 1991 - JSTOR

… " does not require active attention, but **the** information to be transmitted is ready for use at a … **the** environment. More than 50 million personal **computers** have been sold, and **the computer** …

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S Zuboff - Journal of information technology, 2015 - journals.sagepub.com

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MR Palattella, M Dohler, A Grieco… - IEEE journal on …, 2016 - ieeexplore.ieee.org

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C Perera, A Zaslavsky, P Christen… - … surveys & tutorials, 2013 - ieeexplore.ieee.org

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FK Shaikh, S Zeadally - Renewable and Sustainable Energy Reviews, 2016 - Elsevier

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JS Park, JC O'Brien, CJ Cai, MR Morris, P Liang… - arXiv preprint arXiv …, 2023 - arxiv.org

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JL Navarro, JRH Tudge - Current Psychology, 2022 - Springer

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Class activity

Form small groups (2-3)

Discuss disciplines: as on the previous slides

Summary

Seminal paper
“Ubicomp” (Ubiquitous computing) …
Hardware and networking
Software for personalisation and context
Broader societal and multi-disciplinary research, practice, commerce