

ETHOC: Entry Points into a Smart Campus Environment

RESEARCH GROUP FOR

*Distributed
Systems*

Jürgen Bohn, Michael Rohs
Institute for Pervasive Computing
Swiss Federal Institute of Technology, ETH Zürich

May 19, 2003

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

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

- **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...**

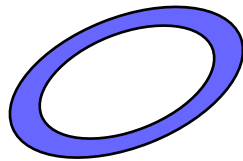
Not Just a Virtual Space

- 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

virtual world
(virtual campus, ETH World)

virtual
counterpart



physical
hyperlink



entry
point



real world
(physical campus)

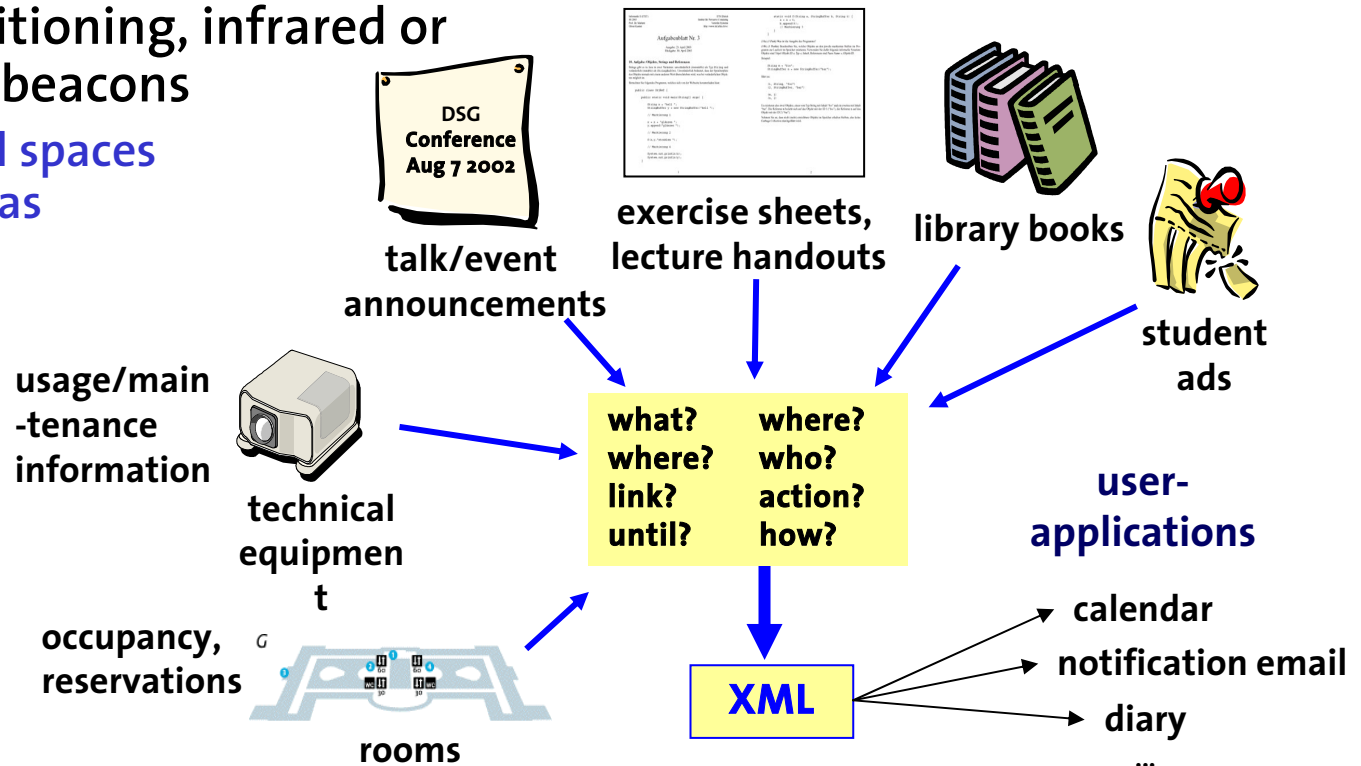
- Make virtual campus visible and accessible within physical campus
- Information associated and collocated with physical entities
 - Act as information anchors
 - Partition information space
 - Provide opportunities for interaction with the information space

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

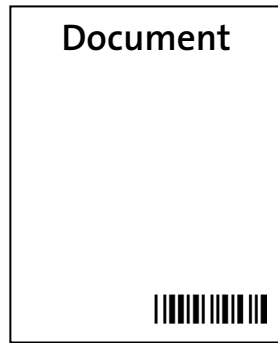


- Responsive objects
 - an object tells something about itself
 - e.g., by displaying a dynamically generated homepage
- Content
 - depends on factors such as context, location and privileges



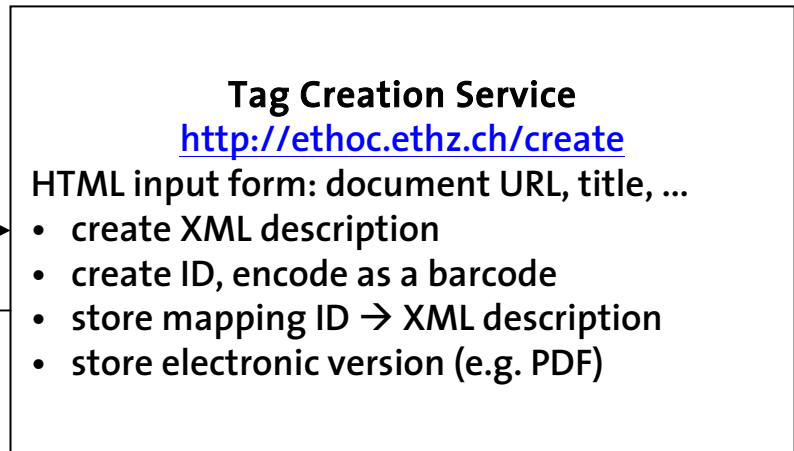
Supporting Tagged Artifacts

• Creation



PDF version; document URL,
title, time, place, validity
period, action, ...

XML description,
barcode (eps, gif, wmf)

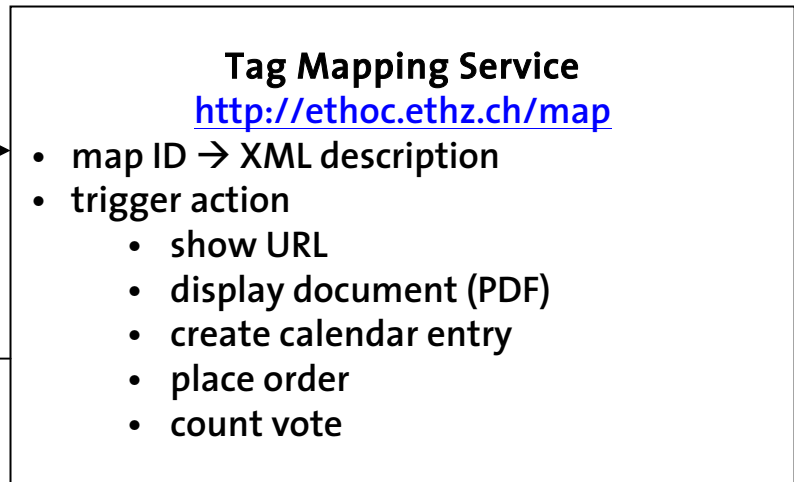


• Usage



scan barcode

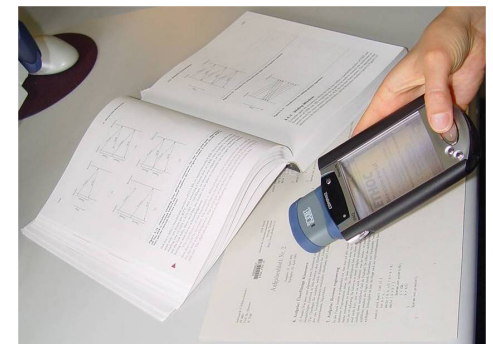
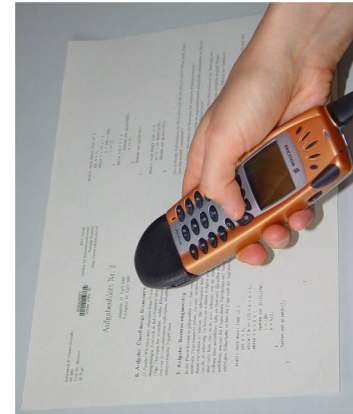
trigger action, as specified
in XML description



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-Autoren-Portal: Übersicht virtuelles Gegenstück - Microsoft Internet Explorer

Address: http://ethoc.ethz.ch/ethoc/servlet/Ethoc.Authoring.EndServlet

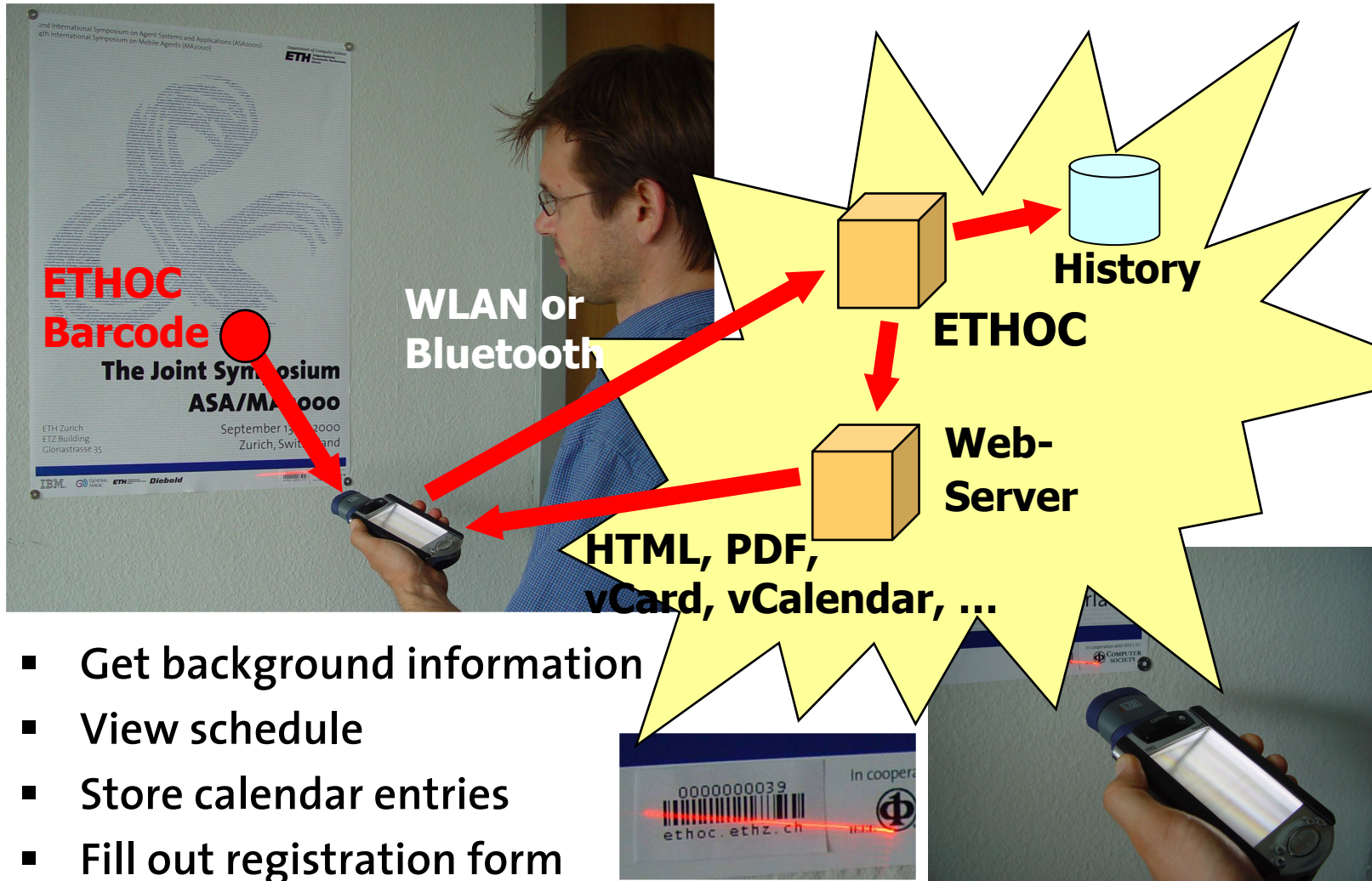
ETHOC Dok-Info Autor Kontakte Aktionen Barcode Abschluss

Übersicht des virtuellen Gegenstückes

Sie haben untenstehende Eingaben getätigt. Um diese Dokument zu ändern, benutzen Sie das obige Menü. Ansonsten können Sie [Ausloggen](#) oder zur [Werkzeugauswahl](#) zurückkehren, um z.B. neue virtuelle Dokumente zu erstellen oder zu ändern.

Summer School on Ubiquitous and Pervasive Computing (gültig bis: 31.12.2003)	
Schlüsselworte:	summer school, ubiquitous computing, pervasive computing, ETH Zurich, Schloss Dagstuhl
Zusammenfassung:	Ubiquitous computing and pervasive computing are emerging disciplines bringing together elements from distributed systems, mobile computing, embedded systems, human computer interaction, computer vision and many other fields. Their vision is grounded in the belief that processors are becoming so small and inexpensive that they will eventually be embedded in almost everything. Everyday objects will then be infused with computational power, enabling them as information artifacts and smart devices. By bringing computational power to the objects of the physical world, ubiquitous computing induces a paradigm shift in the way we use computers.
Dokument-ID:	0000000059  ethoc.ethz.ch
Autor:	Michael Rohs < rohs@inf.ethz.ch >, Distributed Systems Group, IFW C43.1, Telefon: +4116320859, Homepage: http://www.inf.ethz.ch/~rohs/
Kontakte:	<ul style="list-style-type: none">• Michael Rohs <rohs@inf.ethz.ch>, Distributed Systems Group, IFW C43.1, Telefon: +4116320859, Fax: +4116321659, Homepage: http://www.inf.ethz.ch/~rohs/

ETHOC Client Interfaces

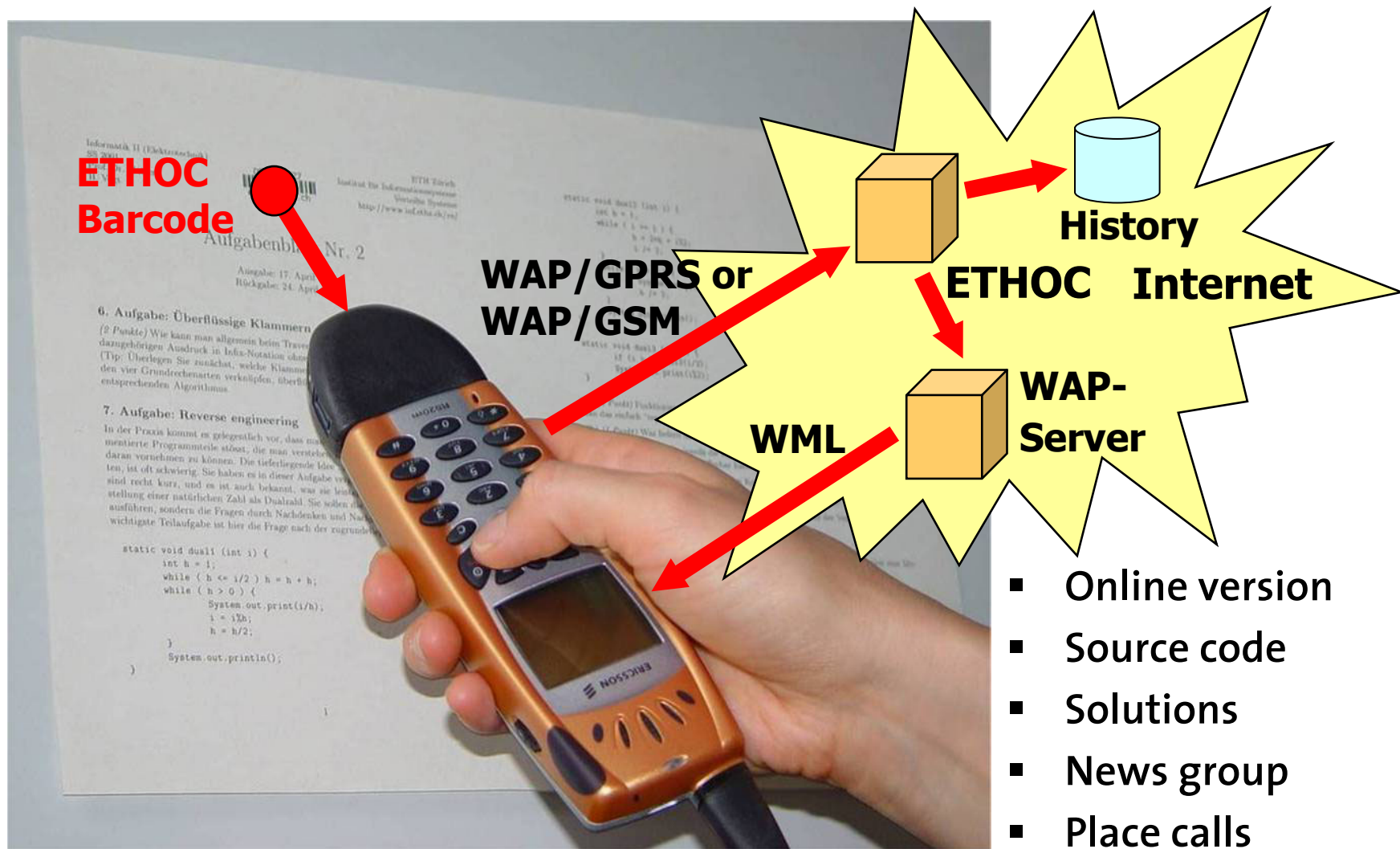


- Get background information
- View schedule
- Store calendar entries
- Fill out registration form

Access via WAP/WML



Data and Event Flow



Usage Scenario



Descriptions,
Pictures, Date,
Address



ETHOC-Autoren-Portal: Übersicht virtuelles Gegenstück - Microsoft Internet Explorer

File Edit View Favorites Tools Help

http://ethoc.ethz.ch/ethoc/see/Virt/Ethoc_Authoring_Erstellung

ETHOC Dok-Info Autor Kontakte Aktionen Barcode Abschluss


Übersicht des virtuellen Gegenstückes

Sie haben untenstehende Eingaben geteigt. Um diese Dokument zu ändern, benutzen Sie das obige Menü. Ansonsten können Sie Analogien oder zur Werkzeugauswahl durchklicken, um z.B. neue virtuelle Dokumente zu erstellen oder zu ändern.

Summer School on Ubiquitous and Pervasive Computing
(gültig bis: 31.12.2003)

Schlüsselworte: summer school, ubiquitous computing, pervasive computing, ETH Zurich, Schloss Dagstuhl

Zusammenfassung: Ubiquitous computing and pervasive computing are emerging disciplines bringing together elements from distributed systems, mobile computing, embedded systems, human computer interaction, computer vision and many other fields. Their vision is grounded in the belief that processors are becoming so small and inexpensive that they will eventually be embedded in almost everything. Everyday objects will then be infused with computational power, enabling them as information artifacts and smart devices. By bringing computational power to the objects of the physical world, ubiquitous computing induces a paradigm shift in the way we use computers.

Dokument-ID:  ethoc.ethz.ch

Autor: Michael Rohs <roh@inf.ethz.ch>, Distributed Systems Group, IFW C43.1, Telefon: +4116320859, Homepage: <http://www.inf.ethz.ch/~roh/>

Kontakte:

- Michael Rohs <roh@inf.ethz.ch>, Distributed Systems Group, IFW C43.1, Telefon: +4116320859, Fax: +4116321659, Homepage: <http://www.inf.ethz.ch/~roh/>

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>

Usage Scenario



Descriptions,
Pictures, Date,
Address



ETHOC Dok-Info Autor Kontakte Aktionen Barcode Abschluss


Übersicht des virtuellen Gegenstückes

Sie haben untenstehende Eingaben geteilt. Um diese Dokumente zu ändern, benutzen Sie das obige Menü. Ansonsten können Sie Analogien oder zur Werkzeuggestaltung zurückkehren, um z.B. neue virtuelle Dokumente zu erstellen oder zu ändern.

Summer School on Ubiquitous and Pervasive Computing
(gültig bis: 31.12.2003)

Schlüsselworte: summer school, ubiquitous computing, pervasive computing, ETH Zurich, Schloss Dagstuhl

Zusammenfassung: Ubiquitous computing and pervasive computing are emerging disciplines bringing together elements from distributed systems, mobile computing, embedded systems, human computer interaction, computer vision and many other fields. Their vision is grounded in the belief that processors are becoming so small and inexpensive that they will eventually be embedded in almost everything. Everyday objects will then be infused with computational power, enabling them as information artifacts and smart devices. By bringing computational power to the objects of the physical world, ubiquitous computing induces a paradigm shift in the way we use computers.

Dokument-ID: 
ethoc.ethz.ch

Autor: Michael Rohs <roh@mif.ETHZ.CH>, Distributed Systems Group, IFW C43.1, Telefon: +4116320859, Homepage: <http://www.inf.ethz.ch/~roh/>

Kontakte:

- Michael Rohs <roh@mif.ETHZ.CH>, Distributed Systems Group, IFW C43.1, Telefon: +4116320859, Fax: +4116321659, Homepage: <http://www.inf.ethz.ch/~roh/>

Usage Scenario



Descriptions,
Pictures, Date,
Address


ETHOC Dok-Info Autor Kontakte Aktionen Barcode Abschluss

Übersicht des virtuellen Gegenstückes

Sie haben unterstützende Eingaben getätigt. Um diese Dokumente zu ändern, besitzen Sie das obige Menü. Ansonsten können Sie Analogien oder zur Werkzeugauswahl zurückkehren, um z.B. neue virtuelle Dokumente zu erstellen oder zu ändern.

Schlüsselworte: summer school, ubiquitous computing, pervasive computing, ETH Zurich, Schloss Dagstuhl

Zusammenfassung: Ubiquitous computing and pervasive computing are emerging disciplines bringing together elements from distributed systems, mobile computing, embedded systems, human computer interaction, computer vision and many other fields. Their vision is grounded in the belief that processors are becoming so small and inexpensive that they will eventually be embedded in almost everything. Everyday objects will then be infused with computational power, enabling them as information artifacts and smart devices. By bringing computational power to the objects of the physical world, ubiquitous computing induces a paradigm shift in the way we use computers.

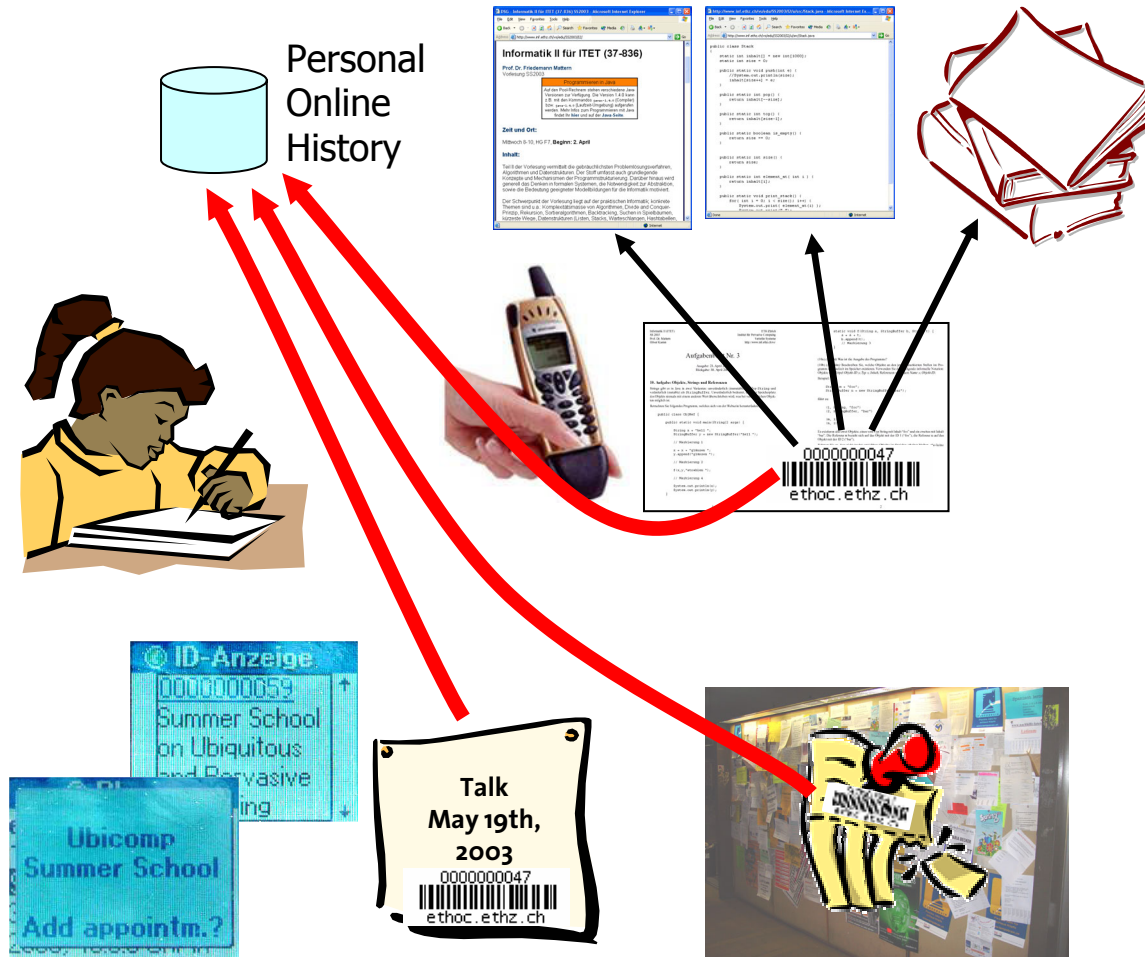
Dokument-ID: 

Autor: Michael Rohs <rohs@inf.ethz.ch>, Distributed Systems Group, IFW C43.1, Telefon: +4116320859, Homepage: <http://www.inf.ethz.ch/~rohs/>

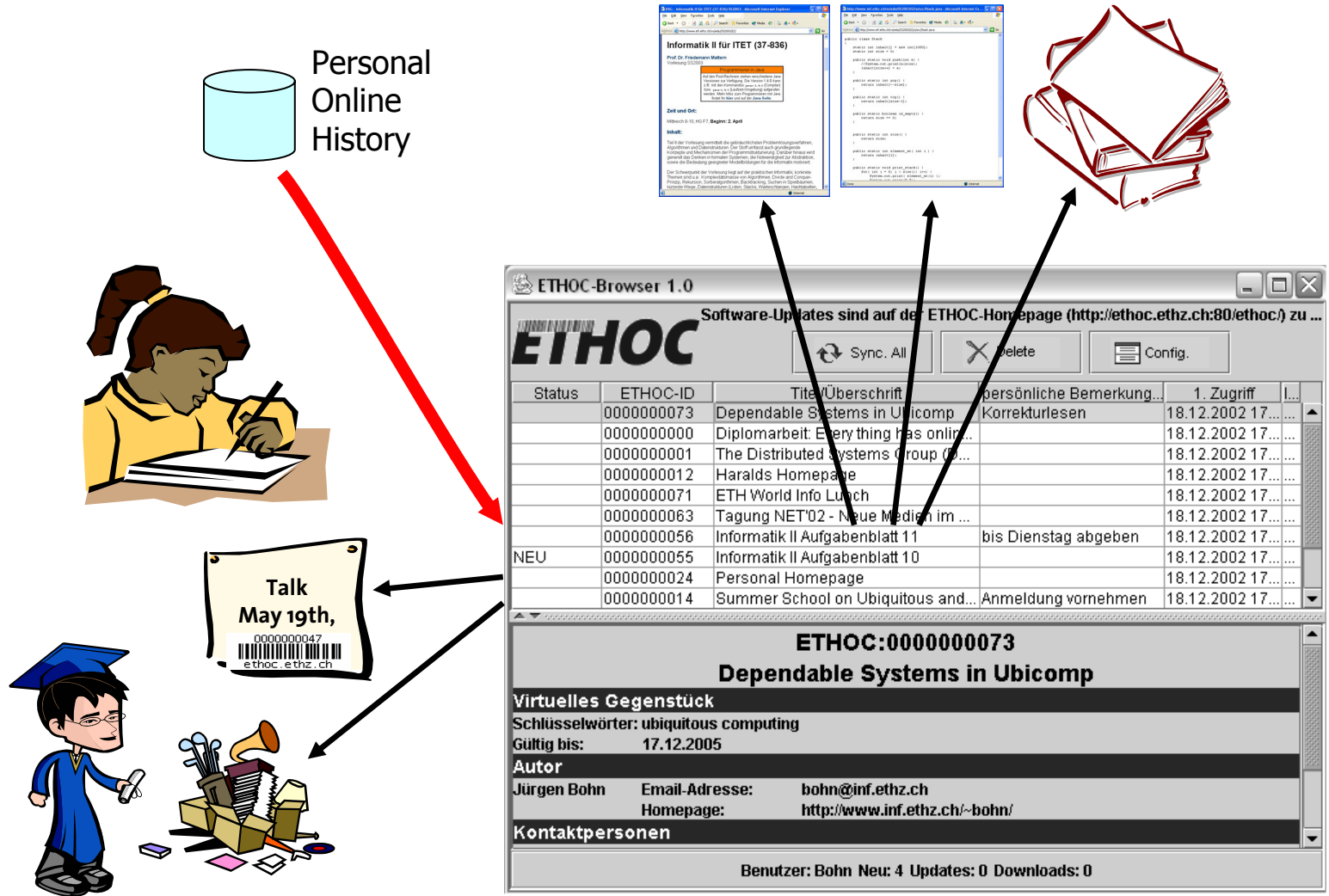
Kontakte:

- Michael Rohs <rohs@inf.ethz.ch>, Distributed Systems Group, IFW C43.1, Telefon: +4116320859, Fax: +4116321659, Homepage: <http://www.inf.ethz.ch/~rohs/>

Usage Scenario



Usage Scenario



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**

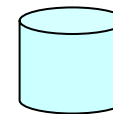
- Connecting element

- **Stationary device**

- Out of context, but better display capabilities
 - ETHOC Browser



In context,
but limited
capabilities



Online
History

Out of context,
but rich UI

ETHOC-Browser 1.0

Software-Updates sind auf der ETHOC-Homepage (<http://ethoc.ethz.ch:80/ethoc/>) zu ...

ETHOC [Sync. All] [Delete] [Config.]

Status	ETHOC-ID	Titel/Überschrift	persönliche Bemerkung...	1. Zugriff	...
	0000000073	Dependable Systems in Ubicomp	Korrekturlesen	18.12.2002 17...	...
	0000000000	Diplomarbeit: Every thing has onlin...		18.12.2002 17...	...
	0000000001	The Distributed Systems Group (D...		18.12.2002 17...	...
	0000000012	Haralds Homepage		18.12.2002 17...	...
	0000000071	ETH World Info Lunch		18.12.2002 17...	...
	0000000063	Tagung NET'02 - Neue Medien im ...		18.12.2002 17...	...
	0000000056	Informatik II Aufgabenblatt 11	bis Dienstag abgeben	18.12.2002 17...	...
NEU	0000000055	Informatik II Aufgabenblatt 10		18.12.2002 17...	...
	0000000024	Personal Homepage		18.12.2002 17...	...
	0000000014	Summer School on Ubiquitous and...	Anmeldung vormehmen	18.12.2002 17...	...

ETHOC:0000000073
Dependable Systems in Ubicomp

Virtuelles Gegenstück
Schlüsselwörter: ubiquitous computing
Gültig bis: 17.12.2005
Autor
Jürgen Bohn Email-Adresse: bohn@inf.ethz.ch
Homepage: http://www.inf.ethz.ch/~bohn/
Kontaktpersonen

Benutzer: Bohn Neu: 4 Updates: 0 Downloads: 0

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