

TSG-SA Working Group 1 (Services) meeting #2
Edinburgh, Scotland 9th-12th March 1999

TSGS1#2(99)113

Agenda Item: 9.1
Source: Coordinator
Title:
Document for: Information

**Service aspects; Service principles
(UMTS 22.01 version 3.4.0)**

UMTS 22.01 V3.4.0 (1999-03)

Technical Specification

Universal Mobile Telecommunications System (UMTS): Service aspects; Service principles (UMTS 22.01 version 3.4.0)

SMG#28 Approved CRs

UMTS

Universal Mobile
Telecommunications System



European Telecommunications Standards Institute

Reference

DTS/SMG-0102201U (iho00icr.PDF)

Keywords

Universal Mobile Telecommunications System,
Service Principles

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Contents

Intellectual Property Rights	5
Foreword.....	5
1 Scope	6
2 References.....	6
2.1 Normative References	7
2.2 Informative references.....	7
3 Definitions, symbols and abbreviations	7
3.1 Definitions.....	7
3.2 Abbreviations.....	10
4 General	10
4.1 Aims of UMTS	10
4.2 Standardisation of Service Capabilities	11
4.3 Efficient Use of Network Resources.....	11
4.4 Compatibility with Global Standards.....	11
4.5 Virtual Home Environment.....	12
4.6 Functionality of Serving Network and Home Environment.....	12
5 Principles for new service capabilities	12
5.1 General.....	12
5.2 Multimedia	13
5.3 Service Management Requirements.....	13
6 Service architecture	15
7 Quality of Service (QoS)	15
8 Security.....	16
8.1 Security for the Serving Network and Home Environment	16
8.2 Control of User Profiles and Supplementary Services	16
8.3 Security for the user	16
8.4 Emergency calls.....	16
9 Numbering principles	16
9.1 UMTS Number portability	17
9.1.1 Home Environment Level	17
9.1.2 Location Level	17
9.1.3 Service Level	17
9.2 Evolution path	17
9.3 User Identification	17
9.4 Terminal Identification	18
9.5 Service dependence/independence.....	18
9.7 Private numbering.....	18
9.8 Optimal routing	18
10 Human Factors and user procedures.....	18
11 UMTS IC Card, USIM and Terminal.....	19
11.1 The USIM and User Profiles	19
11.1.1 The USIM.....	19
11.1.2 User Profiles	19
11.1.3 Multiple USIMs per UICC	19
11.2 The UICC	20
11.2.1 The UMTS UICC and Applications other than the USIM.....	20
11.3 Terminals and Multiple UICCs	20

13 Service environment.....	20
14 Evolution.....	21
14.1 Support of pre UMTS services.....	21
14.2 Provision and evolution of services within UMTS	21
15 Types of features of MSs.....	22
16 Charging principles for UMTS	23
17 Handover Requirements.....	24
18 Network Selection	24
Annex A (informative):.....	25
Change history	25
History.....	27

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Foreword

This Technical Specification has been produced by the Special Mobile Group (SMG) of the European Telecommunications Standards Institute (ETSI).

This TS describes the Service Principles of the Universal Mobile Telecommunications System (UMTS).

The contents of this TS is subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of this TS, it will be re-released by SMG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to SMG for information;
 - 2 presented to SMG for approval;
 - 3 Indicates UMTS;
- y the third digit is incremented when editorial only changes have been incorporated in the specification;
- z the second digit is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

1 Scope

This ETSI Technical Specification (TS) describes the Service Principles of the Universal Mobile Telecommunications System (UMTS).

The European initiative to develop UMTS should be seen as part of the policy to provide more advanced capabilities than can be anticipated for pre-UMTS systems. UMTS provides integrated personal communications services. UMTS operates in parallel with pre-UMTS technologies (e.g. GSM, DCS 1800, DECT, TETRA etc.) which must be allowed to achieve their full potential. UMTS is a system that will support different applications ranging from narrow-band to wide-band communications capability with integrated personal and terminal mobility to meet the user and service requirements of the 21st century.

UMTS is the realisation of a new generation of mobile communications technology for a world in which personal communications services should allow person-to-person calling, independent of location, the terminal used, the means of transmission (wired or wireless) and the choice of technology. Personal communication services should be based on a combination of fixed and wireless/mobile services to form a seamless end-to-end service for the user.

UMTS should be in compliance with the following objectives:

- a) to provide a single integrated system in which the user can access services in an easy to use and uniform way in all environments;
- b) to allow differentiation between service offerings of various serving networks and home environments;
- c) to provide a wide range of telecommunications services including those provided by fixed networks and requiring user bit rates of up to 2 Mbits/s as well as services special to mobile communications. These services should be supported in residential, public and office environments and in areas of diverse population densities. These services are provided with a quality comparable with that provided by fixed networks such as ISDN;
- d) to provide services via hand held, portable, vehicular mounted, movable and fixed terminals (including those which normally operate connected to fixed networks), in all environments (in different service environments - residential, private domestic and different radio environments) provided that the terminal has the necessary capabilities;
- e) to provide support of roaming users by enabling users to access services provided by their home environment in the same way even when roaming.
- f) to provide audio, data, video and particularly multimedia services;
- g) to provide for the flexible introduction of telecommunication services;
- h) to provide within the residential environment the capability to enable a pedestrian user to access all services normally provided by fixed networks;
- i) to provide within the office environment the capability to enable a pedestrian user to access all services normally provided by PBXs and LANs;
- j) to provide a substitute for fixed networks in areas of diverse population densities, under conditions approved by the appropriate national or regional regulatory authority.
- k) to provide support for interfaces which allow the use of terminals normally connected to fixed networks.

2 References

References may be made to:

- a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

- b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or
- c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or
- d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

2.1 Normative References

- [1] ETSI TR 22.25 "Universal Mobile Telecommunications System (UMTS): Quality of Service and Network Performance"
- [2] ETSI TS 22.05 "Universal Mobile Telecommunications System (UMTS): Service Capabilities related to Service Usage"
- [3] UMTS 22.XX: "Universal Mobile Telecommunications System (UMTS): Virtual Home Environment (VHE), Stage 1"

2.2 Informative references

- [1] ITU-T Draft Recommendation F.700: "Framework Recommendation for audio-visual/multimedia services";
- [2] ITU-T Draft Recommendation F.SFEA: "Service Features and Operational Provisions in IMT-2000".
- [3] GSM 02.01: "Digital cellular telecommunications system (Phase 2+); Principles of telecommunication services supported by a GSM Public Land Mobile Network (PLMN)".
- [4] GSM 02.04: "Digital cellular telecommunications system (Phase 2+); General on supplementary services"
- [5] GSM 02.30: "Digital cellular telecommunications system (Phase 2+); Man-Machine Interface (MMI) of the Mobile Station (MS)"
- [6] GSM 02.66: "Digital cellular telecommunications system (Phase 2+); Support of Mobile Number Portability (MNP); Service description; Stage 1"
- [7] GSM 02.79: "Digital cellular telecommunications system (Phase 2+); Support of Optimal Routing; Stage 1"

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of this TS, the following definitions apply:

Authentication: a property by which the correct identity of an entity or party is established with a required assurance. The party being authenticated could be a user, subscriber, home environment or serving network.

Bearer: a bearer capability of defined capacity, delay and bit error rate, etc.

Bearer capability: a transmission function which the mobile station requests to the network.

Cipher key: a code used in conjunction with a security algorithm to encode and decode user and/or signalling data.

Confidentiality: the avoidance of disclosure of information without the permission of its owner.

Home Environment: the home environment is responsible for enabling a user to obtain UMTS services in a consistent manner regardless of the user's location or terminal used (within the limitations of the serving network and current terminal).

IC Card: a card holding an Integrated Circuit containing subscriber, end user, authentication and/or application data for one or more applications.

Integrity: (in the context of security) is the avoidance of unauthorised modification of information.

International mobile user number (IMUN): The International Mobile User Number is a diallable number allocated to a UMTS user.

Mobility: the ability for the user to communicate whilst moving independent of location.

Multimedia service: Multimedia services are services that handle several types of media such as audio and video in a synchronised way from the user's point of view. A multimedia service may involve multiple parties, multiple connections, and the addition or deletion of resources and users within a single communication session.

Number portability: where the provision of diallable numbers is independent of home environment and/or serving network.

One Stop Billing: one bill for all charges incurred using UMTS.

Quality of Service: the collective effect of service performances which determine the degree of satisfaction of a user of a service. It is characterised by the combined aspects of performance factors applicable to all services, such as:

- service operability performance;
- service accessibility performance;
- service retainability performance;
- service integrity performance;
- and other factors specific to each service.

Roaming: the ability for a user to function in a serving network.

Security: the ability to prevent fraud as well as the protection of information availability, integrity and confidentiality.

Service: is set of functions offered to a user by an organisation.

Service Control: is the ability of the user, home environment or serving environment to determine what a particular service does, for a specific invocation of that service, within the limitations of that service.

Serving Network: the serving network provides the user with access to the services of home environment.

Subscriber: the responsibility for payment of charges incurred by one or more users may be undertaken by another entity designated as a subscriber. This division between use of and payment for services has no impact on standardisation.

Supplementary service: is a service which modifies or supplements a basic telecommunication service. Consequently, it cannot be offered to a customer as a standalone service. It must be offered together with or in association with a basic telecommunication service. The same supplementary service may be common to a number of telecommunication services.

Teleservice: is a type of telecommunication service that provides the complete capability, including terminal equipment functions, for communication between users according to standardised protocols and transmission capabilities established by agreement between operators.

User: is a logical, identifiable entity which uses UMTS services.

User Profile: is the set of information necessary to provide a user with a consistent, personalised service environment, irrespective of the user's location or the terminal used (within the limitations of the terminal and the serving network).

Virtual Home Environment: the virtual home environment is a system concept for personalised service portability between serving networks and between terminals.

3.2 Abbreviations

For the purposes of this TS, the following abbreviations apply:

BER	Bit Error Rate
B-ISDN	Broadband ISDN
DAM	DECT Authentication Module
DECT	Digital Enhanced Cordless Telecommunications
DTMF	Dual Tone Multiple Frequency
ECTRA	European Committee of Telecommunications Regulatory Affairs
ETNS	European Telecommunications Numbering Space
ETSI	European Telecommunications Standards Institute
FDD	Frequency Division Duplex
GSM	Global System for Mobile Communications
HF	Human Factors
IEC	International Electrotechnical Commission
IMT-2000	International Mobile Telecommunications 2000
IMUN	International Mobile User Number
IN	Intelligent Network
ISDN	Integrated Services Digital Network
ISO	International Organisation for Standardisation
ITU	International Telecommunication Union
LAN	Local Area Network
ME	Mobile Equipment
MMI	Man Machine Interface
MO	Mobile Origination
MS	Mobile Station
MT	Mobile Termination
O&M	Operations and Maintenance
PBX	Private Branch eXchange
PC	Personal Computer
PCMCIA	Personal Computer Memory Card International Association
PIN	Personal Identity Number
PNP	Private Numbering Plan
POTS	Plain Old Telephony Service
QoS	Quality of Service
SIM	Subscriber Identity Module
SMS	Short Message Service
TDD	Time Division Duplex
TE9	Terminal Equipment 9 (ETSI sub-technical committee)
UICC	UMTS IC Card
USIM	User Service Identity Module
UMTS	Universal Mobile Telecommunications System
VHE	Virtual Home Environment

4 General

4.1 Aims of UMTS

It shall be capable of delivering audio, text, video and graphics direct to people and provide them with access to the next generation of information based services. It moves mobile and personal communications forward from pre-UMTS systems, delivering mass market low-cost digital telecommunication services.

UMTS therefore seeks

- to enable users to access a wide range of telecommunications services, including many that are today undefined as well as multi-media and high data rates.
- to facilitate the provision of a high quality of service (particularly speech quality) similar to that provided by fixed networks;
- to facilitate the provision of small, easy to use, low cost terminals with long talk time and long standby operation;
- to provide an efficient means of using network resources (particularly radio spectrum).

4.2 Standardisation of Service Capabilities

Pre-UMTS systems have largely standardised the complete sets of teleservices, applications and supplementary services which they provide. As a consequence, substantial re-engineering is often required to enable new services to be provided and the market for services is largely determined by operators and standardisation. This makes it more difficult for operators to differentiate their services.

UMTS shall therefore standardise service capabilities and not the services themselves. Service capabilities consist of bearers defined by QoS parameters and the mechanisms needed to realise services. These mechanisms include the functionality provided by various network elements, the communication between them and the storage of associated data. Section 6 provides a conceptual description of a service architecture and architecture requirements which aim to provide service capabilities. It is intended that these standardised capabilities should provide a defined platform which will enable the support of speech, video, multi-media, messaging, data, other teleservices, user applications and supplementary services and enable the market for services to be determined by users and home environments.

The standardisation of service capabilities rather than the services themselves is a major differentiator between UMTS and pre-UMTS systems, see UMTS 22.xx.

4.3 Efficient Use of Network Resources

UMTS service capabilities shall take account of the discontinuous and asymmetric nature of most teleservices and user applications in order to make efficient use of network resources (particularly radio resources).

Service capabilities shall be provided in a wide range of radio operating environments (where a radio environment is characterised in terms of propagation environment, mobile station relative speeds and traffic characteristics - see [2]). Although UMTS aims to minimise the number of UMTS radio interfaces and to maximise commonality between them, UMTS may utilise several radio interfaces, each optimised for different environments. Each radio interface might provide differing service capabilities. For UMTS Phase1, a single radio interface supporting two modes (TDD and FDD) is defined.

If more than one radio interface is defined for UMTS, the UMTS standard shall provide a mechanism which will enable a UMTS terminal to adapt to different radio interfaces as necessary and to determine the service capabilities available. The standard shall also provide a mechanism which will enable a UMTS terminal to select radio interfaces capable of providing appropriate service capabilities.

4.4 Compatibility with Global Standards

UMTS aims to be compatible with IMT-2000 and to provide global terminal mobility (roaming), enabling the user to take his/her terminal to different regions of the world and to be provided with services. It is probable that different regions of the world will adopt different radio interface technologies. IMT-2000, as a global standard, should therefore enable a IMT-2000 terminal to determine the radio interface technology and the radio interface standard used in a region. Global terminal roaming also requires the global standardisation of service capabilities. As far as possible the method of indication of the radio interface standard and available service capabilities shall be aligned with IMT-2000.

UMTS shall enable users to access the services provided by their home environment in the same way via any serving network provided the necessary service capabilities are available in the serving network.

4.5 Virtual Home Environment

The above general principles plus the service architecture principles stated in section 6 specify all the capabilities of the virtual home environment (VHE).

UMTS aims to provide the user with a comprehensive set of services and features, which have the "same look and feel" wherever they are used. For further information see UMTS 22.xx Especially the VHE shall provide for:

- a generic set of services / features and access capabilities, if the required service capabilities are available in the visited network;
- the means for serving network, home environments and user to re-use existing system capabilities to define their own specific features / services;
- user personalisation of features / services;
- a personalised service set being used via all UMTS access and transport networks, subject to physical limitations;
- the ability for the user to have access to personalised services from any suitable UMTS terminal
- regional or network based variations / enhancements to the basic / standard UMTS;
- future evolution of UMTS itself.

4.6 Functionality of Serving Network and Home Environment

The following functionality shall be the responsibility of the home environment:

- User Authentication.
- USIM Issue.
- Billing.
- User Profile/VHE Management.

The following functionality shall be the responsibility of the serving network:

- Radio or other means of access.
- Transport and signalling.

The following functionality may be the responsibility of either the serving network, the home environment or an appropriate combination of both

- Service Control.
- QoS negotiation.
- Mobility management, including roaming.
- Automatic establishment of roaming agreements.

5 Principles for new service capabilities

5.1 General

The standard shall enable the user of a single terminal to establish and maintain several connections simultaneously. It shall efficiently cater for applications which have variable requirements relating to specific QoS parameters

(e.g. throughput) whilst meeting other QoS targets. It shall also cater for applications which are able to take adapt to a range of variations in QoS.

5.2 Multimedia

UMTS shall support multimedia services and provide the necessary capabilities.

Multimedia services combine two or more media components (e.g. voice, audio, data, video, pictures) within one call. A multimedia service may involve several parties and connections (different parties may provide different media components) and therefore flexibility is required in order to add and delete both resources and parties.

Multimedia services are typically classified as interactive or distribution services.

Interactive services are typically subdivided into conversational, messaging and retrieval services:

Conversational services are real time (no store and forward), usually bi-directional where low end to end delays (< 100 ms) and a high degree of synchronisation between media components (implying low delay variation) are required. Video telephony and video conferencing are typical conversational services.”

Messaging services offer user to user communication via store and forward units (mailbox or message handling devices). Messaging services might typically provide combined voice and text, audio and high resolution images.

Retrieval services enable a user to retrieve information stored in one or many information centres. The start at which an information sequence is sent by an information centre to the user is under control of the user. Each information centre accessed may provide a different media component, e.g. high resolution images, audio and general archival information.

Distribution services are typically subdivided into those providing user presentation control and those without user presentation control.

Distribution services without user control are broadcast services where information is supplied by a central source and where the user can access the flow of information without any ability to control the start or order of presentation e.g. television or audio broadcast services.

Distribution services with user control are broadcast services where information is broadcast as a repetitive sequence and the ability to access sequence numbering allocated to frames of information enables the user (or the user's terminal) to control the start and order of presentation of information.

UMTS shall support single media services (e.g. telephony) and multimedia services(e.g. video telephony).All calls shall have potential to become multimedia calls and there shall be no need to signal, in advance, any requirement for any number of multimedia components. However, it shall be possible to reserve resources in advance to enable all required media components to be available.

5.3 Service Management Requirements

There will be increased demands for better customer care and cost reductions in managing mobile networks due to :

- the provision of sophisticated personal communications services;
- the expansion of the customer base beyond the business user base;
- the separation between entities of home environment and serving network; and
- drives for 'one stop' billing for a range of services.

In pre-UMTS mobile networks, Service Management has largely been concerned with the management of physical products (often from different vendors and having different network management interfaces). UMTS shall support standardised protocols enabling network management of functionality rather than network management of products and enabling:

- the support of Virtual Home Environment;

- management of user profiles;
- support of number portability;
- control, creation and subscription of service capabilities and services;
- provision of 'one stop' billing;
- quality of service.

6 Service architecture

In order to provide standardisation of service capabilities a service architecture shown by Figure 2 is envisaged

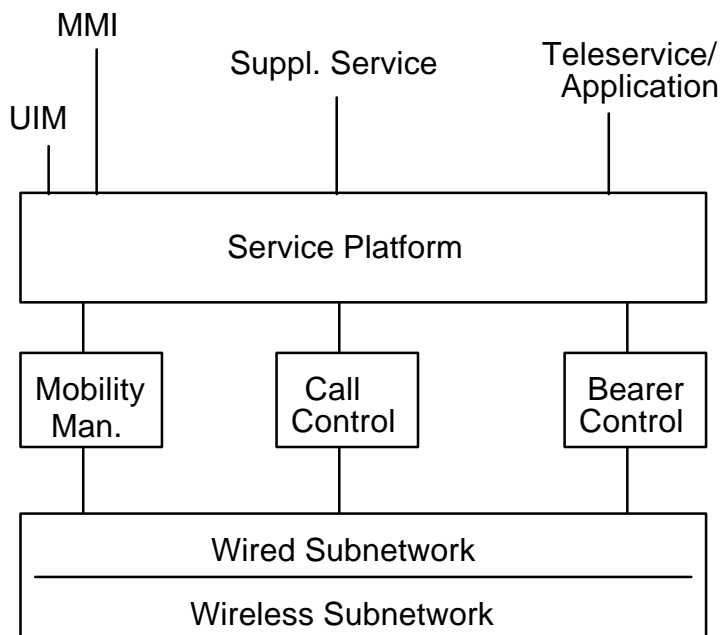


Figure 2: Service Architecture

A number of bearers shall be provided that can differ in flexibility and offer different capabilities. Bearers may be characterised by parameters such as “throughput”, “delay tolerance”, “maximum bit error rate”, “symmetry” etc. These bearers enable information to be transferred appropriate to the provision of teleservices, and end user applications generally, via subnetworks which typically provide different specified qualities of service. The assignment and release of bearers is provided by the bearer control function. Provision should be made for several bearers to be associated with a call and for bearers to be added to a call and/or to be released from a call following call establishment. The bearers provided by UMTS should be independent of radio environments, radio interface technology and fixed wire transmission systems.

Adaptation/Interworking functions are required in order to take account of the differences between the bearers used for the provision of a teleservice/application in the fixed network and the bearers provided by UMTS.

Adaptation/Interworking functions are required which take account of the discontinuous and/or asymmetrical nature of most teleservices/applications.

The service platform shall provide interfaces (to serving networks and home environments) appropriate to the support, creation and control of supplementary services, teleservices and user applications. The service platform will also provide interfaces enabling subscribers to control supplementary services, teleservices and user applications.

Supplementary service provision and control provided by UMTS will be independent of radio operating environment, radio interface technology and fixed wire transmission systems.

As far as possible, the service platform is required to enable new supplementary services, teleservices and/or end user applications to be supported at minimum cost, with minimum disruption of service and within the shortest possible time.

7 Quality of Service (QoS)

The UMTS Quality of Service (QoS) parameters should be identified together with appropriate parameter values which set targets to be reached when designing UMTS standards, and which also will serve as guidelines for network design and service provision.

The QoS for call set-up time, as an example, can be defined in terms of a mean value and as a percentage of cases which should not exceed a certain time limit. Further information can be found in [3] and [4].

8 Security

This section covers service related security issues, more general security matters are considered in ETR 50901.

8.1 Security for the Serving Network and Home Environment

Charging information shall be incontestable and therefore require that the user be unambiguously identified, though there may be exceptions such as pre-paid cards. The UMTS IC Card (UICC) shall be physically present in order to make use of any services except for emergency calls.

The identification of the user should be based upon the UICC and steps should be taken to prevent fraudulent use of stolen IC Card's. As far as possible the usage of stolen terminals should be prevented.

The standard shall cater for the ability for UMTS networks to authenticate each other.

8.2 Control of User Profiles and Supplementary Services

Although supplementary services may not be standardised the control of supplementary services will need to be implemented in a secure manner; e.g. call diversions to international numbers may be barred or limited in number at the discretion of the serving network.

The home environment shall have control of all aspects of user profiles.

Any changes to user profiles shall be done in a secure manner.

8.3 Security for the user

It should be possible for the user to authenticate the network when registering and before initiating a service if desired.

Steps shall be taken to ensure the privacy and integrity of sensitive information transferred between the user and all other entities; e.g. user identity and user traffic.

8.4 Emergency calls

A UMTS terminal capable of making emergency calls shall be able to do so when there is no UICC physically present. The terminal shall be responsible for ensuring that only emergency numbers are attempted when no UICC is present to prevent the misuse of network resources. It will be left to the national authorities to decide whether the network should accept such calls. In addition networks may also validate that only emergency calls are accepted when no UICC is inserted in the terminal.

9 Numbering principles

The following list provides the requirements for numbering and identification of UMTS subscribers:

- Number portability;
- Evolution;
- User identification;
- Terminal Identification

- Billing;
- Service dependence and independence (Multiple and Single numbering scheme);
- Private Numbering;
- Multiple Profiles;
- Optimal Routing;
- Content Providers(for further study).

9.1 UMTS Number portability

The standard shall enable number portability on a home environment level, location level and service level. For further information see GSM 02.66.

9.1.1 Home Environment Level

An International Mobile User Number (IMUN) shall be allocated to each new user at the start of a UMTS subscription. This number may be allocated from one of several numbering domains. For example:

- national numbering scheme;
- regional numbering scheme;
- global numbering scheme.

A UMTS user shall be able to move subscription from one home environment to another without changing the IMUN provided that the new home environment offers service in the same geographic domain. It is envisaged that home environment s will be able to allocate IMUNs from each of these domains as required.

9.1.2 Location Level

It shall be possible for the user to be dialled independently from their location (i.e. mobility).

NOTE: This is fundamental to a mobile network but is not currently fundamental to a fixed network. It is listed here as it is a common principle used in numbering form.

9.1.3 Service Level

The standard shall enable where possible for the number dialled to communicate with a user to be independent from the service requested (see subclause 9.5).

9.2 Evolution path

Since UMTS aims to be aligned with IMT-2000, a primary goal in numbering is the provision of global user numbering in line with steps taken by the ITU - SG2.

(For UMTS Phase 1) It is required that is shall be possible to identify UMTS users using GSM identities, namely IMSI, MSISDN and possibly TMSI and IMEI.

The numbering scheme and network implementation chosen shall allow for international/global evolution.

9.3 User Identification

It is a requirement that the user can be uniquely identified by the home environment from which the service is being obtained. This identification may be unknown to the serving network on which the user is roaming.

9.4 Terminal Identification

It is a requirement that the terminal can be uniquely identified by the home environment.

9.5 Service dependence/independence

UMTS shall provide various methods to identify the service required, for example, via the number dialled or protocol headers. It shall be possible for the home environment to change serving network(s) without changing IMUNs.

It shall be possible for several numbers to be associated with a single subscription on a single UICC.

9.7 Private numbering

A user may wish to use private numbers for the purposes of calling frequent numbers. Therefore there is a requirement for the use, by the user, of Private Numbering Plans (PNPs). These schemes may belong to the user himself, to a home environment or a third party.

In addition, the user shall be able to choose the means to address the identity of a dialled number. For instance the number required to be dialled may be addressed by a spoken name.

NOTE: This may well be considered as a function of the equipment used to access the service and as such is not required to be standardised. However, the provision of such a facility needs to be provided across all terminal types used; fixed and mobile.

9.8 Optimal routing

The implementation of the numbering scheme used for UMTS shall allow for optimal routing; i.e. routing shall not take place simply on the number dialled. See GSM 02.79 for some scenarios.

10 Human Factors and user procedures

As defined in the Service Provision Concepts subclause of this ETS the UMTS system should meet future communication requirements and shall be designed to be adaptable to provide new services as and when they are defined.

The User Interface (MMI) from the end user's point of view should be as flexible as possible while still meeting the general service requirements of UMTS. In addition it should be capable of being updated so as to meet new services which are still to be envisaged.

In general the following principles should be encompassed:

- activation of UMTS services should be as simple as possible with minimum input expected from the user;
- feedback, to the user from the various UMTS services, should be meaningful;
- any error recovery procedures provided should be simple to understand and execute.

However, a detailed specification for the User Interface shall not be defined. In particular given the global nature of the third generation systems, for different regions of the world, different criteria will determine the implementation of the User Interface. Also it is unlikely that there will be a single common handset which will meet all the service requirements of UMTS and therefore a common User Interface would be impractical.

Given the flexibility of the UMTS services, there should be a wide range of User Interface possibilities. These possibilities include simple terminals with a single on/off button through to complex terminals providing support to hearing/visually impaired users.

Existing GSM supplementary services (GSM 02.04), may use MMI as specified in GSM 02.30.

11 UMTS IC Card, USIM and Terminal

This clause defines the functional characteristics and requirements of the User Service Identity Module (USIM) for use in UMTS. The USIM is an application residing on a UICC.

11.1 The USIM and User Profiles

11.1.1 The USIM

Every USIM shall have a unique identity and shall be associated with one and only one home environment.

It shall be possible for a home environment to uniquely identify a user by the USIM.

The USIM shall be used to provide security features.

For access to UMTS services, provided via a UMTS home environment, a valid USIM shall be required.

The USIM shall reside on a UICC, UMTS shall adopt both of the GSM SIM card physical formats. New UMTS terminals may require other formats also. USIM specific information shall be protected against unauthorised access or alteration.

It shall be possible to update USIM specific information via the air interface, in a secure manner.

11.1.2 User Profiles

It shall be possible for a user to be associated with one or a number of user profiles, which the user can select and activate on a per call basis. The user profile contains information which may be used to personalise services for the user.

It shall be possible for one or more user profiles associated with the same user to be active simultaneously so that the user may make or receive calls associated with different profiles simultaneously. Activation of profiles shall be done in a secure manner, for example with the use of a PIN.

For terminating calls the correct profile shall be indicated by the user address used (e.g. IMUN), each profile will have at least one unique user address associated with it. For originating calls the user shall be able to choose from the available profiles, the appropriate one for the call. A profile identity will need to be associated with the call for accounting and billing purposes. User profile identities need not be standardised but a standardised means is required for indicating that a particular profile is being used.

Simultaneous use of the same user profile on multiple terminals for the same type of service shall not be allowed.

User profiles associated with different home environments shall not share the same user address.

11.1.3 Multiple USIMs per UICC

The standard shall support the simultaneous use of more than one USIM per UICC even when those USIMs are associated with different home environments. For UMTS Phase 1 the support of only one USIM per UICC is required.

The standard must not prevent the coexistence of USIM applications, each associated with different home environments on the same UICC, so long as the security problems which arise from such a coexistence are solved when UMTS terminals and UICC are produced. Nevertheless, in the short term, it is safer to assume that only USIMs associated to one home environment will be stored on one UICC.

11.2 The UICC

Physical aspects of the UICC shall be defined by an appropriate committee. However there is a requirement to support access to services via GSM and UMTS with a single UICC.

11.2.1 The UMTS UICC and Applications other than the USIM

It shall be possible for the UICC to host other applications in addition to the USIM, see figure 3. Service providers, subscribers or users may need to establish additional data or processes on the UICC. Each application on an UICC shall reside in its own domain (physical or logical). It shall be possible to manage each application on the card separately. The security and operation of an application in any domain shall not be compromised by an application running in a different domain. Applications may need to use their own security mechanisms which are separate to those specified for UMTS e.g. electronic commerce applications.

Examples of other UICC applications are: a more practical implementation of GSM Phase 2+ SIM items, off-line user applications like UPT, electronic banking, credit service, etc.

Applications should be able to share some information such as a common address book.

It shall be possible to address applications which reside on the UICC, via the air interface.

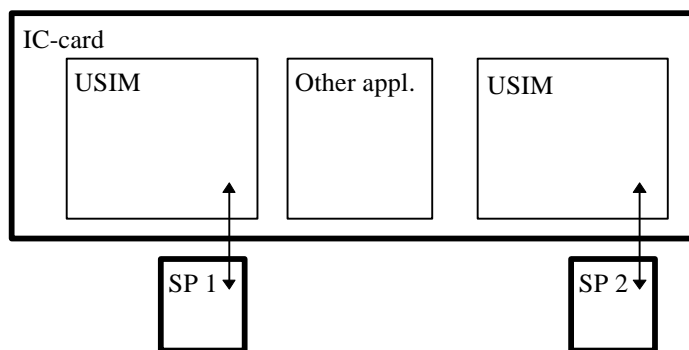


Figure 3 Example of a Multifunction UICC

11.3 Terminals and Multiple UICCs

The standard shall support multiple registration on a single terminal via insertion of multiple UICC, each with at least one unique USIM. In UMTS phase 1 the support of only one UICC is required. One or more of the USIMs may be active at the same time so that the terminal may be used to engage in more than one simultaneous call, possibly associated with different home environments. In UMTS phase 1 the activation of only one USIM at a time is required.

The standard shall allow a user to obtain services simultaneously from different home environments through a single network. It is understood that it may not always be possible to access all home environments through a given network.

If the UICC is removed from the mobile terminal during a call (except for emergency calls), the call shall be terminated immediately.

13 Service environment

The success of UMTS may depend upon its deployment in many regions of the world. Different regions of the world are likely to have widely different market needs for wireless based telecommunications, ranging from low cost provision of POTS (to users whose mobility is to be limited) to the provision of high bit rate and multimedia services (to highly mobile users).

The following scenarios should therefore be considered:

- use of UMTS to primarily provide wideband services (up to 2Mbps).

- use of UMTS to provide primarily telephony.
- use of UMTS for narrow (up to 64kbps) and wideband services.
- use of multi standard terminals to provide integrated services.

14 Evolution

14.1 Support of pre UMTS services

The UMTS standard shall be capable of supporting pre UMTS services in a manner which is transparent to the users of these services.

UMTS shall provide some mechanisms which permit pre UMTS users to roam easily onto UMTS and access the services. See Figure 5 for clarification.

UMTS shall provide some mechanisms which permit UMTS users to roam easily onto pre-UMTS systems and access the services.

14.2 Provision and evolution of services within UMTS

UMTS may be introduced before a complete set of UMTS standards is available. As one of the identified priority areas, UMTS service related standards need to be available at an early stage. If a phased approach to the completion of standards is adapted then the same general service principals shall apply at an early stage.

UMTS networks shall be capable of providing a specified core set of capabilities. Responsibility for providing this core set of capabilities should lie with the serving network.

The core set of capabilities should permit UMTS home environment to offer a range of distinctive services including those which cannot be implemented on pre-UMTS systems.

UMTS shall provide some mechanism which permits UMTS users to roam easily onto pre UMTS systems, with access to a minimum set of services.

It shall be possible for the home environment to develop services with full roaming capability. It should not be necessary for users to subscribe to more than one home environment in order to receive a particular service. For example a company may market an in car navigation/location system which uses UMTS as the core network. As far as users of the navigation service are concerned, that company is their home environment.

The radio interface should not unnecessarily restrict the development of new services (within physical limitations).

The standard shall provide a mechanism which allows a UMTS terminal to be easily upgraded so that it can access new services which are within the physical limitations of the terminal. Figure 4 shows as an example the support of roaming users between GSM and UMTS.

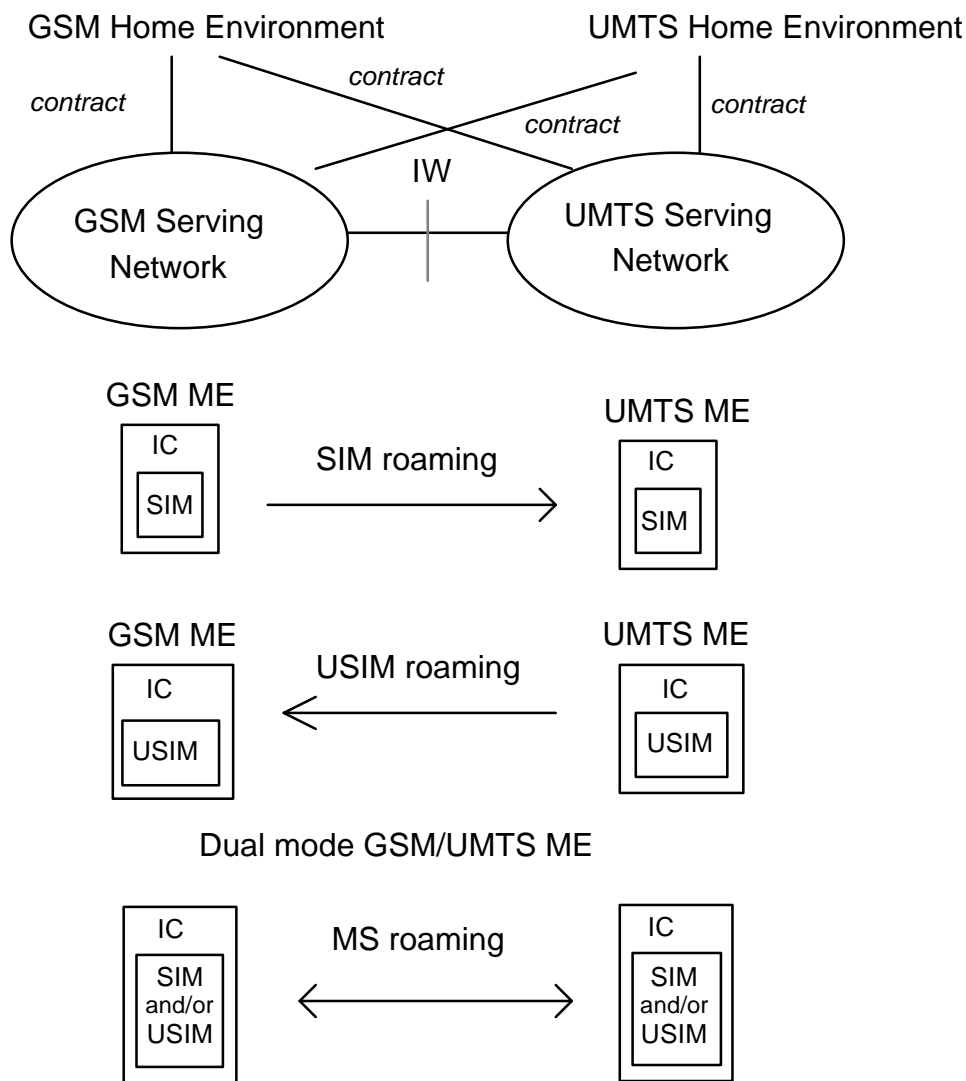


Figure 4 Roaming Users

15 Types of features of MSs

UMTS should support a wide variety of mobile stations, i.e. setting any limitations on terminals should be avoided as much as possible. For example mobile stations like hand-helds, personal digital assistants and laptop computers can clearly be seen as likely terminals for UMTS.

In order not to limit the possible types of mobile stations they are not standardised in UMTS. Anyhow some informative examples can be given to be the basis for mobile station discussions. The MS types could be categorised by their service capabilities rather than by their physical characteristics. Typical examples are speech only MS, narrowband data MS, wideband data MS, data and speech MS, etc.

In order to enhance functionality split and modularity inside the mobile station the interfaces of MS should be identified. Interfaces like UICC-interface, PCMCIA-interface and other PC-interfaces, including software interfaces, should be covered by references to the applicable interface standards.

MSs have to be capable of supporting a wide variety of teleservices and applications provided in UMTS environment. Limitations may exist on MSs capability to support all possible teleservices and information types (speech, narrowband data, wideband data, video, etc.) and therefore functionality to indicate capabilities of an MS shall be specified. MSs should be capable of supporting new supplementary services without any changes in MS.

The basic mandatory MS requirements are:

- Encrypted terminal-UICC interface
- Support for GSM phase 2 and 2+ SIM cards, phase 1 5V SIM cards shall not be supported
- Home environment and serving network registration and deregistration
- Location update
- Originating or receiving a connection oriented or a connectionless service;
- An unalterable equipment identification; IMEI, see GSM 02.16
- Basic identification of the terminal capabilities related to services such as; the support for software downloading, application execution environment/interface, MExE terminal class, supported bearer services.
- Terminals capable for emergency calls shall support emergency call without a USIM.
- Support for the execution of algorithms required for encryption;
- Support for the method of handling automatic calling repeat attempt restrictions as specified in GSM 02.07.
- At least one capability type shall be standardised for mobile terminals supporting the GSM BSS and UTRAN radio interfaces.
- Under emergency situations, it may be desirable for the operator to prevent MS users from making access attempts (including emergency call attempts) or responding to pages in specified areas of a UMTS network, see GSM 02.11.

16 Charging principles for UMTS

The cost of the call may cover the cost of sending, transporting, delivery and storage. The cost of call related signalling may also be included. Provision shall be made for charging based on time, destination, location, volume, bandwidth and quality. Charges may also be levied as a result of the use of value added services.

It shall be possible for information relating to chargeable events to be made available to the home environment at short notice. The requirements shall include:

- Immediately after a chargeable event is completed;
- At regular intervals of time, volume or charge during a chargeable event.

Standardised mechanisms of transferring charging information are required to make these requirements possible.

It should be possible for multiple leg calls (e.g. forwarded, conference or roamed) to be charged to each party as if each leg was separately initiated. However, in certain types of call, the originating party may wish/be obliged to pay for other legs (e.g. SMS MO may also pay for the MT leg.).

Provision shall be made for the chargeable party to be changed during the life of the call. There shall be a flexible billing mechanism which may include the use of stored value cards, credit cards or similar devices.

The chargeable party (normally the calling party) shall be provided with an indication of the charges to be levied (e.g. via the called number automatically or the Advice of Charge supplementary service) for the duration of the call (even though the user may change service environment)The user shall be able to make decisions about the acceptable level of accumulated charge dynamically or through their service profile.

If a user is to be charged for accepting a call then their consent should be obtained. This may be done dynamically or through their service profile.

17 Handover Requirements

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.

18 Network Selection

Three roles may be involved in UMTS network selection: the home environment, the serving network and the user. Services may be available to the user through a choice of several serving networks in a given location, possibly using different types of Radio Access Network, , however it is expected that a user terminal will communicate with one network at a given instant (there may be exceptions such as when an inter-network handover occurs).

All selection schemes make use of information provided by the serving networks, including the network name, the network capabilities and any restrictions. Other information such as terminal capabilities may also be required. This information may change with time but must be accurate and available at the time network selection is being made.

Procedures 1 and 2 below for network selection in UMTS shall be supported by all mobile stations. The user shall be able to choose which procedure to use at any given time.

1. Default Automatic Procedure

A default procedure for network selection shall be defined which selects a network from amongst those available based upon information such as network name/ID, network capabilities, signal strength and network type. The full list of parameters is FFS. The choice of which network to use should be developed from a procedure similar to that specified in GSM 02.11

2. Manual Procedure

The manual procedure consists in presenting to the user the list of all available networks and letting her make the selection. The user shall be able to make use of the manual selection procedure at any time.

3. Home Environment Specific Procedure

Optionally, if provisioned by the MS and selected by the user, the home environment can add the ability to define the behaviour when selecting the required network from those available. A standardised framework for over-the-air transfer of behaviour definition is required. If enabled by the user, it shall be possible for the home environment procedure to instruct the mobile station to search for a network which meets a given set of requirements, indicated by certain parameters or to compile a list of all available networks.

Other procedures may be offered by the MS.

Both automatic and manual network selection schemes are constrained by commercial agreements between the home environments and serving networks. If a roaming agreement does not exist and cannot be established using the procedure for automatic establishment of roaming agreements, then registration on the network will not succeed. Therefore the user must provide sufficient information to allow the serving network to identify the relevant home environment and to allow the home environment to identify the user.

A USIM shall be registered on one and only one serving network at any given time (there may be exceptions such as when preparing for an inter-network handover). Changing the serving network between two calls requires USIM de-registration from the current serving network and USIM re-registration on the newly selected serving network.

If simultaneous access to more than one home environment is required (through a card with multiple USIMs or through several cards in a multi-slot terminal), manual selection shall be invoked.

A procedure for handling network rejections is required, see GSM 02.07 Annex A for an example. During manual selection the user may be allowed to attempt to select any available network (subject to restrictions that may be specified by the home environment). Successful manual network selection shall update the procedure for preventing unnecessary network access attempts. A set of network access rejection causes shall be standardised.

It shall be possible for a network operator to control access to the network. This may be done for example to provide priority to emergency services or to control demand upon the access channel after a network failure, see GSM 02.11 for further details.

Annex A (informative):

Change history

Change history					
SMG No.	TDoc. No.	CR. No.	Section affected	New version	Subject/Comments
SMG#22	302/97	001	4.6 (Role Model)	3.1.0	SMG3 queried the separation of network operator into core and access, which, on examination, SMG1 find unhelpful
SMG#22	319/97 (SMG1 WPC 125/97)	002		3.1.0	Editorial Changes: FLMPTS was replaced by IMT 2000, 2 new references given, additional clarifications.
SMG#22	320/97	003	8.5, 9.3, 9.5, 17	3.1.0	Changes on Emergency Calls, User identification, Multiple profiles and additional handover requirements.
After SMG#23	SMG1 433u/97 965/97	004		Draft 3.2.0	Based on Approved Changes at SMG#22 Distributed at SMG1 in Dresden Nov 3-7, 97 to be Approved at SMG#24
SMG#24	966/97	005	Sections 8, 9, 11	3.2.1	Restructuring of sections 8,9 and 11 to gather all requirements relating to multiple subscriptions into one section and to improve the clarity.
SMG#24	967/97	006	Section 8.1	3.2.1	To improve the accuracy of text on numbering principles and minor editorial change to section 8.1
SMG#27	98-0551	007	Section 4.6 and misc.	3.3.0	Removal of commercial role model from the specification in order to improve clarity
SMG#27	98-0552 (Not Approved)	008	New Section 18 (Not Applied)	3.3.0	To include requirements for network selection in service principles: NOT APPROVED > NOT APPLIED
Pre-SMG#28	(SMG1 Tdoc 98-0893) 99-040	008 r4 Rejected	New Section 18 Applied	[Draft 3.4.0]	Added Network Selection section - Agreed by correspondence - Jan 13, 1999 - <u>Prepared with CRs applied with revision marks</u>
SMG#27	98-0553	009	Section 4.3	3.3.0	To remove unnecessary reference to IN and B-ISDN

SMG#27	98-0682	010	Section 11	3.3.0	To improve the clarity of service requirements for multiple user profiles
Pre-SMG#28	(SMG1 Tdoc 98-0869) 99-040	011	Sections 1, 2, 3, 4, 9, 10, 12, 17	Draft 3.4.0	Clean up for UMTS phase 1 Agreed at SMG1 Rome
Pre-SMG#28	(SMG1 Tdoc 98-852) 99-040	012	Sections 3,8,9,11,14,15	Draft 3.4.0	Changes in IC card and terminal service requirements Agreed at SMG1 Rome
Pre-SMG#28	(SMG1 Tdoc 98-0894) 99-040	013r1	Section 3.2 & 4.3	Draft 3.4.0	Clarification of general requirements for efficient use of radio resources Agreed by correspondence - Jan 13, 1999 - <u>Prepared with CRs applied with revision marks</u>
NOTE				Draft 3.4.0	SMG1 agreed only
pre-SMG#28	99-040	015 Rejected	17	Draft 3.4.0	According to the outcome of the SMG 1 ad-hoc meeting on handover issues it is proposed that inter-operator handover is not required for UMTS phase 1 [REDACTED]
SMG#28	99-305	008r5	Revised Section 18	3.4.0	Network Selection presented at SMG#28 in 2201_008r4 was further revised and Approved at SMG#28.
NOTE				3.4.0	Removal of Section 12 on UPT with CR 011 causes a skip section from Section 11 to 13.

History

Document history		
Date	Status	Comment
22 October 1995	Version 0.0.1	SMG 1 WPC output draft for editing purposes only
14 December 1995	Version 0.0.2	SMG 1 WPC output draft for editing purposes only
17 th April 1996	Version 0.3.0	SMG 1 WPC Output Version
9 th May 1996	Version 1.0.0	Version Following SMG 1 Plenary
13 th June 1996	Version 1.0.1	Version following comments from SMG1 delegates
3 rd July 1996	Version 1.1.0.	SMG1 WPC output following meeting 1-3 July at Tampere, Finland and comments from SMG1 delegates
28 th August 1996	Version 1.2.0	SMG1 WPC meeting 27/28 August 1996 in Stuttgart, Germany
28 th August 1996	Version 1.2.1	SMG1 WPC meeting 27/28 August 1996 in Stuttgart, Germany, presented to SMG1 Plenary for approval
30 th August 1996	Version 2.0.0	SMG1 Plenary meeting August 1996, editorial changes prior to approval as Version 2.0.0
November 1996	Version 3.0.0	Approved by SMG #19
June 1997	Version 3.1.0	Approved by SMG #22
November 1997	Draft Version 3.2.0	Agreed by SMG1 Dresden, presented for information at SMG#24
January 1998	Version 3.2.1	2 CRs approved by SMG#24
October 1998	Version 3.3.0	3 out of 4 CRs were approved by SMG#27
January 1999	draft v3.4.0	SMG1 agreed CRs
January 1999	pre-draft v3.5.0	Further CR on Handover
March 1999	Version 3.6.0	Following SMG#28 revision and approval of Network Selection