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Technical Report

Universal Mobile Telecommunications System (UMTS); UMTS Relationship to other Standards (UMTS 22.80 version 2.0.1)



UMTS

Universal Mobile
Telecommunications System



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1 Scope

At the time when the first UMTS-systems are deployed, a multitude of other systems will also be in service. This report is intended as a guide to those making the UMTS Standards. It discusses and clarifies three important aspects of this multi-user environment.

1) The role, schedule and objectives of standards bodies, in particular ITU and ETSI.

Market needs and interests are different between regions. It should therefore be recognised that there will be several different IMT-2000 systems based on a common framework. Roaming between these different systems should be possible. They could be considered as a family of systems. In this context, ITU should focus on framework standardisation and the registration of IMT-2000 family members, while ETSI, being one of the regional bodies, should proceed in making the regional 3rd generation standard UMTS. ETSI must contribute to ITU on issues concerning framework standardisation, service interworking and roaming.

2) The technical issues concerning this multi-system environment, and how they must be covered by the UMTS Standard.

In multi-system environment, special attention has to be made to the technical aspects of e.g. intersystem roaming and handover. Further, the approach taken by the terminal when selecting system needs to be investigated.

3) The special relationship between UMTS and GSM

UMTS is standardised by ETSI, the same body that standardises GSM. Further, the combination of UMTS and GSM has been identified as a very attractive concept on the infrastructure side as well as on the terminal side. UMTS Standards should therefore contain special arrangements to enable optimal solutions for this combination. If these arrangements require changes to existing GSM standards, then also such changes should be considered.

2 Setting the scene

Users are requiring greater mobility from their telecommunications creating new needs for services. It can hence be expected that the personal and business use of mobile services will significantly exceed today's level in the years 2000-2005. In some regions, almost all the population will be making use of mobile or cordless telephony.

Widespread use of computing in the home and at the office, will provide a hardware base for extensive use of wideband services. The business sector is likely to push for extreme service requirements for office and certain public environments, with computer LAN access, video and multimedia as very demanding and driving applications.

At the time of UMTS introduction, a significant portion of the user needs will still be fulfilled by pre-UMTS systems. UMTS should therefore be an evolution as well as revolution, thus utilising the investments already made by operators and users, in pre-UMTS systems prior to the introduction of UMTS.

In Europe, mobile speech and data services will be offered by analogue networks, GSM, DECT, CT2 HIPERLAN etc. GSM will be the dominating cellular network. Also, since European operators will not be constrained to a specific technology, existing operators may introduce UMTS technology as a means of enhancing their services, within the regulatory framework. GSM Phase 2+ encompasses among other work items GPRS for wide-band data services and CAMEL as an evolutionary path towards service portability.

Handset technology will have evolved with decreased size, weight and factory-gate costs. Multi-mode handsets will have appeared based on a combination of standards (e.g. GSM/UMTS). The user will have increased possibilities to select networks and services.

Massive investments, by operators and users, will have been made in pre-UMTS systems prior to the introduction of UMTS. This motivates scenarios where the development of UMTS is based on an evolution of pre-UMTS technology. Hence, the life of existing systems capable of evolving towards UMTS can be maximized without compromising UMTS objectives and service requirements.

3 Standardisation

3.1 Overview

Standardisation bodies other than ETSI SMG work on standards for future mobile communications systems. ETSI NA works on third generation issues, as do global standardisation bodies like ITU, ATM Forum and IETF.

3.2 Mobile Standardisation in ETSI

The main ETSI bodies concerned with UMTS are:

- TC-SMG
- TC-NA
- EP-BRAN, Broadband Radio Access Network
- EP-TIPHON
- DECT, Digital Enhanced Cordless Telephone
- TC-SES

UMTS Standards are developed mainly by SMG (see also UMTS 30.00) but also by NA in a structure according to Figure 1.

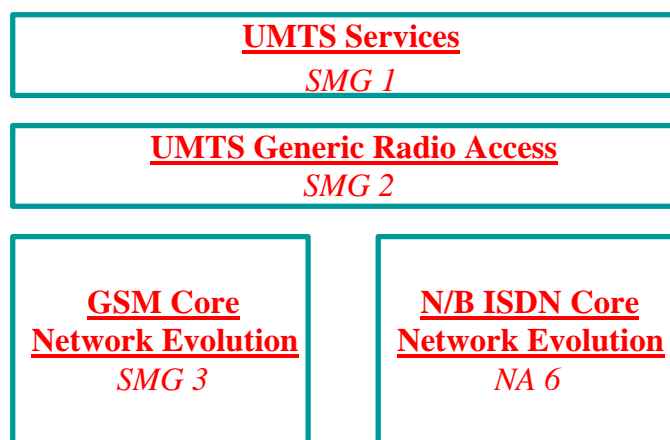


Figure 1, UMTS Standards development within ETSI

Within ETSI, the work is split between Subtechnical Committees according to Figure 2

SMG1	UMTS services and service capabilities
SMG2	UTRA UMTS Terrestrial Radio Access
SMG3	UMTS network architecture
SMG4	UMTS Multimedia
SMG6	UMTS network management
SMG9	USIM - UMTS SIM
SMG10	UMTS security aspects
SMG11	UMTS speech aspects
PT SMG	UMTS program management support of STCs
TC-SES	Satellite Issues
NA2	Service and Numbering expertise providing support to other ETSI Groups.
NA6	Evolution from fixed network to UMTS

Figure 2, Work Split within ETSI

3.3 Mobile Standardisation in ITU-T

ITU has just entered a new study period for 1997 to 2000. The study group of interest within ITU-T is SG11 (Signalling Requirements and Protocols) which will be the lead group for IMT 2000 within ITU-T. A new set of questions for SG11 are given in Figure 3.

Question	Title
5/11	Intelligent network capability sets
6/11	New signalling capabilities and requirements for advanced broadband multimedia services
7/11	Signalling, call handling and management requirements for universal personal telecommunications and for user mobility in future public land mobile systems
8/11	Signalling requirements for emerging land mobile and satellite mobile networks
11/11	Access signalling to support narrow-band and broadband ISDN services and third generation (IMT 2000) mobile networks
13/11	Network signalling for the support of broadband services and third generation land mobile networks (IMT 2000)
23/11	Access signalling for future public land mobile systems
24/11	Network signalling for future public land mobile systems

Figure 3, New ITU-T SG11 Questions for Study Period 1997 to 2000

The following documents are being prepared by ITU SG11 WP3/11 (mobility) for IMT 2000.

- Q.FNA : IMT 2000 network architecture
- Q.FIF : IMT 2000 information flow
- Q.FIN: IMT-2000 Family Concept
- Q.FSR : IMT 2000 signalling requirements for radio interface
- Q.FSA : IMT 2000 signalling requirements for 'A' interface
- Q.FSU : IMT 2000 signalling requirements for UIM interface
- Q.FSN : IMT 2000 signalling requirements for network interface
- Q.FUM : IMT 2000 user mobility requirements

The following relevant are being prepared by ITU SG2

- F.sfea Service features and Operational Provisions in IMT-2000
- F.115 : Service Objectives and Principles for Future Public Land Mobile Telecommunication Systems

3.4 Mobile Standardisation in ITU-R

Most of the work of the ITU-R is handled by the 8 Study Groups, which are as follows:

- SG1 Spectrum Management Techniques
- SG3 Radiowave propagation
- SG4 Fixed Satellite Service
- SG7 Science Services
- SG8 Mobile Service

SG9 Fixed Service

SG10 Broadcast Service (Sound)

SG11 Broadcast Service (Television)

The group most relevant to UMTS is Study Group 8 which addresses the Mobile Service. It consists of three Working Parties and one Task Group, as follows:

- Working Party 8A (WP 8A) - Land mobile service excluding FPLMTS, amateur and amateur satellite services
- Working Party 8B (WP 8B) - Maritime mobile service including global maritime distress and safety system (GMDSS), aeronautical mobile service, and radiodetermination service
- (WP 8C has been merged with WP 8B)
- Working Party 8D (WP 8D) - All mobile satellite services except the amateur satellite service, and radiodetermination satellite service
- Task Group 8/1 (TG 8/1) - International Mobile Telecommunications - 2000 / Future public land mobile telecommunication systems (IMT-2000 / FPLMTS)

3.5 Mobile Standardisation in W-ATM

The Wireless ATM (WATM) working group will develop a set of specifications intended to facilitate the use of ATM technology for a broad range of wireless network access scenarios, both private and public. Its specification will include both “mobile ATM” extensions for mobility support within an ATM network, as well as “radio access layer” for ATM-based wireless access. The WATM specifications are intended for use in networks involving terminal mobility and/or radio access, and will be designed for compatibility with ATM equipment adhering to the (then) current ATM Forum specification. Figure 4 shows the time table for W-ATM Forum

July 97 Sept 97 Nov 97 Feb 98 April 98 July 98 Sept 98 Nov 98 Feb 99

	July 97	Sept 97	Nov 97	Feb 98	April 98	July 98	Sept 98	Nov 98	Feb 99
Radio layer						Refined spec	Straw ballot	Resolve comments	Final Ballot
MAC						Refined spec	Straw ballot	Resolve comments	Final Ballot
DLC	Draft req.					Refined spec	Straw ballot	Resolve comments	Final Ballot
WLC	Draft req.					Refined spec	Straw ballot	Resolve comments	Final Ballot
Handover	Prop. Ref.	Prop. Ref.	Draft spec.	Tech. spec		Refined spec	Straw ballot	Resolve comments	Final Ballot
Location Manag.	Tech. spec					Refined spec	Straw ballot	Resolve comments	Final Ballot
Routing	Prop. Ref.	Prop. Ref.	Draft spec.	Tech. spec		Refined spec	Straw ballot	Resolve comments	Final Ballot
QoS, Traffic	Prop.	Prop.	Draft	Tech.		Refined	Straw	Resolve comment	Final

	Ref.	Ref.	spec.	spec		spec	ballot	s	Ballot
Network Manag.	Prop. Ref.	Prop. Ref.	Prop. Ref.	Draft spec.	Tech. spec	Refined spec	Straw ballot	Resolve comments	Final Ballot

Figure 4, W-ATM WG Schedule

3.6 Mobile Standardisation in the IETF

The Internet Engineering Task Force (IETF) is concerned with the evolution of the Internet Architecture. It is the protocol engineering arm of the Internet. It deals with mobile IP standards (IP6).

4 A multi-system environment

UMTS may be deployed in environments where 2nd and other 3rd generation systems are already in operation. For the benefit of the user, the standards should include mechanisms for handover and roaming. Any handover required to maintain an active service while a user is mobile within the coverage area of a given network, shall be seamless from the user's perspective. However handovers that occur between different radio environments may result in a change of the quality of service experienced by the user.

It shall be possible for users to be handed over between different UMTS networks subject to appropriate roaming/commercial agreements.

Handover between UMTS and GSM systems (in both directions) is required, even if this requires changes to GSM specifications. In addition, a generic solution may be implemented in UMTS which allows calls to be handed over between UMTS and other pre-UMTS systems in both directions.

5 IMT-2000 Family Concept

SMG has contributed to the development of the 'family concept', based on inputs described in the GMM Report and elsewhere. The family concept is flexible, allowing some variation in implementation between networks. Roaming is a key feature and this must be supported between different family members. This may be achieved by various forms such as standard USIM (which plugs into different terminals as he enters different countries); multimode terminal and software radio.

Further roaming techniques could be described but these would depend on the level of common elements in the various IMT2000 systems. The target as far as possible should allow the roaming user to access similar service irrespective of the country or serving network.

It is also desirable to avoid unnecessary differences between family members and this may influence specifications for network interfaces.

Common agreement on the roles involved in provision and use of services in IMT-2000 and the relationships between them would help to create a firm foundation on which the family concept could be developed. The UMTS role model as described in TS 22.01 should be promoted as the basis for agreement on the roles and relationships in IMT-2000.

6 Evolution from GSM

6.1 Introduction

The many strengths that have made GSM the most successful platform in the world - open interfaces specified by international bodies, a highly competitive multi-vendor environment, service authentication, privacy of communications,

true international roaming, the adoption of SIM card technology, existing global footprint, well-developed terminal market - makes it a promising basis also for UMTS, especially since UMTS is standardised by ETSI, the same body that standardises GSM.

6.2 GSM Evolution

The teleservices provided by GSM Phase 2 are telephony, emergency calls, facsimile group 3 and short message service. The bearer service bit rates are 0.3 - 9.6 kb/s. GSM Phase 2 also includes versatile supplementary services including multi-party call, calling line identification presentation/restriction, call waiting, call hold, call transfer and a range of different call forwarding and barring services. Additional supplementary services can be provided by IN SCP. Voice mail box and TCP/IP support for data services are additional features provided but not standardised within the GSM standard.

GSM Phase 2+ features will be introduced step by step in the networks and major part of them should be operational around 1999. One of the main improvements in GSM Phase 2+ will be higher bit rates provided by General Packet Radio Service (GPRS) and High Speed Circuit Switched Data (HSCSD). Both GPRS and HSCSD make use of the multislot technique. Also data compression (V.42bis) can be applied.

GPRS will provide packet switched bit rates up to more than 100 kbit/s and a new, more direct access to Packet Switched Public Data Networks (PSPDN) e.g. Internet.

For Speech, the Enhanced Full Rate (EFR) codec will significantly improve the overall quality.

MSC/VLR and HLR/AC/EIR will be upgraded to Phase 2+ capabilities. Various IN services based on CS-2 will be provided in the user's home network. Customised Applications for Mobile networks Enhanced Logic (CAMEL) will make operator specific services available also in visited networks.

6.3 A GSM/UMTS System

A system characterised by being evolution from GSM and complying with the requirements of both the GSM standard and the UMTS standard can be called the GSM/UMTS system.

The GSM/UMTS system consists of USIM, GSM/UMTS multimode terminal, UMTS Access Network, GSM/UMTS Core Network (CN) and GSM Base Station System. Its main characteristics are the following:

- A GSM/UMTS system can provide speech, fax, SMS and data services up to 100 kb/s through the GSM radio interface and wideband services (data, multimedia) up to 2 Mb/s through the UMTS radio interface.
- Virtual Home Environment (VHE) is used to allow the user to perceive the service offering of any network under the UMTS umbrella.
- Roaming and Handover between GSM and UMTS access systems as well as between different GSM/UMTS networks is provided.
- It is envisaged in the early stages of UMTS deployment, islands of UMTS coverage will exist in a sea of GSM. In order to provide continuity of service within such an environment, inter- and intra-operator handovers between UMTS and GSM must be considered.
- Compatibility between GSM SIM and UMTS USIM is an important issue from the evolution point of view. USIM will have the same two physical sizes as the SIM.
- GSM security features will be upgraded to cater also for UMTS.

In the GSM/UMTS system the UMTS terminal and Access Network will be *revolutionary* compared with the GSM. However, also the revolutionary components can be integrated to the evolutionary part of the system. The existing GSM base stations and terminals will co-exist with the revolutionary parts of the GSM/UMTS system.

The *evolutionary* parts of the GSM/UMTS system are the *Network Subsystem (or Core Network)* and the *User and Services Identity Module, USIM*. The Core Network must be able to deliver packet-switched and circuit-switched UMTS services with speeds up to 2 Mb/s.

7 Evolution from fixed networks

ETSI NA is developing a ISDN-UMTS Framework document. This document is to provide guidelines for the design of the system architecture for a third generation UMTS evolving from fixed networks. The ISDN-UMTS Framework focuses on the evolved fixed network and considers cordless access systems, wire line access systems and UMTS radio access network (URAN) as developed by SMG.

History

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