Mobile Middleware Course

Introduction and Overview

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Lecture Outline

- 3 credit course + 2 credits for an optional assignment
- 13.3. Introduction and overview.
- 20.3. Mobile platforms.
- 27.3. Mobile platforms continued.
- 3.4. Support technologies.
- 10.4. Principles and patterns.
- 17.4. Applications and service case studies.
- 20.4. Summary and Discussions

Exam: 7.5. 16-19
Assignment

- Optional 2 credits
- Deadline for returning the assignment 16.5.
- Start with 1-2 page description
- 2-3 person groups
- Android, iPhone, WP7

Final submission:
- Demo 20.4. or 16.5.
- 2-3 page final report, sources, binaries, compilation and running instructions
Course Book

- Mobile Middleware – Architecture, Patterns, and Practice published by Wiley
  - Publication date 27.3.2009

- Several papers to read including a summary of the course
Motivation

- Mobile computing has become one of the breakthrough technologies of today
  - Over 4 billion mobile phones in use
  - 25 billion downloads from Apple Appstore
  - Current trend is converged communications
  - Web resources integrate seamlessly with mobile systems
  - Mobile systems are increasingly dependent on software

- We give a comprehensive overview of mobile middleware technology
Mobile software

- Mobile software is a growing area
  - Development processes, tools, APIs are crucial for the ecosystem
  - Integration with Web resources
- Key applications
  - Voice
  - Multimedia
  - Messaging
  - Web sites, mashups, services
  - Location-based services
- Forthcoming features
  - Context-awareness, adaptability, smart spaces
  - Internet of Things
Mobile Evolution

- **1st generation (1990-1999)**
  - Text messages (SMS) and mobile data. Speeds up to tens of Kbps.

- **2nd generation (1999-2003)**
  - Limited browsers, WAP, iMode, and MMS. Speeds up to 144Kbps.

- **3rd generation (2003-2008)**
  - Mobile platforms, middleware services. Series 60, J2ME, Android, iPhone. Speeds up to several Mbps.

- **4th generation (2008-)**
  - Adaptive services, user interfaces, and protocols. Context-awareness, always-on connectivity. Speeds up to hundreds of Mbps.
  - Emergence of app stores.
  - Versatile devices: smartphones, pads.
  - Cloud-assisted applications with social networks.
Monophonic  Polyphonic  Master tones  Music clips  Music downloads  Full music streaming  Full music and video streaming  On-demand and streaming video  Advanced browsers  revenue

Stores and Web pages  WAP Ringtones  Portals  Social sites, media portals  AppStore

SMS ringtones, logos  WAP Ringtones  Portals  Social sites, media portals  AppStore
Toward Internet of Things

Global connectivity

1875 1900 1925 1950 1975 2000 2025

~0.5 Billion

7 Billion

Hundreds of Billions

Digital Society

Personal mobile

Places

People

Things

~0.5 Billion

7 Billion
Wireless Technologies

- Global System for Mobile (GSM),
- General Packet Radio Service (GPRS)
- Universal Mobile Telecommunications System (UMTS)
- Long Term Evolution (LTE)
- Wireless LAN (WLAN)
- Worldwide Interoperability for Microwave Access (WiMax)
- Ultra-wideband (UWB)
- Wireless Personal Area Network (WPAN)
- Bluetooth, Wibree
- RFID
Mobility in the Internet

- This topic pertains to mobility of
  - Networks
  - Hosts
  - Transport connections
  - Sessions
  - Objects (passive, active)
  - Services
  - Users

- Many solutions are needed on multiple layers
  - Link layer, network, transport, application
Users of Middleware

- **End user.** The goal of middleware is not to directly interact with the end users, but rather support the applications and services that are visible to the users. This means that middleware should provide sufficient APIs and mechanisms to cope with different kinds of failures and faults, and in general support enhanced usage experience.

- **Device Manufacturers.** Device manufacturers use middleware in order to provide extended features that interface with device drivers.

- **Internet Service Providers.** Internet service providers utilize middleware to monitor and administer the network.

- **Platform Providers.** Platform providers develop middleware platforms that integrate with different operating systems.

- **Application Service Providers.** Application service providers utilize middleware in order to facilitate application development and deployment in a scalable and secure manner.
Key Elements

- **Accessibility**
  - Resources are available and accessible for end users irrespective of the current location or where resources are located.

- **Reachability**
  - Resources should be available in any location. Reachability cannot be taken for granted in today’s dynamic environment.

- **Adaptability**
  - The environment is subject to changes. Mobile service usage needs to adapt to the operating environment.

- **Trustworthiness**
  - The various entities in the environment need to have certain level of trust that operations are carried out according to expectations (and contracts).

- **Universality**
  - Universal data access is one of the key reasons for the success of the Internet. This is a key element for the success of the mobile service ecosystem.