P2P Mobile Web Service Provisioning using SIP

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Overview

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• IP Multimedia Subsystem
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• Protocol/Middleware Architecture
• Service Creation
• Prototypical Implementation
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  – Example Applications
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• Conclusion
• Motivation
  – Realization and Provisioning of Mobile Peer-to-Peer (P2P) applications under the control of the IMS

• Problem
  – Implementation of various application layer protocols is time- and cost-intensive
  – Mobility support of P2P applications
  – Charging of P2P applications

• Solution
  – P2P Mobile Web Services (Client and Server on the mobile terminal)
  – Session Initiation Protocol (SIP) for Mobility, Presence, and Session Management
    → Integration in the IMS
Mobile P2P Web Services

• Sharing arbitrary applications by providing a Web Service interface
  – P2P → Mobiles are Web Service clients and servers at the same time
Mobile P2P Web Service Examples

• GPS Location Web Service
  – Locate a person of your contact list

• Cooperate Working
  – Share an application/document to work jointly with your colleagues

• Share your Blogs
  – Share your mobile Blog (diary) with your friends

• Play a Mobile P2P Game
  – Invite a contact to a P2P game
Initial State

- User with **different mobiles** connected to **various Radio Access Networks (RANs)** providing **different services**

- Events
  - Terminal Handover or simultaneous use (TH/SU)
  - Radio Access Network Handover (RH)
  - Service state changes

→ Using the IP Multimedia Subsystem with Web Services
Support of the IP Multimedia Subsystem (IMS)

- PDF: Policy Decision Function
- HSS: Home Subscriber Server
- CSCF: Call Session Control Function
- P-CSCF: Proxy-CSCF
- I-CSCF: Interrogating-CSCF
- S-CSFS: Serving-CSCF
- SGSN: Serving GPRS Support Node
- GGSN: Gateway GPRS Support Node
- CSCF: Call Session Control Function
- HLR: Home Location Register

Diagram:
- IMS network
- User terminals
- TH/SU (Terminal in Service/Subscription Update)
- RAN (Radio Access Network)
- WAN (Wide Area Network)
- PDF
- HSS
- CSCF
- P-CSCF
- I-CSCF
- S-CSFS
- SGSN
- GGSN
- HLR

Adr1: [Symbol]
Adr2: [Symbol]
• Sharing a single user identity between multiple terminals
  – IMS Rel. 6 allows to register with same public UID from a number of terminals
  – S-CSCF may perform forking
    • Sequential forking
    • Parallel forking
IP Multimedia Subsystem (IMS) - Overview

- IMS is an architecture to offer data services on the packet domain
- IMS is a standardized SIP-based overlay network
- IMS is access agnostic, integrates with existing voice and data networks
- IMS is a service enabler, not a service provider

**Application Layer**
- Content
- Value-added services

**Call / Session Control Layer**
- Call/Session Signalling
- Access Control
- Authentication/Authorization
- Mobility Management

**Connectivity Layer**
- Media Transport
- Media Manipulation

- AS, HSS
- Charging
- SIP, SDP, ..
- Diameter (AAA)
- MAGACO,
- IP connectivity
- CS telephony
Session Initiation Protocol (SIP)

Main Methods:
REGISTER, INVITE, BYE, CANCEL, ACK, OPTIONS, ...

Extension Methods:
SUBSCRIBE, NOTIFY, MESSAGE, ...

INVITE sip:jiplet@comnets.rwth-aachen.de SIP 2.0
Max-Forwards: 70
To: <sip:user1@comnets.rwth-aachen.de>
From: Jiplet <sip:jiplet@comnets.rwth-aachen.de>
Call-ID: SID007
CSeq: 1 INVITE
Subject: MPBlogger
Contact: sip:137.226.4.40:5060
Content-Type: application/sdp
Content-Length: 150
<<sdp information as body>>
CUA – Context User Agent (Extension of the SIP Presence User Agent)
Service Creation Process

A)
- Application already exists
- Exposing Programming Interface as Web Service
- Generate and Publish WSDL
- Register Service with a IMS Service ID

B)
- Define Service Interface (WSDL)
- Publish WSDL (e.g. in UDDI)
- Register Service with a IMS Service ID
- Initiate client development
Prototypical Implementation

• SIP Application Server
  - Including Call Session Control Functions
  - Presence and Context Management
  - Mobility Support and Session Management
  - Mobile Web Service Management

• J2ME application
  - SIP API (JSR180)
  - Web Service Engine (kSOAP + ComNets Extensions)
    • HTTP Server + SOAP server binding
    • UDP bindings + server
    • WAP binding
  - Example Mobile P2P applications offering Web Services
    • Mobile P2P Blog
    • Mobile P2P Chess
Mobility Support

Registration of user 1

User 2 changes his state (e.g. IP Adresse)

Accessing Web Service

Registration of user 2
Session Establishment

Accessing Web Service

Session Termination
Mobile P2P Chess

User Info
- Name: Guido Gehlen
- Country: Germany
- Note: I like to play chess.
- Network: GPRS / Free
- SIP Name: guge@comnets.rwth-aachen.de
- Options: Invite, Cancel, Clear Log, Exit

Options: Cancel

SIP
Mobile P2P Chess

P
N
B
R
Q
K

1
2
3
def
gh
g
h
j
k

Options Back

Options Back

SOAP

Pawn
Knight
Bishop
Rook
Queen
King
Performance Enhancements

Mean Round Trip Time (RTT) Measurement
Services deployed on ComNets Light-Weight SOAP Server and invoked via HTTP and reliable UDP transports for over 30 execution of each service
Conclusion

• Mobile P2P Web Service architecture based on SIP and IMS
  – Mobility Management
  – Session Management
  – Service Creation
  – Prototypical implementation
  – Performance Enhancements using alternative SOAP bindings
Thank you for your attention!

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Any questions?

... See you at the demonstration!