

Softwareprojekt Mobilkommunikation

Summer 2009



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Structure and Content of CST Lectures

⑧
⑥

Praktikum Mobilkommunikation

Medienzugriff, Mobile IP, Mobiles Web

⑦
+

Embedded Sensor Web

Projekte rund um Sensornetze

⑥
+

Seminar Technische Informatik

Forschung in Mobilkommunikation, eingebettete Systeme, Internet

⑧
⑥

Mobilkommunikation

Drahtlose Übertragung, Medienzugriff, GSM, 3G, WLAN, Mobile IP, Ad-hoc-Netze, WAP

⑦

Embedded Internet

Protokolle, Dienste, Internet, TCP/IP, Betriebssysteme für eingebettete Systeme

⑦
⑤

Mikroprozessorpraktikum

Programmierung eingebetteter Systeme, mobile Endgeräte, Mikrocontroller, Steuerungssysteme

⑤

Telematik

Protokolle, Dienste, Standards, LAN, Internet, TCP/IP, WWW, Sicherheit, ISDN/IN/ATM, Dienstgüte, Multimedia, IPv6, MPLS

④ Semester
□ Bachelor
□ Master

④

Praktikum Technische Informatik (TI IV)

Eingebettete Systeme, Schnittstellen, Treiber, Betriebssystem – programmieren, vernetzen, interagieren

③

Betriebs- und Kommunikationssysteme (TI III)

Ein-/Ausgabe, DMA/PIO, Unterbrechungen, Puffer, Prozesse/Threads, UNIX/Windows, Netze, Medienzugriff, Protokolle, TCP/IP, Internet

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Rechnerarchitektur (TI II)

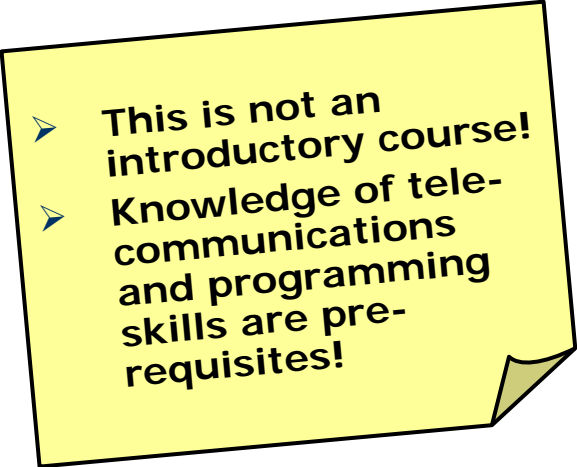
Harvard/v. Neumann, Mikroarchitektur, RISC/CISC, VLIW, Pipelining, Cache, Speicherhierarchie, Assembler, Multiprozessorsysteme

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Grundlagen der Technischen Informatik (TI I)

Schaltnetze, Schaltwerke, Logikminimierung, Gatter, Speicher, Halbleiter, Transistoren, CMOS, AD/DA-Umsetzer

- Goals:
 - Conduct **hands-on research** on exemplary topics from the field of mobile communications
 - Gain experience doing **real project work** (possibly with industry feedback)
 - Code up something relevant on **state-of-the-art platform**
- Participants have to ...
 - dig into the foundations of wireless communication techniques,
 - learn how to work with them, and
 - become acquainted with the advantages and flaws of current and upcoming technologies.
- Focus of *this* course:
 - Software architecture for mobile devices
 - Design, implement and evaluate state-of-the-art application using frameworks for distributed application development



➤ This is not an introductory course!
➤ Knowledge of telecommunications and programming skills are pre-requisites!

General:

- Class
 - Thursday, 14:00-18:00h, Room K60, Takustr. 9
 - Starts 16.4.09, ends 16.7.09
 - No class on 21.5.09
- Work in smaller groups
 - Up to you to schedule
 - Course is designed for 150h of work per person
 - 10 ECTS credits, 15h per credit
 - *Only 37% of work done in class!*
- Participation restricted due to available facilities (...)

(Irregular) Assignments:

- There will be irregular assignments, e.g.
 - Read up on background technology
 - Give a brief talk on a specific project-related question
 - Demo your current progress
 - Conduct performance evaluation
 - Write test cases, documentation, use case examples, ...
 - Assignments reflect aspects of project work other than programming
- Office Hours
 - Just in or after class
- News and Updates
 - <http://cst.mi.fu-berlin.de/>

Two main criteria:

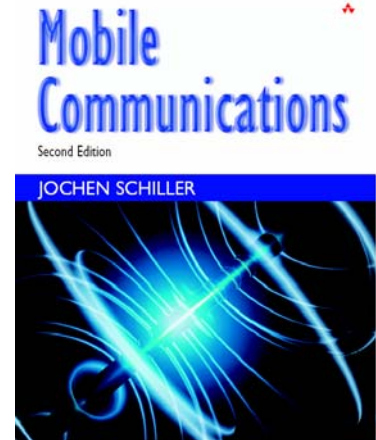
1. Regular participation in class

- Minimum **n-2 times** present

2. Active participation

- **Actively participate** in project work
 - Volunteer for a reasonable number of assignments
-
- Participation/assignments will be tracked on course webpage
 - *Tell me if I missed something you did!*

- Lecture Notes:
 - Telematics / Mobile Communications
 - Sold for € 5,- at secretary's office (room 155)



- Books:
 - Larry L. Peterson, Bruce S. Davie: Computernetze - Eine systemorientierte Einführung, 3. Auflage. dpunkt Verlag, Heidelberg, April 2004, ISBN-13: 978-3-89864-242-2.
 - Jochen Schiller: Mobilkommunikation, 2. Auflage. Pearson Studium, Mai 2003, ISBN: 978-3-8273-7060-0.
- Research Papers:
 - Various, available online, specified as course progresses

Softwareprojekt Mobilkommunikation

Introduction and Project Description

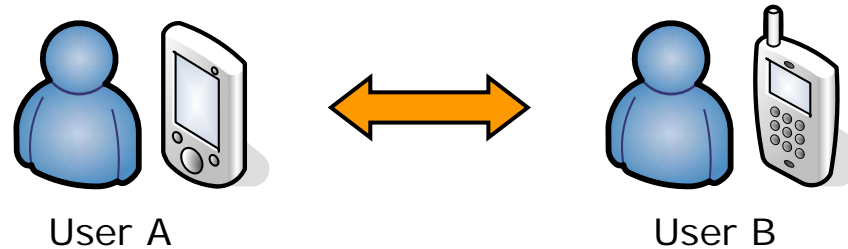
- Ad hoc Networking
- Push Service for Mobile Devices
- P2P / Push Services
- Google Android Platform



- Ad hoc network: Networking without infrastructure
- Different scenarios emphasize different aspects of ad hoc networking:
 - Mesh networks – Routing, backbone services (mostly IP)
 - Vehicular networks – Mobility, changing topology
 - Sensor networks – Highly embedded, constrained resource
- Big topics (mostly solved):
 - PHY/MAC, e.g. 802.11 in ad hoc mode
 - Routing, e.g. proactive vs. reactive (vs. domain specific) protocols

➤ *Killer application?*

Use Case #1 (Address Book)



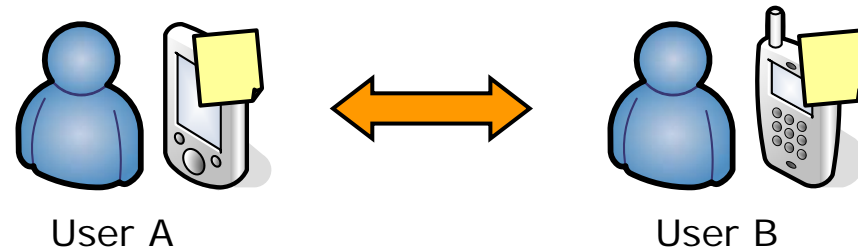
Setup:

- User A gives ID# of his user profile (stored on PDA) to user B
- User B adds user A's profile to address book of his mobile phone by entering ID#
- User A authorizes user B's access to his profile
- User A's profile is now part of address book on user B's mobile phone

Benefits:

- If user A changes his contact data in his profile, these changes propagate automatically to user B's address book.
- In case user B's mobile phone is switched off or disconnected, the data is synchronized at a later point.

Use Case #2 (Distributed Notes)



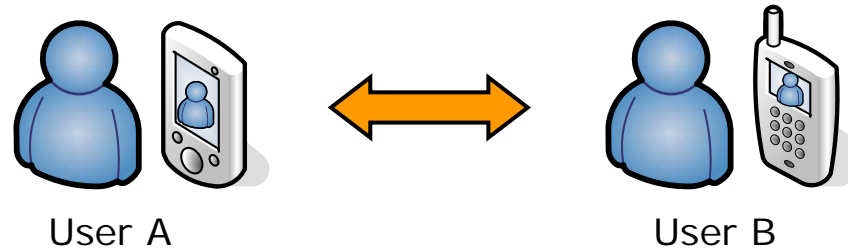
Setup:

- User A creates note on his PDA and generates ID# for publication
- User A gives ID# of note to user B
- User B accesses user A's note on his mobile phone by entering ID#
- User A authorizes user B's to access note
- User A's note is now accessible on user B's mobile phone

Benefits:

- If user A or user B make changes to the note, these changes propagate automatically to the other copies of the note.
- In case a device is switched off or disconnected, the data synchronized at a later point.

Use Case #3 (Real-time Pictures)



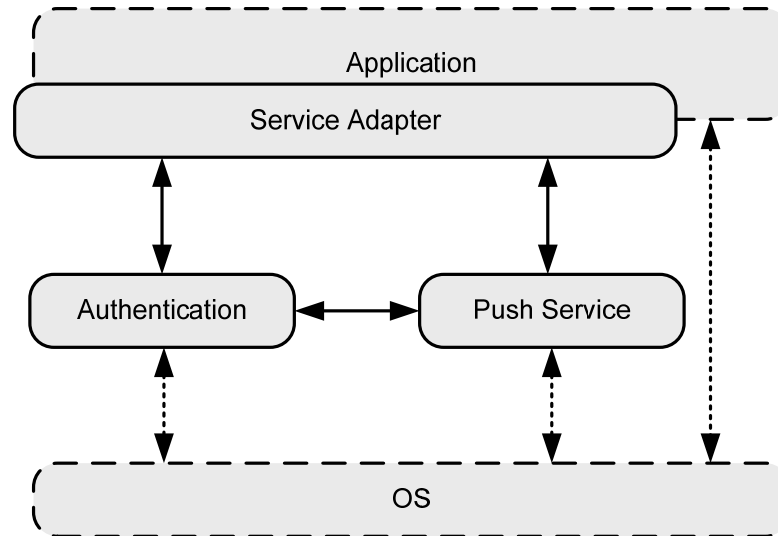
Setup:

- User A and B have shared their profiles as described above
- User A takes picture of himself and adds it to his profile
- Picture appears next to user A's entry in user B's address book
- 3. User B may select whether he wants to be notified whenever user A's picture changes or whether this should happen in background

Benefits:

- Shared content may include multi-media data.
- Synchronization works in real-time whenever connected.

- Push Service for Mobile Devices

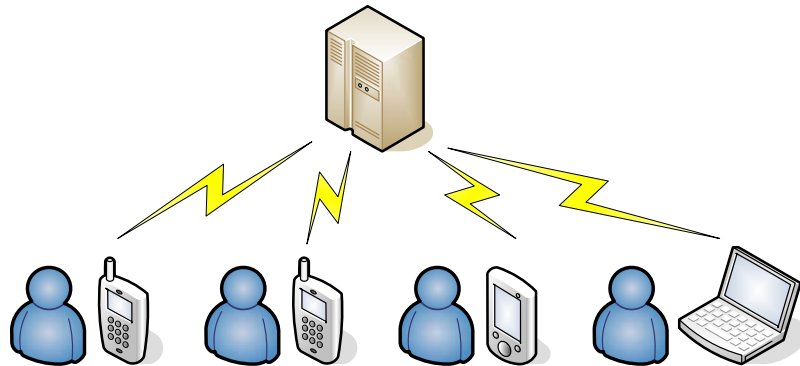


- Components:

- Push Service: Share data items between mobile devices
- Authentication Module: Control access to shared data items
- Service Adapter: Integrate service into applications

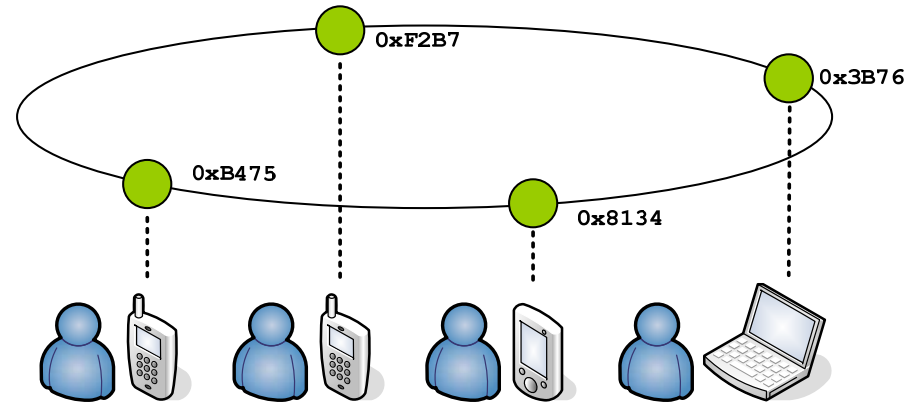
Networking Aspects

- Client/Server vs. P2P for Push Services



Client/Server

- Pro: Ease of implementation
- Contra: Single point of failure, provider controlled service



Peer-to-Peer

- Pro: Naturally matches application, no central control
- Contra: Requires end-to-end connectivity, Complexity (e.g. cryptography)

➤ We start with client/server and expand to P2P later on.



Google Android Platform

Android:

- Software stack for mobile devices
- Includes operating system, middleware and key applications



Android SDK:

- Managed code in Java language
- Device control via Google-developed Java libraries
- Development tools
 - Debugger / Libraries
 - QEMU-based handset emulator
 - Documentation, samples, tutorials, ...
- Supported development platforms
 - Linux (any modern distribution)
 - Mac OS X 10.4.8 or later
 - Windows XP or Vista
- Eclipse (≥ 3.2 supported IDE)
 - Android Development Tools (ADT) Plug-in
 - Command line tools available

Next Steps

Lightening talks (max. 10 mins, ca. 5 slides, *to the point*):

- Talk #1 (Oliver K., Michael D.): Introduction to Android
 - Talk #2 (Adrian A., Carlos D.): Android Simulator / Hello World
 - Talk #3 (Thilo M., Karsten G.): Android Java Specifics / Basic IO
 - Talk #4 (Silke R., Alexander E.): Android API - Networking
 - Talk #5 (Lars R., Janosch K.): Android API - UI
 - Talk #6 (Christoph M., Anja C.): Peer-to-Peer
 - Talk #7 (W. Yu, L. AiQuan, Hans-Christoph S.): Version Control / SVN
 - Talk #8 (Till W., Ronald S.): Software Engineering
 - Talk #9 (Georg W.): Planning
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- Talks to be held during first part of class next week (23.4.)
 - Slide template at <http://www.fu-berlin.de/cd/>
 - Final version of slides due on 21.4. (noon)!