THESIS:
EVOLUTION OF THE MEDIA GATEWAY
IN CDMA2000 BASED LAYERED
ARCHITECTURE CORE NETWORK

Thesis Presentation 2007-10-16
by Kari-Pekka Perttula

Supervisor: Professor Jörg Ott
Instructors: Mika Ahola and Juha Eloranta, Oy LM Ericsson Ab
Content

- Background
- CDMA Market Overview
- CDMA Radio Access Evolution
- CDMA Network Architecture
- Media Gateways Features and Interfaces
- Common Media Gateway Realization
- Common Media Gateway with Multiple Radio Access Networks
- Conclusions
Background

- The Code Division Multiple Access (CDMA) networks are specified in the 3GPP2 organization, whereas the GSM and WCDMA are specified in the 3GPP organization.

- Both 3GPP and 3GPP2 have defined the Core Network architecture to be Layered Architecture based, which includes a network element called Media Gateway (MGW).

- Problem was that requirements from the 3GPP and 3GPP2 are not the same, which might hinder building a Media Gateway supporting both standards.

- The goal of the thesis was to analyze these differences and propose requirements for a common Media Gateway supporting both 3GPP and 3GPP2 specifications.
The CDMA Subscriber growth in 2006 was 24% (71.6 million)
87% of the subscribers are using CDMA2000 3G networks
The CDMA was initially introduced by Qualcomm in 1988
1x was the first 3G CDMA radio technology with data rates up to 153 kbit/s
The current 1xED-DO rev.A networks provide data rates up to 3.1 Mbit/s

<table>
<thead>
<tr>
<th>Data only</th>
<th>1xED-DO rev.0</th>
<th>1xED-DO rev.A</th>
<th>1xED-DO rev.B</th>
<th>UMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data &amp; VoIP</td>
<td>1X</td>
<td>IS-95A</td>
<td>IS-95B</td>
<td></td>
</tr>
<tr>
<td>Data &amp; CS</td>
<td></td>
<td></td>
<td></td>
<td>1X</td>
</tr>
<tr>
<td>Brand</td>
<td>cdmaOne</td>
<td></td>
<td>cdma2000</td>
<td></td>
</tr>
</tbody>
</table>

CDMA Radio Access Evolution
The CDMA network architecture is very much similar to GSM or WCDMA network architecture. Only the use protocols or codecs are different.

Media Gateway is a Core Network element, which is controlled by MSC Server with H.248 protocol.
Media Gateways task is the process end-user data and provide the bearer connectivity towards different access networks.
Common Media Gateway Realization

- Large part of the MGW functions are common
- Speech codecs are the main difference
- ATM could be optional part of the MGW

**MGW**

<table>
<thead>
<tr>
<th>Functional Area</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call Control</td>
<td>Common Call Control, CDMA2000 Codecs, WCDMA Codecs</td>
</tr>
<tr>
<td>Speech Processing</td>
<td>Common Codecs and Processing, CDMA2000 Codecs, WCDMA Codecs</td>
</tr>
<tr>
<td>Switching</td>
<td>Call Switching, ATM Switching</td>
</tr>
<tr>
<td>Transmission</td>
<td>IP, TDM, ATM</td>
</tr>
<tr>
<td>Hardware</td>
<td>GPB, DSP, IP ET, TDM ET, ATM ET</td>
</tr>
</tbody>
</table>

**Color coding:**
- Common
- CDMA2000 Unique
- WCDMA Unique

**Abbreviations:**
- ATM: Asynchronous Transfer Mode
- CDMA: Code Division Multiple Access
- DSP: Digital Signal Processor
- GPB: General Purpose Board
- ET: Exchange Terminal
- IP: Internet Protocol
- MGW: Media Gateway
- MSC: Mobile Switching Center
- MSCe: Mobile Switching Center emulation
- TDM: Time Division Multiplexing
- WCDMA: Wideband Code Division Multiple Access

**Diagram Notes:**
- H.248 protocol used for signaling between the MGW components.
CDMA, GSM and WCDMA networks can be connected to one common MGW, but different MSCs are needed.
Conclusions

- Technically feasible to build a common Media Gateway, which can interconnect to CDMA, GSM and WCDMA networks. Biggest difference in the required speech codecs and framing.

- 3GPP2 requirements are based more on the IETF RFC, but many of the 3GPP2 standards are still not complete!

- Development from the 3GPP based Media Gateway could be done in two steps:
  1. TDM-based A2-interface with 3GPP definitions
  2. IP-based A2p-interface and support for the 3GPP2 speech codecs and framing

- Standardization effort would be needed to align the 3GPP and 3GPP2 H.248 specifications