ETHOC: Entry Points into a Smart Campus Environment

RESEARCH GROUP FOR
Distributed Systems

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Ubicomp Campus

- University campus as experimental application environment for ubicomp paradigm
  - Information needs are related to objects, places and people situated within the campus
  - Enabling technology is readily available
- University community open for ubicomp ideas
  - Open-minded, willing to explore new ideas, oriented towards future developments
  - Let can university community benefit from ubicomp technology

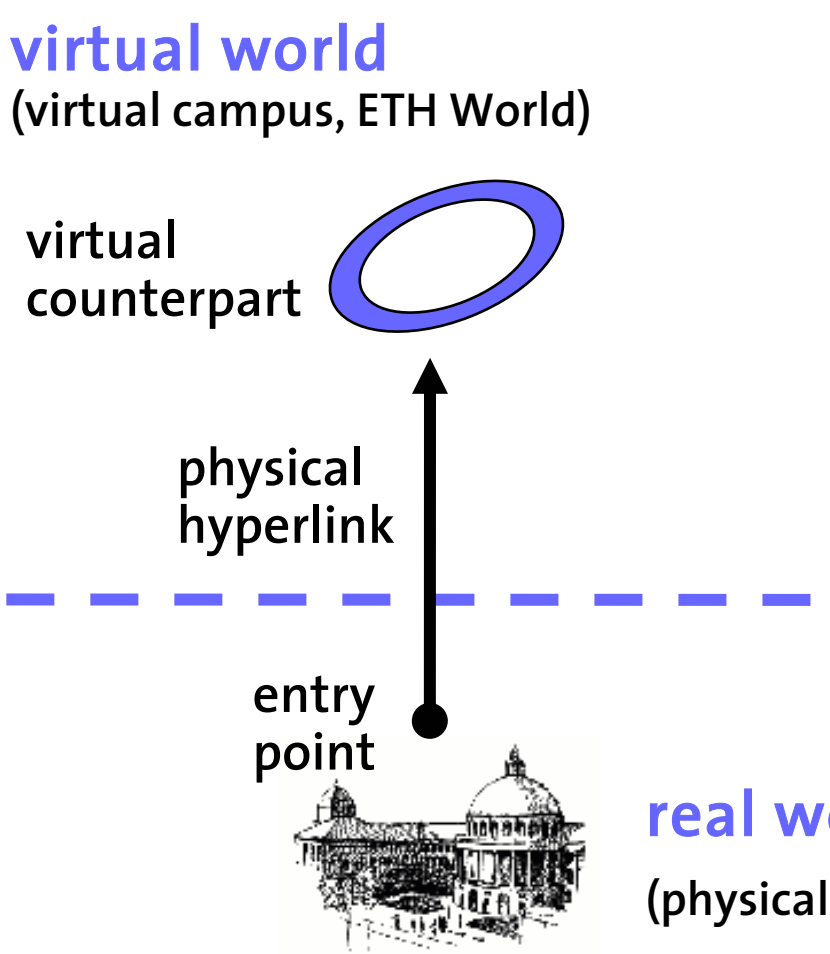
ETH World — a virtual space for everyone associated with ETH Zurich

- Virtual campus augmenting physical ETH
  - Supports research, teaching and learning, administration
  - Provides online services, communication, community awareness
  - Is used and extended by all members of the ETH community
  - Combines physical and virtual elements
  - Is linked to the real world…

Not Just a Virtual Space

- Unlike the World Wide Web
- Linked to well-defined user community
  - Active participation of students, faculty, and staff
  - Usage in everyday life
- Linked to the physical campus
  - Information closely coupled to physical entities on campus
- Make ETH World visible and accessible within physical campus requires “entry points”

Entry Points into ETH World



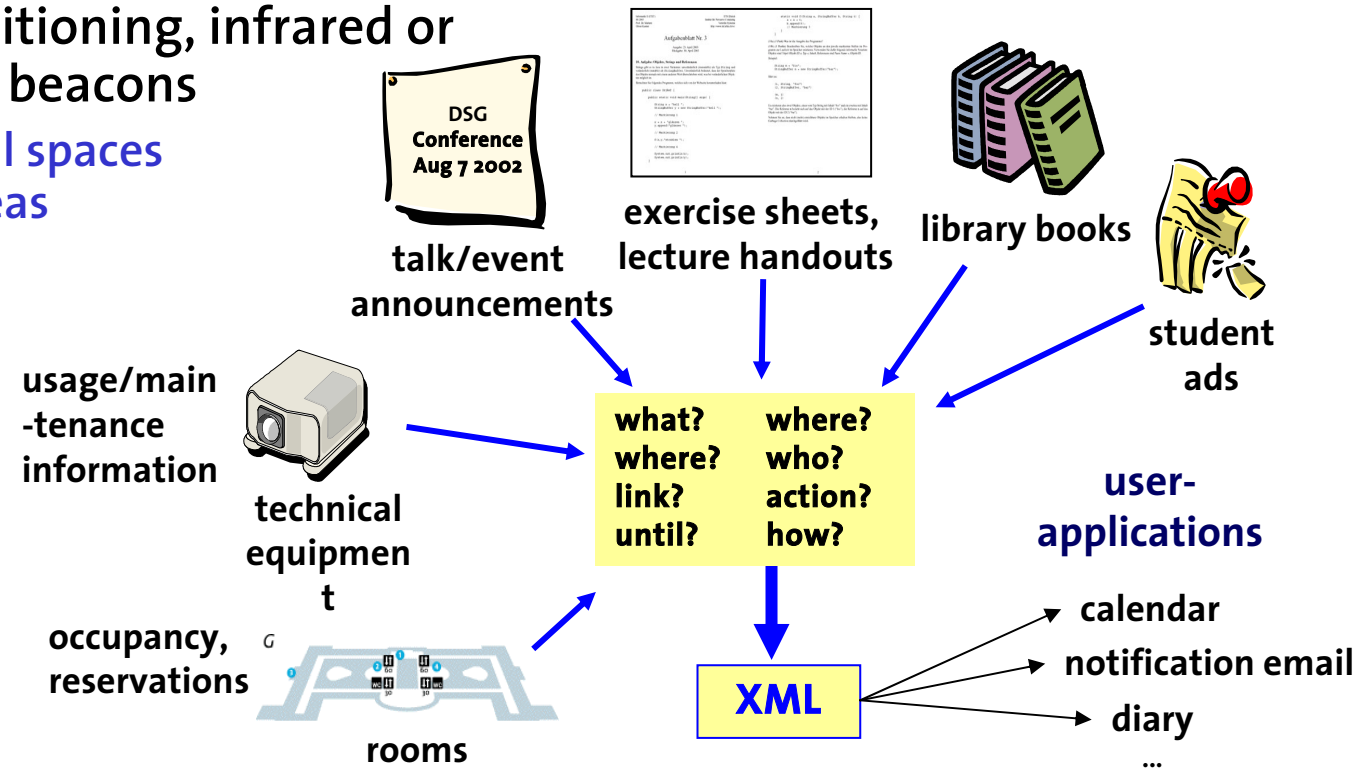
- Make virtual campus visible and accessible within physical campus
- Information associated and collocated with physical entities
  - Act as information anchors
  - Partition information space
  - Provide opportunities for interaction with the information space

Entry Point Goals

- Smart campus becomes accessible from places throughout the physical campus
  - Physical objects and related information become a unity
- Information is situated and grounded in the physical context
  - Simpler user orientation in the hybrid of physical and virtual campus

Entry Point Examples

- Augmenting physical ETH entities with virtual counterparts
- Barcodes and RFID tags
  - At doors, in rooms, on documents, on physical items, worn by ETH members
- WLAN positioning, infrared or Bluetooth beacons
  - Physical spaces and areas

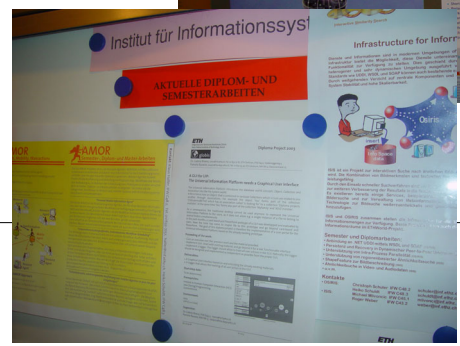


Documents and Actions

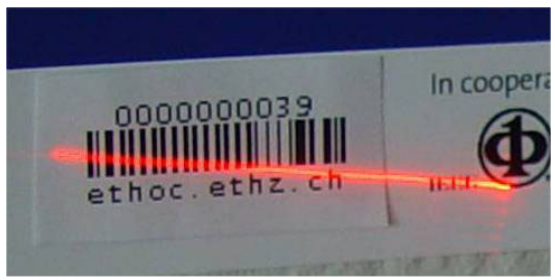
Category	Possible Action(s)
exhibition posters	play audio content, show Web page
announcements	store calendar entry
classified ads	store contact information, collect ad
talks	calendar entry, speaker homepage, abstract
events	buy tickets
surveys, opinion polls	count vote (e.g. lectures, mensa food)
lent library books	show return date, request status
exercises	show results, solutions (based on period)

Paper-based Information

- Paper-based information dispersed throughout the campus environment
  - "Environment mediated communication" (Gellersen, 1998)
    - Casual interaction
    - Anonymous communication
  - Information bound to physical object
    - Natural partition of information space
  - Information bound to location
    - Local relevance reduces information overload



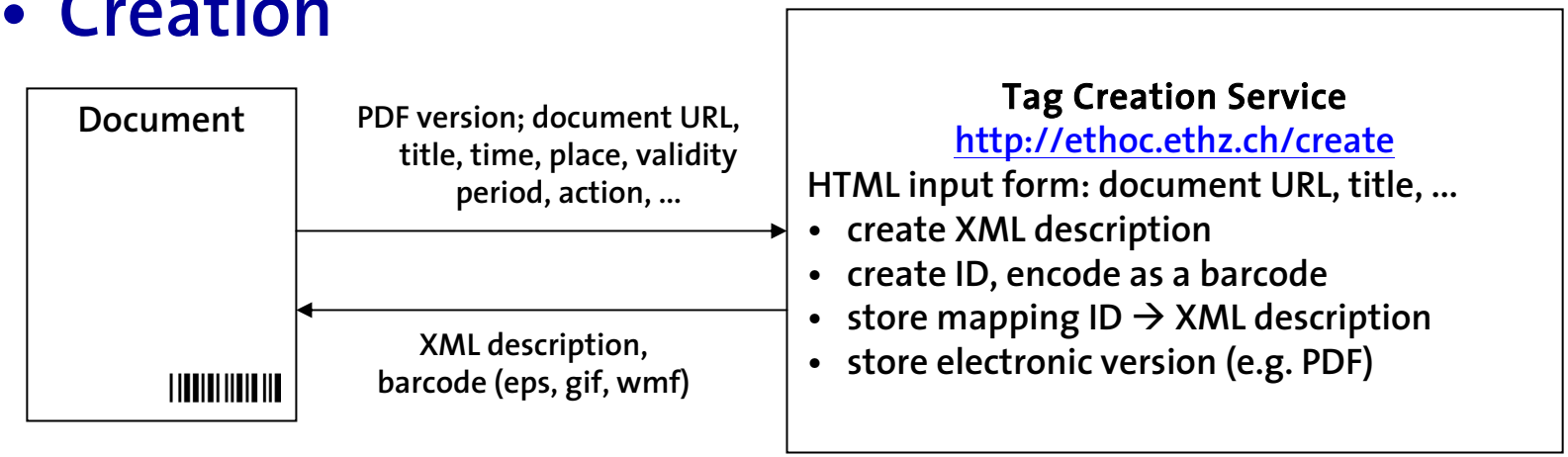
Responsive Objects



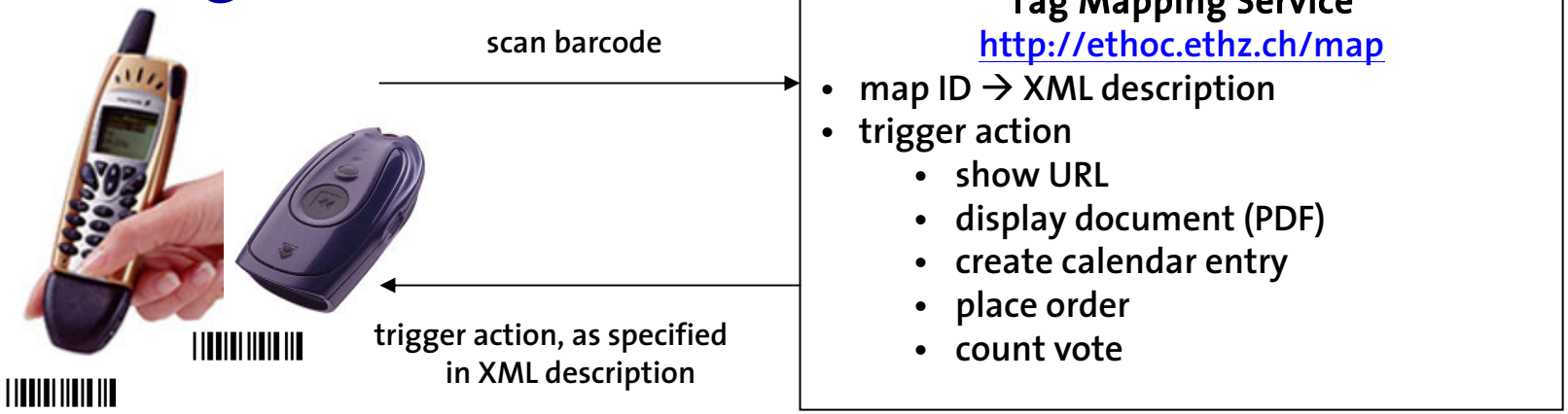
- Responsive objects
  - an object tells something about itself
  - e.g., by displaying a dynamically generated homepage
- Content
  - depends on factors such as context, location and privileges

Supporting Tagged Artifacts

- Creation



- Usage



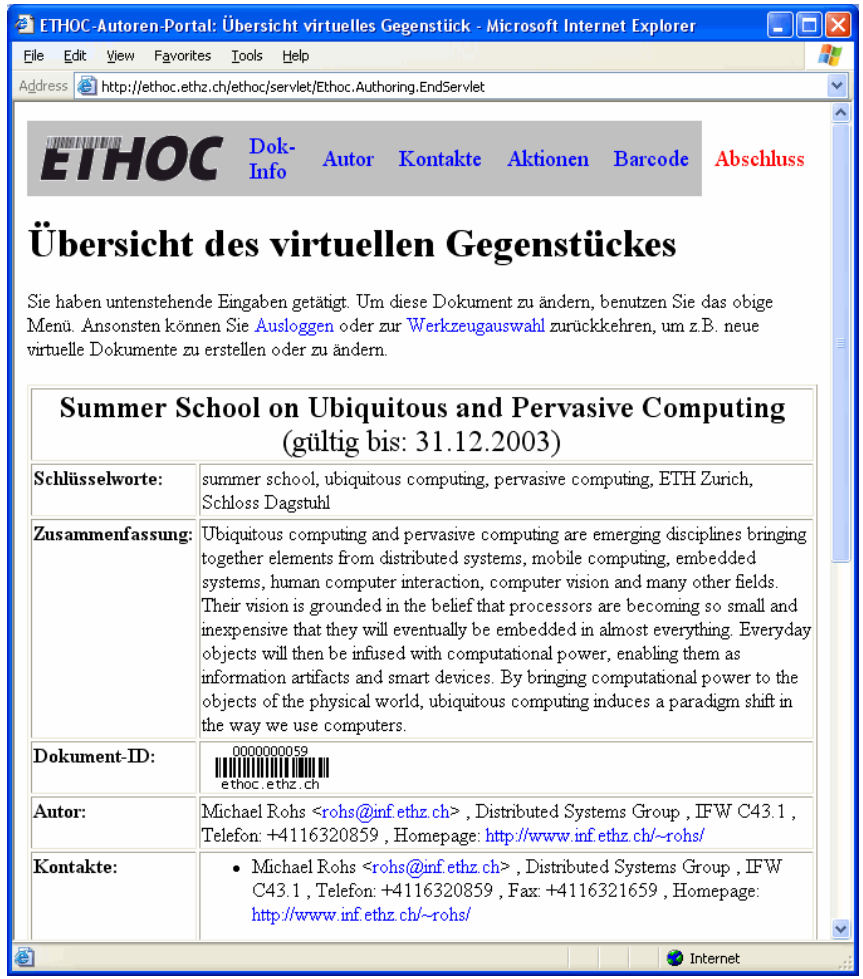
ETHOC System

- "Everything has online content"
  - Creation, administration, and intermediation of virtual counterparts related to paper documents and physical objects
- Author interface
  - Web-based portal for virtual augmentation with online content and functionality
- Multiple client interfaces
  - Interaction with virtual counterparts using a variety of mobile and stationary devices
    - PC, laptop, PDA, mobile phone, memory scanner
    - Online history available for every user, independent of device used

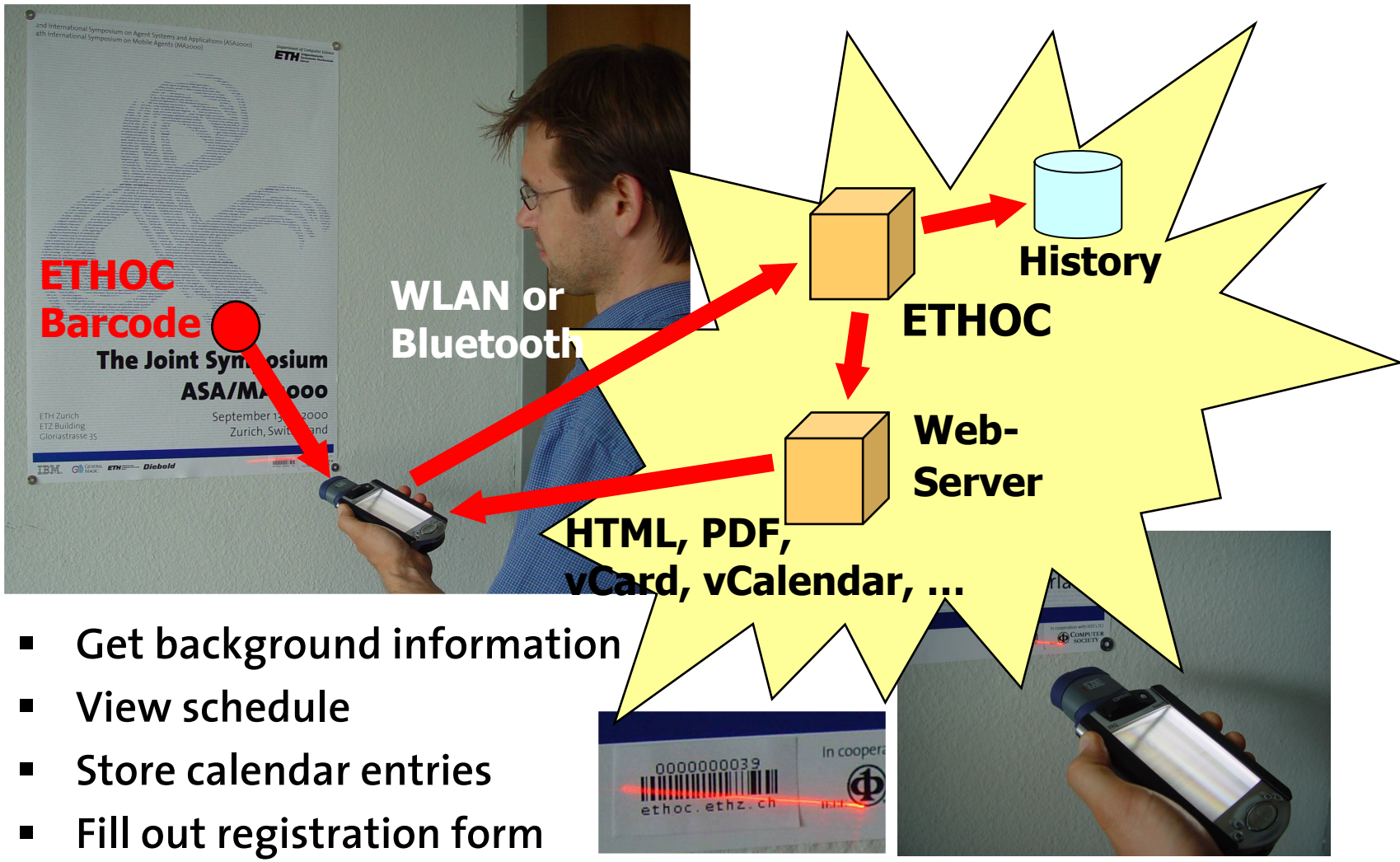
ETHOC

ETHOC Author Portal

- Simple creation of virtual counterparts for printed material
  - Usable by whole university community
- Registers and manages document and meta-data
  - Keywords, summary, validity, publisher, related documents, related URLs, dates, ...
- Provides unique ID as a barcode image
- Life cycle management
  - Author notification
  - Feedback questionnaire
  - News client support

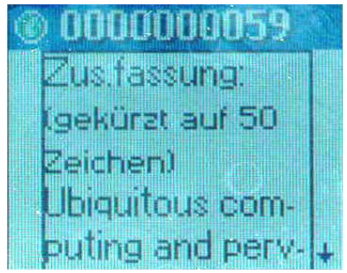


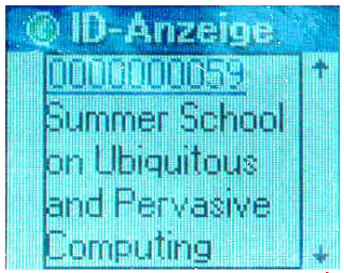
ETHOC Client Interfaces

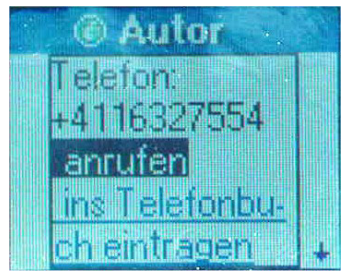


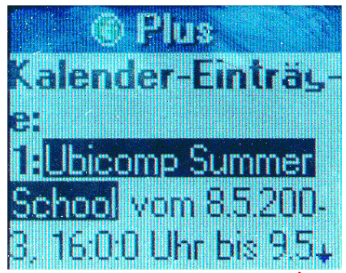
- Get background information
- View schedule
- Store calendar entries
- Fill out registration form

Access via WAP/WML

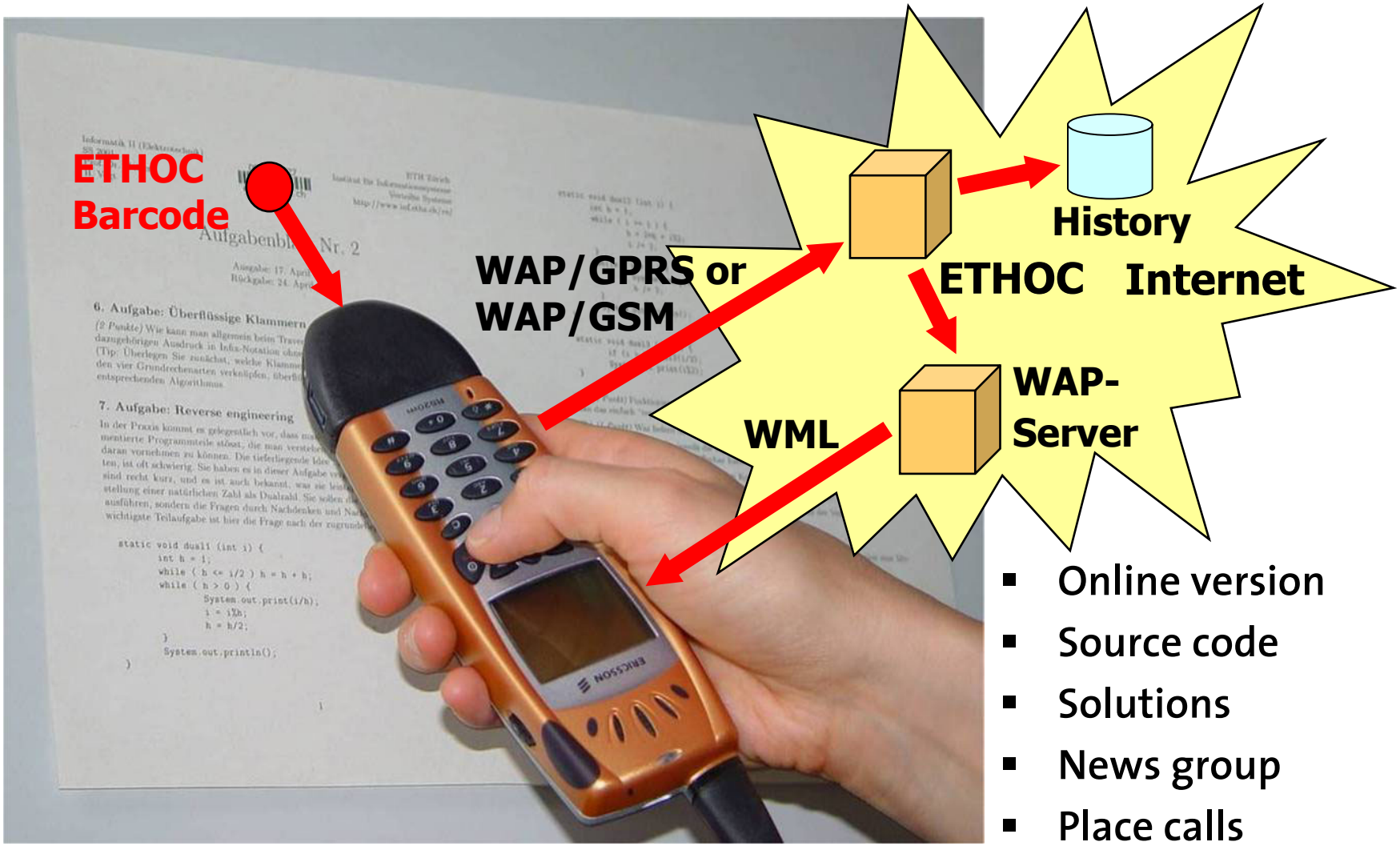








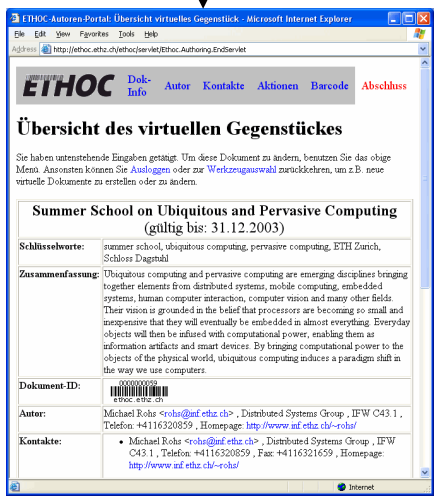
Data and Event Flow



- Online version
- Source code
- Solutions
- News group
- Place calls

Usage Scenario

Descriptions, Pictures, Date, Address



For a description of the usage scenario, please see:

Michael Rohs, Jürgen Bohn: *Entry Points into a Smart Campus Environment – Overview of the ETHOC System*. Proc. 23rd International Conference on Distributed Computing Systems - Workshops (ICDCS 2003 Workshops). Available at: http://www.inf.ethz.ch/vs/publ/papers/ethoc.pdf

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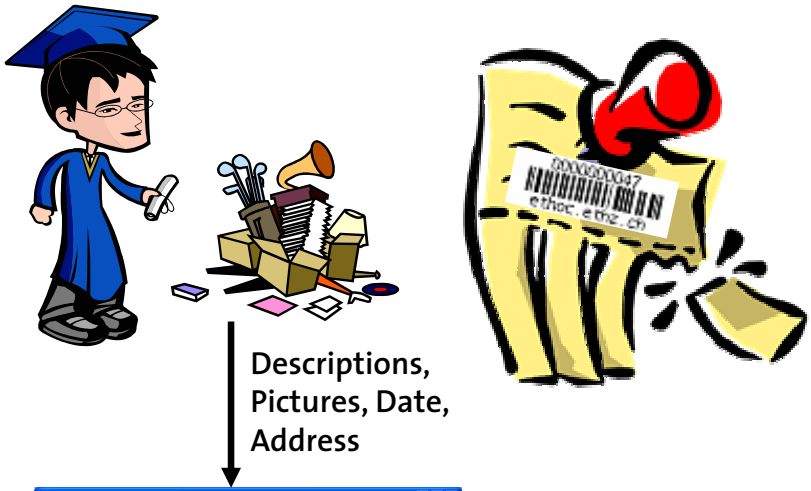

Usage Scenario

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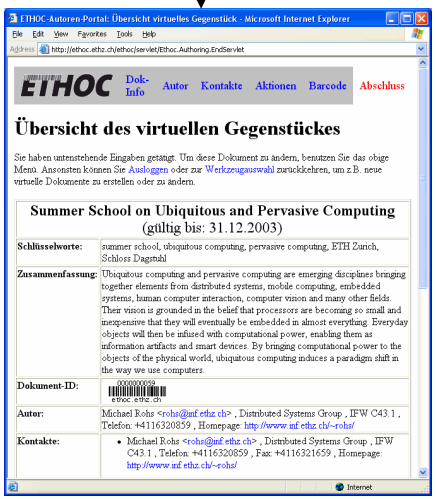

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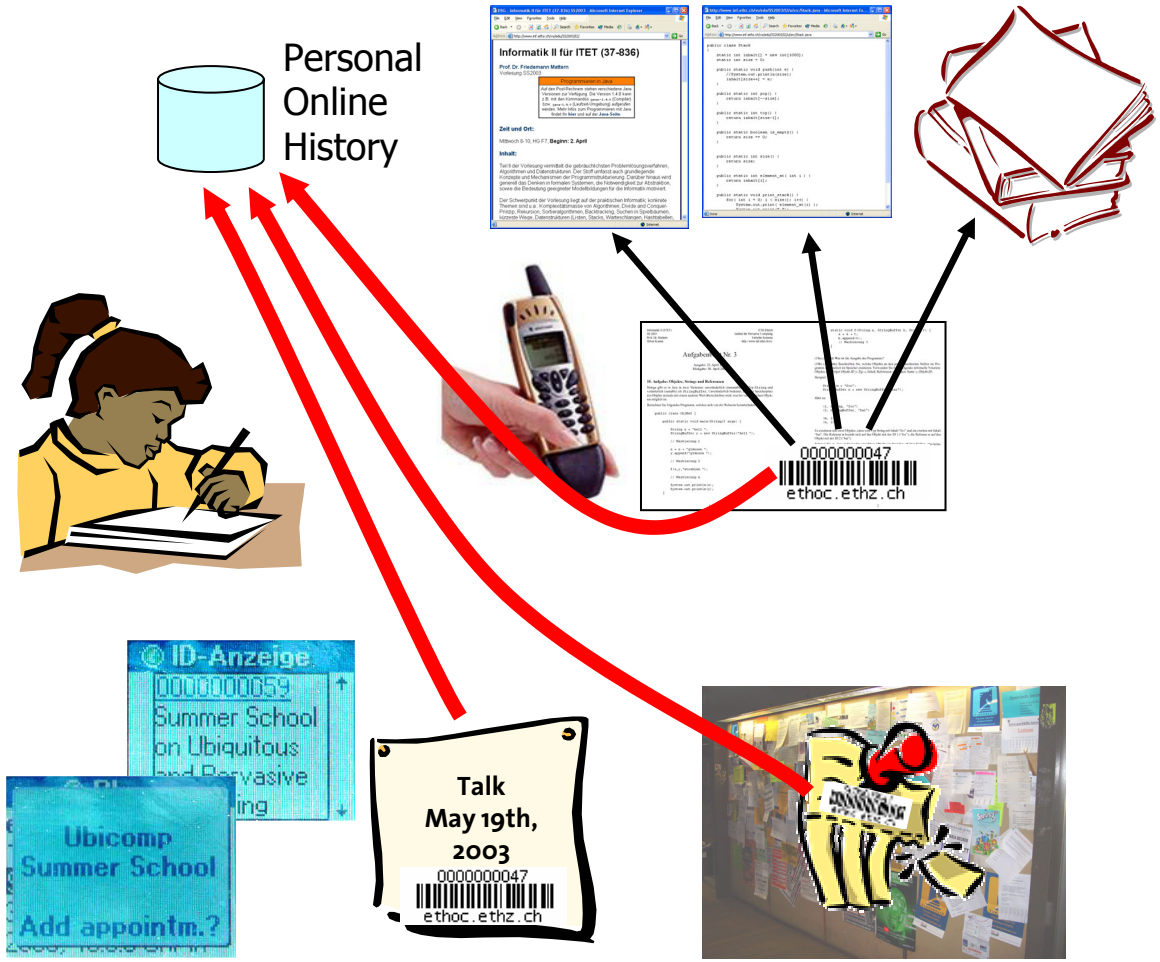

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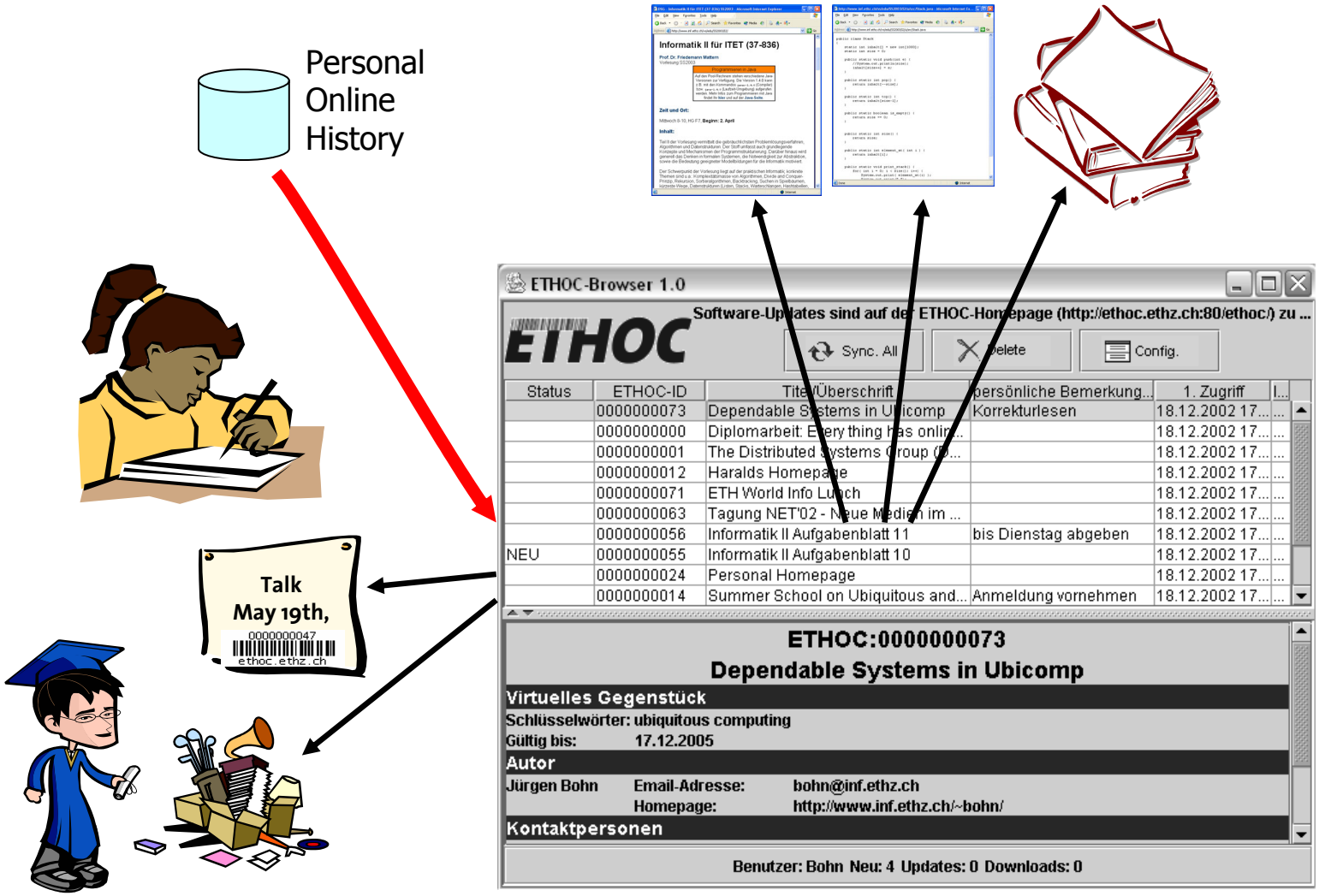
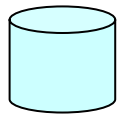


Device Capabilities

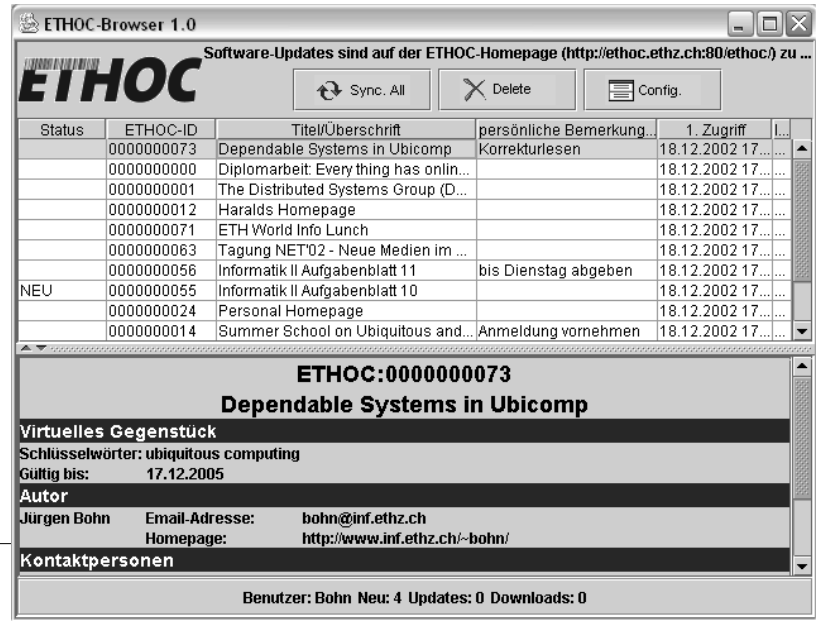
- Devices complement each other
  - Mobile device
    - Small-sized, always carried by user
    - Short interaction time for „picking up“ information in the originating context
    - In context, but severely limited display capabilities
  - Personal online history
    - Connecting element
  - Stationary device
    - Out of context, but better display capabilities
    - ETHOC Browser

In context, but limited capabilities

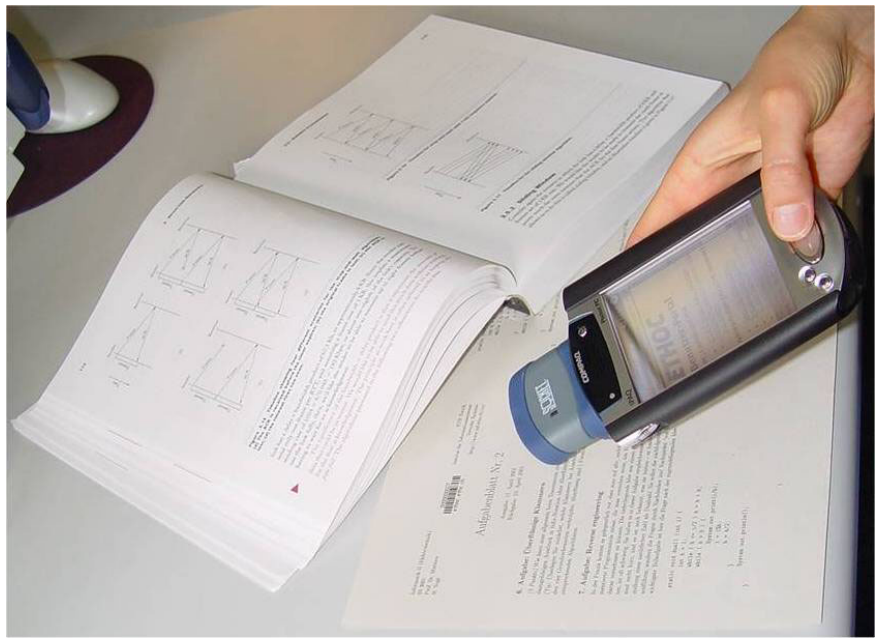


Online History

Out of context, but rich UI



Usage Experience



- ETHOC tested in an undergraduate lecture
  - Embed ETHOC codes in exercise sheets
  - Provide source code fragments
  - Exemplary solutions
  - News group for discussing specific exercises
- Preliminary, no day-to-day usage
  - Lack of barcode reader devices for every student

Summary

- University campus offers interesting experimental application environment for ubicomp paradigm
  - Involvement of a well-defined user community
  - Evaluation of usage constraints and opportunities in a realistic setting
  - Focus on technologies that are readily available
- ETHOC system: “entry points” into virtual campus
  - Author interface for active involvement of ETH community members
  - Access with a variety of client devices
- Modularity, extensibility
  - Arbitrary real-world objects: design of virtual counterparts
  - Context-aware retrieval of online context (user’s role, language, location)

Thank You!

- Email
  - rohs@inf.ethz.ch
- Entry Points Project
  - www.ethworld.ch/nw/projects/details/137/
- ETHOC Web Portal
  - ethoc.ethz.ch