Lessons in Application Development

Adding VoIP & IP Communications on Android: A Case Study

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General Mobile App Issues

• Physical hardware differences
  – Display size
  – Input methods
  – Radio/network types

• Rapidly evolving OS versions
  – e.g. Android 1.0, 1.1, 1.5, 1.6, 2.0, 2.1 all in 18 months!

• Customization and extensions
  – New features & applications
  – Device OEM and Carrier requirements
Case Study:
D2’s mCUE UC/IP Comms Client on Android

Converged Contact List
- Integrated address book
- Multiple services / contact
- Presence for each service
- Push-to-x communications

Push-to-X Communications
- Txt Message: IM Chat or SMS
- Call: VoIP or Cell Call
- Video: Call/chat
- Email

Dialer
- mCUE or Android as primary dialer
- Complete integration w/ Android telephony stack
- Android apps can access mCUE resources

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### mCUE Integration Platforms

#### Diversity of Android Platforms

<table>
<thead>
<tr>
<th>Device</th>
<th>Processor Type</th>
<th>Platform</th>
<th>Connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTC G1</td>
<td>MSM-7201a</td>
<td>Android/Linux</td>
<td>GSM/3G/WiFi</td>
</tr>
<tr>
<td>HTC Hero</td>
<td>MSM-7201a</td>
<td>Android/Linux</td>
<td>GSM/3G/WiFi/WiMAX</td>
</tr>
<tr>
<td>ECS MID</td>
<td>OMAP3 3430</td>
<td>Android/Linux</td>
<td>WiFi/WiMAX</td>
</tr>
<tr>
<td>NETL Dev Platform</td>
<td>AU1300</td>
<td>Android/Linux</td>
<td>WiFi/Ethernet</td>
</tr>
<tr>
<td>TI Dev Platform</td>
<td>OMAP3 34/34xx</td>
<td>Android/Linux</td>
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</tr>
</tbody>
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OESF

- Open Embedded Software Foundation
  - Focused on expanding market reach for the Android platform
  - Target devices include:
    - MID, STB, Photo Frames, Media Phones, Navigation devices, Personal Media Player, ...
OESF Targeted Industries/Devices

- **STB Industry**
  - STB for CATV
  - Hotels, STB for kiosk
- **VoIP Industry**
  - Fixed IP-phone (business phone)
  - Intercom
  - FAX and other information communication devices
- **Home Electronics Industry**
  - Digital TV
  - DVR
  - Information appliance
- **Mobile Industry**
  - Car navigation systems
  - Mobile terminals
  - Others
Android Framework Expansion

- Expanding the Framework for Embedded Industry

- Standard application development
- Framework development by industry
- New library development
- New driver development

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OESF IP Comms WG Mission

“Enhance Android for IP Communications”

- Define user interface requirements
- Address new IP communication modes
  - Examples: VoIP, Video Call, Instant Messaging (IM), presences/status
- Enhancements and additions to framework
  - Application, middleware and kernel/driver levels
  - Define APIs, JNIs, “intents” and “content providers”
  - Recommendations for drivers, kernel modules & BSPs
Android Today:
No IP Communications!
IP Communications Enhancements

IP Communications Applications and UI

IP Communications Framework Specs (Content Provider, App interface, JNI)

IP Services Interface (API & Abstraction)
Protocol Stacks

Media Engine API
Media Engine (VoIP/Video)

Applications
- Home
- Contacts
- Phone
- Browser
- ...

Application Framework
- Security Manager
- Window Manager
- Content Providers
- View System
- Notification Manager
- Resource Manager
- Location Manager
- XMPP Service

Libraries
- Core Libraries
  - Dalvik Virtual Machine
- Media Framework
- SQLite
- OpenGL ES
- FreeType
- WebKit
- SSL
- libc

Android Runtime

Linux Kernel
- Display Driver
- Camera Driver
- Bluetooth Driver
- Flash Memory Driver
- Binder (IPC) Driver
- USB Driver
- Keypad Driver
- WiFi Driver
- Audio Drivers
- Power Management
Example Implementation

*D2 Technologies’ mCUE*

**mCUE UI Layer**
- Communications user interface
- Multiple modes
  - VoIP and Cellular
  - IM / SMS
  - Presence / Status
  - Video (roadmap)

**vPort Protocol Stack**
- ISI: IP Communications API
- mPS: Multi Protocol Suite
  - SIP (IETF & IMS) & SIMPLE
  - XMPP / Gtalk
  - Yahoo, MSN, Facebook, etc.
- FMC: VCC and IP-to-IP handover

**vPort Media Engine (vTSP)**
- CODECS (VoIP and V2oIP)
- Echo cancellation
- Packet Loss compensation (PLC)
- Jitter buffer (JB)
- Packet processing (RTP, SRTP, RTCP)

= D2’s IP Communications Extensions
The Starting Point: Android Telephony

- Telephony Manager API
- Telephony Manager Internals
- RIL Demon
- Vendor-specific RIL Library

Supports one provider of circuit-switched 2.5G and 3G, GSM and CDMA voice and messaging media
No support for multiple voice services, video or IM media, IP voice capabilities, multiple service providers or identities, etc.
A Generalized Communications Architecture

Application API

Telephony Manager Compatibility Shim

Multimedia Communications Manager

Protocol A

Protocol B

Protocol C

Circuit switched mobile

Voice engine

Protocol and code plug-in API

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Multimedia Communications Manager API: Open and Compatible

• TelephonyManager backwards compatibility
  – Supports existing Android communications applications and third-party applications

• Enables multiple technology providers
  – Independent of the application layer
  – Open to protocols and protocol suites
  – Open to media engine implementations

• Supports multiple implementation of the same or similar protocols
Conclusion

• All apps are not created equally
  – Delivery
    • Downloadable (OTA or USB)
    • Installable (w/ updates, patches, firmware)
    • Native (pre-installed)
  – Type
    • Write once, run anywhere
    • Dependent unique platform functions (OS or HW)
    • Require extensions/modifications/patches to OS and/or framework
• Utilize standards as much as possible
  – If none exist: It’s better to create one – the whole industry benefits!!!