The GSM Evolution to UMTS

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SM dominates in the Mobile Market
September 2002 ~ 800 mio users

Source: EMC World Cellular Database
UMTS: IT & T Integration

**Internet / Intranet**
- E-Mail
- WWW
- Voice over IP
- E-Commerce

**Telecommunication**
- Person-to-Person Audio/Video, Fax (ISDN)
- Mobility-Roaming (GSM)
- Mailbox services (SMS, Voice)
- Callcenter services etc.

**Information - Data**
- Audio/video on demand
- Infotainment/Education
- TV & radio distribution

**UMTS**

**GSM**
2G + 3G Spectrum

- Bandwidth allocations in the regions depending on market demand
- Spectrum overload visible in countries with high penetration rates (speech)
- New services require additional spectrum
UMTS: IT & T Integration

It is compliant with IMT - 2000:

• It builds on ITU Standards (3GPP)
• It builds on GSM
• It builds on IMT – 2000 Spectrum Plan from ITU
The ITU IMT-2000 Standards (Terrestrial)

3GPP Specifications

- IMT-DS
  - W-CDMA (UTRA)
  - Direct Spread

- IMT-TC
  - Time-Code

- IMT-SC
  - UWC-136 Multi Carrier

- IMT-MC
  - cdma2000 Multi Carrier

- IMT-FT
  - DECT Frequency Time

UMTS

- FDD: Paired Spectrum
- TDD: Unpaired Spectrum
- Paired Spectrum

WLAN Bluetooth

Core Networks

- Evolved GSM
- IP-based Networks

Fixed Network

Evolved ANSI-41

IP Network
The Paths to UTRA

GSM (incl. HSCSD) → EDGE → GPRS → UTRA

IMT-2000 family

- FDD
- TDD
- HCR
- LCR
= TD-SCDMA

Voice & low-speed data
Circuit Switched

Voice & medium-speed data
Packet Switched

Voice & high-speed data
IP

Paths from other technologies, e.g. IS-136, PDC ...

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ITU Seminar IMT-2000, 10-13 September 2002
Moscow, Josef F. Huber, Siemens AG
GSM & WCDMA - one seamless network

GSM/GPRS/EDGE
- GSM/EDGE radio
- 800/900/1800/1900 MHz spectrum
- Nationwide

Common Parts
- One core network
- One service network
- Dual mode handsets
- QoS and CoS based load sharing
- Commonalities & transport

WCDMA
- WCDMA radio
- Initially 2 GHz spectrum
- Start in urban areas
Evolving Proven 2G Network Infrastructure

Multimode terminals provide the end-user with access to the best of both worlds.
Standardisation: Definition of the Third Generation Partnership Project

GPP develops globally applicable technical specifications for a Mobile System

- based on the evolved GSM core network, and the Universal Terrestrial Radio Access (UTRA),

- to be transposed by relevant standardisation bodies (organisational partners) into appropriate deliverables (e.g. standards).
# One Set of Specifications for UMTS and GSM

<table>
<thead>
<tr>
<th>3GPP</th>
<th>Specified Features</th>
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<tbody>
<tr>
<td>1999: Release 99</td>
<td>Bearer Services: 64 kbps circuit switched, 384 kbps packet switched, Call services: GSM compatible, USIM based, CAMEL Phase 3, FDD and TDD Radio (3,84 Mcps), Location Services, New Codec (AMR)</td>
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<tr>
<td>2001: Release 4</td>
<td>EDGE Radio, TDD Low Chip Rate Radio (1,28 Mcps), Improved Location Services (Emergency), USIM toolkit, MExE, Repeater Specification, Multimedia Messaging</td>
</tr>
<tr>
<td>2002: Release 5</td>
<td>IP Multimedia Subsystem (IMS), IPv6, IP transport in UTRAN, HSDPA 10 Mbps (ITU-R update of M.1457), CAMEL Phase 4, Wideband AMR (16 kHz), Improvements in GERAN, LCS, MExE, etc.</td>
</tr>
<tr>
<td>2003: Release 6</td>
<td>IMS improvements, Presence service, WLAN Integration, Multimedia Broadcast and Multicast (MBMS), Digital Rights Management, Network Sharing</td>
</tr>
</tbody>
</table>
End-to-end harmonised 3G portal services for mobile users

Source: UMTS Forum
Web Services - What Comes with 3G?

- 3G will offer transparent HTML access in addition to cHTML, xHTML
  Various Microbrowsers for handhelds, PDAs and portable computers will be available.

- Higher Bitrates: HSDPA = 10 Mbps (ITU-R update M.1457)

- E-2-E QoS in the Packet Domain

- Java Download
Multimedia Session Handling

Multiple services

Service 1  Service 2  Service 3

Synchronised services

Service 1  Service 2  Service 3

Partly synchronised services

Service 1  Service 2  Service 3

IP-Multimedia Subsystem integrates, modifies dynamically multiple sessions

Basic building stones:
SIP, IPv6

single session

multiple sessions

multiple sessions

The IMS Network Interconnectivity

The IMS Service

Interoperability Between Networks

Source: UMTS Forum

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Comparisons
Network Architectures GSM & UMTS

2.5G Radio Access Network

MSC/VLR

A

MSC/VLR

MAP-D

Gb

Gs

Gr

HSLR

PSTN/ISDN

Internet, Intranet, private networks

SGSN

Source: Siemens AG

3G Radio Access Network

Gc

Gn

Internet, Intranet, private networks

Core Network

Gb

Gb

Gb

Gb
Voice Capacity

WCDMA may provide around 30% higher voice capacity than CDMA2000.

Voice capacity in 5 MHz allocation

Voice capacity in 10 MHz allocation

Industry Source
Data Capacity

- EGPRS outperforms CDMA2000 1X and 1XEV-DO in capacity per sector.
- WCDMA/HSDPA can provide the highest capacity among all standards.

Data capacity in 5 MHz allocation

- EGPRS
- WCDMA
- CDMA2000
- 1XEV/DO

Data capacity in 10 MHz allocation

- EGPRS
- WCDMA
- CDMA2000
- 1XEV/DO

HSDPA
Conclusion

In the near term, GSM/GPRS with the introduction of AMR and EGPRS offers sufficient performance.

UTRA/WCDMA is the most efficient of all the 3G technologies. WCDMA and CDMA2000 use the same underlying spread-spectrum technologies, but the wider bandwidth of WCDMA will always mean that there are inherent advantages for WCDMA over CDMA2000.

Interoperability between GSM & UMTS and CDMA 2000 still open. USIM/UICC provides a first step.

There are 107 UMTS network rollouts on their way using new 3G spectrum, offering high traffic capacity.
Thank you for your Attention!

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