Mobile Middleware Course

Applications and Service Case Studies

Sasu Tarkoma

Reading

- Earl Oliver. A Survey of Platforms for Mobile Networks Research. SIGMOBILE Mobile Computing and Communications Review. October 2008.
- M. Jurmu, S. Boring, J. Riekki ScreenSpot: Multidimensional Resource Discovery for Distributed Applications in Smart Spaces. Mobiquitous 2008.
- Final exam: Wednesday 29.4. 16-19 in CK112

Contents

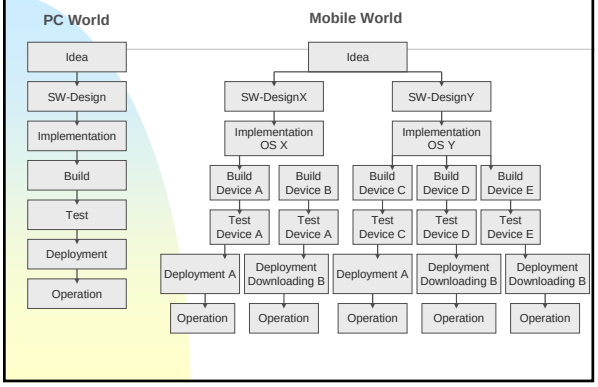
- Mobile Services
  - IMS, presence
  - Widgets
  - Location-based services and maps
  - Push email
  - Advertising
- Summary

Introduction

- Mobile software is a growing area
  - One billion downloads from iPhone AppStore
  - 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

Mobile Service Development

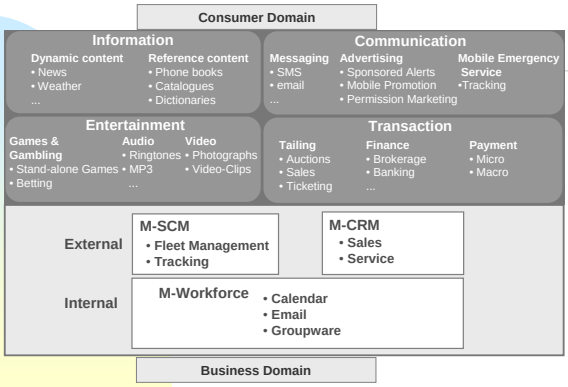
- The mobile landscape is fragmented
  - Heterogeneous device base
  - Many different wireless technologies
- The situation is challenging for the developer
  - Many APIs
  - Many middleware platforms
  - APIs evolve over time
- Current challenge of the industry pertains to improving the development processes



Properties of platforms

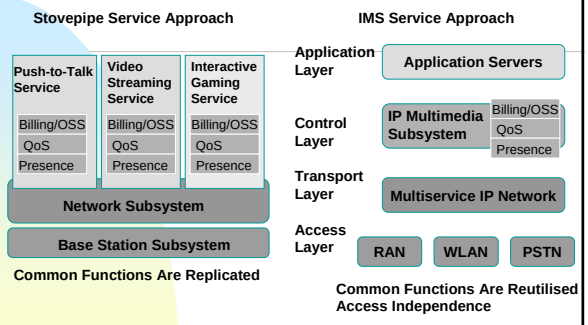
	Symbian C++/Python	Windows Mobile .NET	Android Linux, Java	iPhone Mac OS X SDK (locked)	Java ME (Symbian, device manufactu-rers)
Network scanning					
Network interface control					
Background processing					
Energy and power monitoring and control					
Memory management					
Persistent storage					
Location information					
SIP support					
Open Source					
Level of fragmentation					

Mobile Services Overview



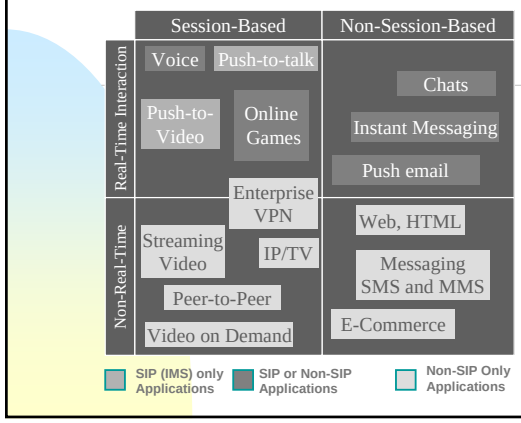
IMS Service Approach

- Stovepipe and IMS service models
  - Stovepipe has separate service stacks for particular services
  - IMS service model has common layers
- The **IP Multimedia Subsystem** Provides Multimedia Services Across Networks (fixed & mobile), such as:
  - Instant Messaging, Video Sharing, Push-To-Talk, Gaming, Video Conferencing
- IMS Uses SIP protocol To Setup Multimedia Sessions Over IP Network
- SIP is a signalling protocol to:
  - Locate user given SIP Universal Resource Identifier (URL) (e.g., sip:jane@isp.com)
  - Set up session and negotiate its parameters

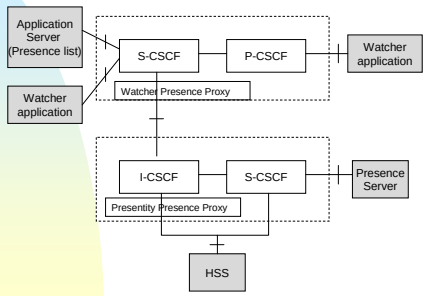


Network centric mobile application types

- Streaming Media
  - high jitter, low throughput
  - buffering, layered encoding
- Mobile Commerce
  - high latency, security
  - adaptive design, minimized comms.
- Pervasive Gaming
  - latency variations system
  - specific timeout values
- Web Browsing
  - low throughput, high load
  - phone caching,backoff algorithm



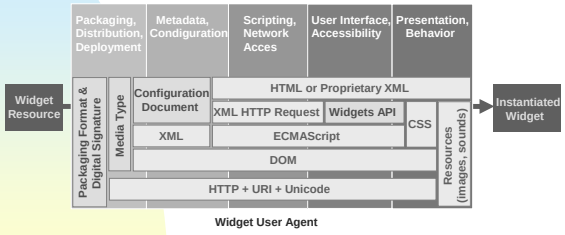
Presence



Widgets

- Widgets are lightweight Web applications
  - HTML, Cascading Style Sheets (CSS), RSS, Javascript, and AJAX
- Differences exist in:
  - the packaging format
  - the security model
  - the APIs
- WidSets is a simple service developed by Nokia that provides mobile users with information that is normally accessed via the Internet
  - WidSets is based on widgets that utilize RSS feeds to retrieve current information from the Web

W3C Widgets



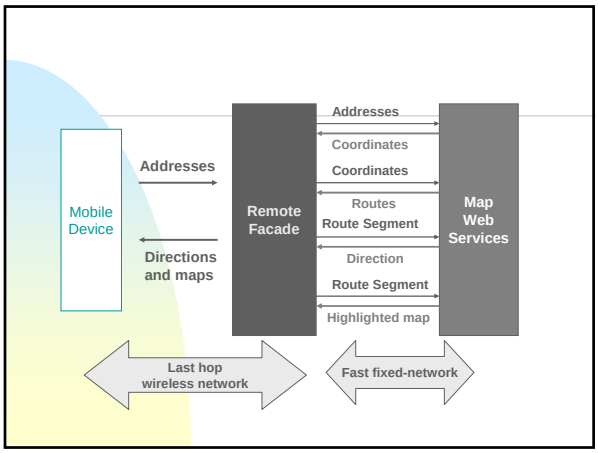
Location-based Services 1

- Location-based services are currently being introduced
  - GPS
    - 24 satellites 20 km above the Earth
    - 4 satellites are needed (at least 3)
  - A-GPS
    - Phone gets satellite information from the mobile network
    - Works indoors
  - Cell-id (one basestation, three basestations + known measurement point)
  - Indoor positioning

Location-based Services 2

- Geocoding: to calculate a location's latitude and longitude coordinates, including street addresses and intersections, street blocks, postal codes, …
- Reverse geocoding: to get location information given latitude and longitude
- Geotagging: to add map annotations

- Applications
  - Friend finding and communities
  - Dynamic content services
  - Pedestrian and city use
  - Outdoor and satellite maps
  - Alerts for traffic, POI, safety, speed alerts
  - Collaborative location-aware sensing



Email

- Simple Mail Transfer Protocol (SMTP) protocol for sending messages
- The Internet Message Access Protocol (IMAP) supports polling and notifications
- The server sends a notification to a client to inform that there is data available
- This allows flexible retrieval of messages and gives the client the control of whether or not to download new message data.

Mobile Push Email

- BlackBerry
- Microsoft DirectPush
- Apple iPhone OS 3.0

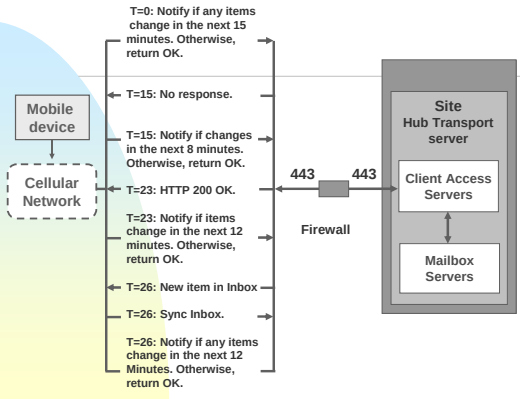
- Implementation
  - Custom server in access network
  - IMAP IDLE
  - Long-lived client-initiated connection
  - SIP (in the future?)

BlackBerry

- Blackberry devices have become popular among business users in part because they support desktop style email usage experience with almost instant delivery of messages
- Blackberry devices utilize a custom enterprise server that is connected to the traditional e-mail system
- The enterprise server monitors the e-mail server and then can pull new messages and send them to the Blackberry device using push over the wireless network

DirectPush

- Microsoft introduced the DirectPush Technology with Windows Mobile 6
- Mobile devices that support DirectPush utilize a long-lived HTTPS request to the Exchange server
- The Exchange server monitors activity on the users mailbox

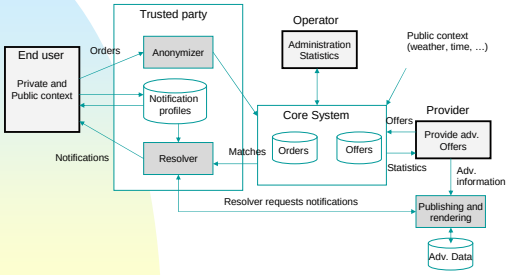


IMAP IDLE

- This solution relies on the existing IDLE (RFC 2177) command to provide instant e-mail notification on the client device
- The IDLE command is often used to signal the ability of a client to process notifications sent outside of a running command
- This can be used to provide a similar user experience to push

Mobile Advertisement Example

- The central entities are the end user, the trusted party, the operator, and the provider
- The trusted party manages end user profiles and anonymizes user profiles and other data so that other parties cannot determine user preferences
- The operator is responsible for running the core system that stores orders
- When an order and offer match, a notification is generated towards the end user
- The provider is the advertiser and responsible for the offers and providing advertisement information that can be then delivered to end users.



Revisiting Patterns 1/3

- Location Awareness.
  - Rendezvous and Synchronization are crucial. This can be achieved using a Remote Proxy pattern and the Connection patterns. The Remote Facade pattern is often applied to minimize the number of remote calls needed. Eager Acquisition can be used to anticipate future information needs.
- Mobile Server.
  - Reachability is vital in this application and it is achieved using the Client-initiated Connection, Remote Proxy, and Rendezvous patterns. Caching can be used at the Remote Proxy to improve performance.

Revisiting Patterns 2/3

- Mobile Advertisement.
  - This application requires a combination of patterns, namely Client-initiated connections, Rendezvous, Synchronization, Caching, Remote Proxy, and Broker.
  - The connections ensure reachability of the mobile terminals and allow to the advertisement system to synchronize advertisements and impressions with the mobile device (if they are stored on board).
  - Rendezvous is needed to keep track of the current location of the device. Remote proxy is needed to handle the connections. The Broker is used to provide indirection between different components in the system.

Revisiting Patterns 3/3

- Mobile Push Email. Reachability is vital also in this application scenario. This is achieved using the Client-initiated Connection, Remote Proxy, and Rendezvous patterns.
- Mobile Video. This application can utilize the Client-initiated Connection and Multiplexed Connection for enabling continuous media delivery to the client.
  - Video-on-demand can be Cached, and video stream buffering can be seen a variant of the Eager Acquisition pattern.
- Widgets. Widgets can employ a number of patterns, typically Remote Proxy and Broker are pertinent.
- Airline Services. This application case is similar to Mobile Server, Location Awareness, Mobile Advertisement, and Mobile Video.

Conclusions

- Mobile software is becoming mainstream
  - Appstores
  - Better tools and development environments
  - Integration with Web resources
- Challenges include
  - Fragmentation in its many forms
    - Devices, standards, implementations
  - Access to mobile APIs
  - Practical ubicomp deployment
  - Adaptation

Final Exam

- Wednesday 29.4. 16-19 in CK112
- Optional assignment as separate course
  - Assignment in Mobile Middleware
    - June-July, 2009
    - 2 credits