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Agenda Item: **5.1.3**

S1-99809	22.121	002	R99	Virtual Home Environment.
S1-99845	22.121	003	R99	Addition of IP4 Addressing
S1-99535	22.121	004	R99	Charging capabilities
S1-99746	22.105	015	R99	Service Capabilities and Service Capabilities Features.

TSG-SA Working Group 1 (Services) meeting #5
Bernried, Starnberger, Germany 27th Sept – 1st Oct 1999

TSG S1 (99)809
Agenda Item: 6.3.5

CHANGE REQUEST No : 002

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

Technical Specification / Report UMTS 22.121 Version: 3.1~~0~~.0

Submitted to TSG_SA	5	for approval	X	without presentation ("non-strategic")	
list TSG plenary meeting no. here ↑		for information		with presentation ("strategic")	X

PT SMG CR cover form is available from: http://docbox.etsi.org/tech-org/smg/Document/smg/tools/CR_form/crf28_1.zip

Proposed change affects: USIM [ ] TE [ ] Network [X]
(at least one should be marked with an X)

Work item: Virtual Home Environment

Source: VHE Adhoc group **Date:** 29/9/99

Subject: Virtual Home Environment.

Category: *(one category and one release only shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			UMTS 99	X

Reason for change: Change of title from VHE execution environment to Service execution environment. As VHE is a concept there is no VHE execution environment hence change of title. Definition for service execution environment has also been included. Changes to tidy up the USER definition. ~~make mores~~

Clauses affected: 3.1, 4.0, 5.1, .

Other specs affected:

Other releases of same spec	[ ]	→ List of CRs:
Other core specifications	[ ]	→ List of CRs:
MS test specifications / TBRs	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

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<--------- double-click here for help and instructions on how to create a CR.

3G TS 22.121 3.10.0 (1999-06)

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3rd Generation Partnership Project;
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Contents

Foreword

This Technical Specification has been produced by the 3GPP.
The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version 3.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 Indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the specification;

1 Scope

This document specifies the content of the stage one requirement for realisation of VHE.
Virtual Home Environment (VHE) is defined as a concept for personal service environment (PSE) portability across network boundaries and between terminals. The concept of the VHE is such that users are consistently presented with the same personalised features, User Interface customisation and services in whatever network and whatever terminal (within the capabilities of the terminal and the network), wherever the user may be located.
A key feature to support VHE is the ability to build services using a standardised application interface.
Requirements not applicable for R99 will be explicitly indicated.

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] GSM 01.04 (ETR 350): ”Digital cellular telecommunication system (Phase 2+); Abbreviations and acronyms”

[2] GSM 02.57: ”Digital cellular telecommunication system (Phase 2+); Mobile Station Application Execution Environment (MExE); Service description”

[3] GSM 02.78: ”Digital cellular telecommunication system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL); Service definition - Stage 1”

[4] GSM 11.14: ”Digital cellular telecommunication system (Phase 2+); Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment; (SIM - ME) interface”

[5] UMTS TS 22.01: ”Universal Mobile Telecommunications System (UMTS): Service Aspects; Service Principles”

[6] UMTS TS 22.05: ”Universal Mobile Telecommunications System (UMTS); Services and Service Capabilities”

[7] ITU-T Recommendation Q.1701, Framework for IMT-2000 networks

[8] ITU-T Recommendation Q.1711, Network Functional Model for IMT-2000

[9] UMTS TS 22.00 UMTS phase 1

2.2 Informative references

[1] UMTS TR 22.70: ”Universal Mobile Telecommunications System (UMTS); Virtual Home Environment”

[2] World Wide Web Consortium Composite Capability/Preference Profiles (CC/PP): A user side framework for content negotiation (www.w3.org)

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this TS, the following definitions apply:
HE-VASP: Home Environment Value Added Service Provider. This is a VASP that has an agreement with the Home Environment to provide services.
Local Service: A service, which can be exclusively provided in the current serving network by a Value added Service Provider.
Service Capabilities: Bearers defined by parameters, and/or mechanisms needed to realise services. These are within networks and under network control.
Service Capability Feature: Functionality offered by service capabilities that are accessible via the standardised application interface
Services: Services are made up of different service capability features.
Service Execution Environment: a service execution environment is a platform on which an application or programme is authorised to perform a number of functionalities; examples of service execution environments are the user equipment, integrated circuit card and a network platform or any other server.
Applications / Clients: These are services, which are designed using service capability features.
Application Interface: Standardised Interface used by application/clients to access service capability features.
Personal Service Environment: contains personalised information defining how subscribed services are provided and presented towards the user. The Personal Service Environment is defined in terms of one or more User Profiles.
Home Environment: responsible for overall provision of services to users
User: is a logical ~~, identifiable~~ entity, which uses UMTS services.
User Interface Profile: Contains information to present the personalised user interface within the capabilities of the terminal and serving network.
User Services Profile: Contains identification of subscriber services, their status and reference to service preferences.

User Profile: This is a label identifying a combination of one ~~-~~user interface profile, and one user services profile.
Value Added Service Provider: provides services other than basic telecommunications service for which additional charges may be incurred.
Virtual Home Environment: A concept for personal service environment portability across network boundaries and between terminals.

Further UMTS related definitions are given in 3G TS 22.101.

3.2 Abbreviations

For the purposes of this TS the following abbreviations apply:

API	Application Programming Interface
CAMEL	Customised Application For Mobile Network Enhanced Logic
CORBA	Common Object Request Broker Architecture
FFS	For Further Study

ME	Mobile Equipment
MExE	Mobile Station (Application) Execution Environment
MMI	Man Machine Interface
MS	Mobile Station
MSC	Mobile Switching Centre
HLR	Home Location Register
GSN	GPRS Support Nodes
SSF	Service Switching Function
PLMN	Public Land Mobile Network
HE	Home Environment
SAT	SIM Application Tool-Kit
SIM	Subscriber Identity Module
SMS	Short Message Service
USIM	User Service Identity Module
USSD	Unstructured Supplementary Service Data
VASP	Value Added Service Provider
HE-VASP	Home Environment Value Added Service Provider
PSE	Personal Service Environment
VHE	Virtual Home Environment
LCS	LoCation Services
CAP	Camel Application Part
MAP	Mobile Application Part
CSE	Camel Service Environment
OSA	Open Service Architecture

Further GSM related abbreviations are given in GSM 01.04. Further UMTS related abbreviations are given in UMTS TS 22.01.

4 General Description of the VHE

Virtual Home Environment (VHE) is defined as a concept for personal service environment portability across network boundaries and between terminals. The concept of the VHE is such that users are consistently presented with the same personalised features, User Interface customisation and services in whatever network and whatever terminal (within the capabilities of the terminal and network), where ever the user may be located.

The key requirements of the VHE are to provide a user with a personal service environment which consist of:

- Personalised services;
- Personalised User Interface (within the capabilities of terminals);
- Consistent set of services from the user's perspective irrespective of access e.g. (fixed, mobile, wireless etc. Global service availability when roaming

The standards supporting VHE requirements should be flexible enough such that VHE can be applicable to all types of future networks as well as providing a framework for the evolution of existing networks. Additionally the standards should have global significance so that user's can avail of their services irrespective of their geographical location. This implies that VHE standards should:

- provide a common access for services in future networks;
- enable the support of VHE by future networks.
- enable the creation of services,
- enable personal service environment to be recoverable (e.g in the case of loss/damage of user equipment)

Roles and components involved in realisation of VHE consist of the following also see fig 1:

- Home Environment
- User Identifiers
- Users
- Terminals (simultaneous activation of terminals providing the same service per single subscription is not allowed)

- Serving Networks
- Subscriptions
- Possibly Value added service providers.
- Personal Service Environment
- User Profiles

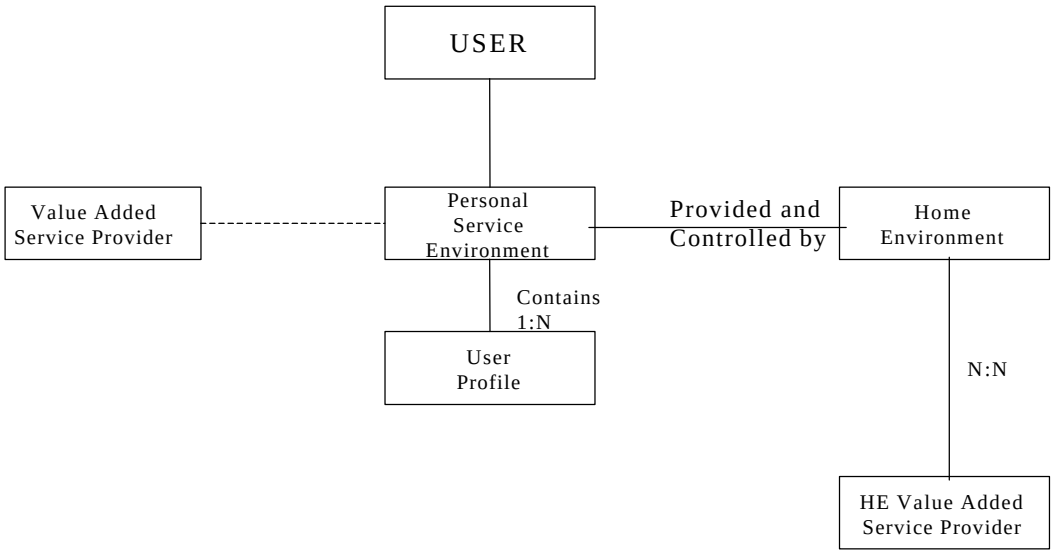

Fig 1: Service Provisioning From User's point of View.~~The Set of Services from the User's Point of View~~

The Home Environment provides and controls services to the user in a consistent manner. The User's personal service environment is a combination of services and personalisation information (described in the user profile). The user may have a number of user profiles which enable her to manage communications according to different situations or needs, for example being at work, in the car or at home. Services provisioned to the user may allow or require personalisation by the user.

The Home Environment provides services to the user in a managed way, possibly by collaborating with HE-VASPs, but this is transparent to the user. The same service could be provided by more than one HE-VASP and HE-VASP can provide more than one service.

Additionally, but not subject to standardisation, the user may access services directly from Value Added Service Providers. The Home Environment does not manage services obtained directly from VASPs. A mechanism may be provided which allows the user to automate access to those services obtained directly from VASPs and personalise those services. However such a mechanism is outside of the scope of this specification.

5. Framework for Services

The implementation of VHE in UMTS release 99 shall support both GSM phase 2+ release 99 teleservices, bearer services and supplementary services as applied in 3G TS 22.100 and new services built by service capability features. Later UMTS developments will provide support for a wider range of services in later releases.

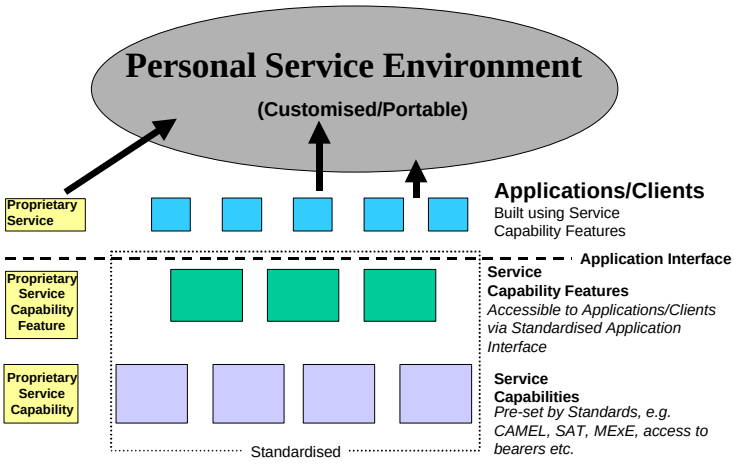

Fig 2: Framework for Services.

The goal of standardisation in UMTS with respect to services is to provide a framework within which services can be created based on standardised service capability features see figure 2 and 3. UMTS services will generally not rely on the traditional detailed service engineering (evident for supplementary services in second-generation systems), but instead provides services using generic toolkits.

Services can be built using service capability features ([1] [2],[3],[4],[9], [10]), which are accessed via a standardised interface. An example of how a service can be built on service capability features could be "call to nearest restaurant", this will make use of call set-up, authorisation, location and database lookup.

The available service capability features are visible ~~to applications~~to applications through the standardised application interface. The application interface can be realised in a non-generic way (implying applications must have knowledge of the underlying mechanisms used) and/or a generic way (implying applications need not have knowledge of underlying mechanisms used). The functionality provided in both cases is the same and both solutions are independent of vendor specific solution.

For example, in the non-generic way, the User Location service capability features can be provided by a location server (e.g HLR, LCS). In the generic way the application will only see a single User Location service -capability feature and does not know which location server provides it.

- The standardised application interface shall be: Independent of vendor specific solutions,
- Independent of programming languages, operating systems etc used in the service capabilities.
- Secure scalable and extensible

In the case of realising the standardised application interface in the generic way, the following additional requirements apply:

- Independent of the location where service capabilities are implemented,
- Independent of supported server capabilities in the network and,

Access to Service Capability Features shall be realised using modern state of the art access technologies, e.g. distributed object oriented technique might be considered.

5.1 Ways to realise services

The information contained in this clause is only to aid understanding and is not an extensive list. Figure 3 illustrates how the concept of VHE makes use of the standardised application interface and how that fits to the service capability features and service capabilities for release 99. It is not to be implied as the agreed architecture as this is a stage 2 issue.

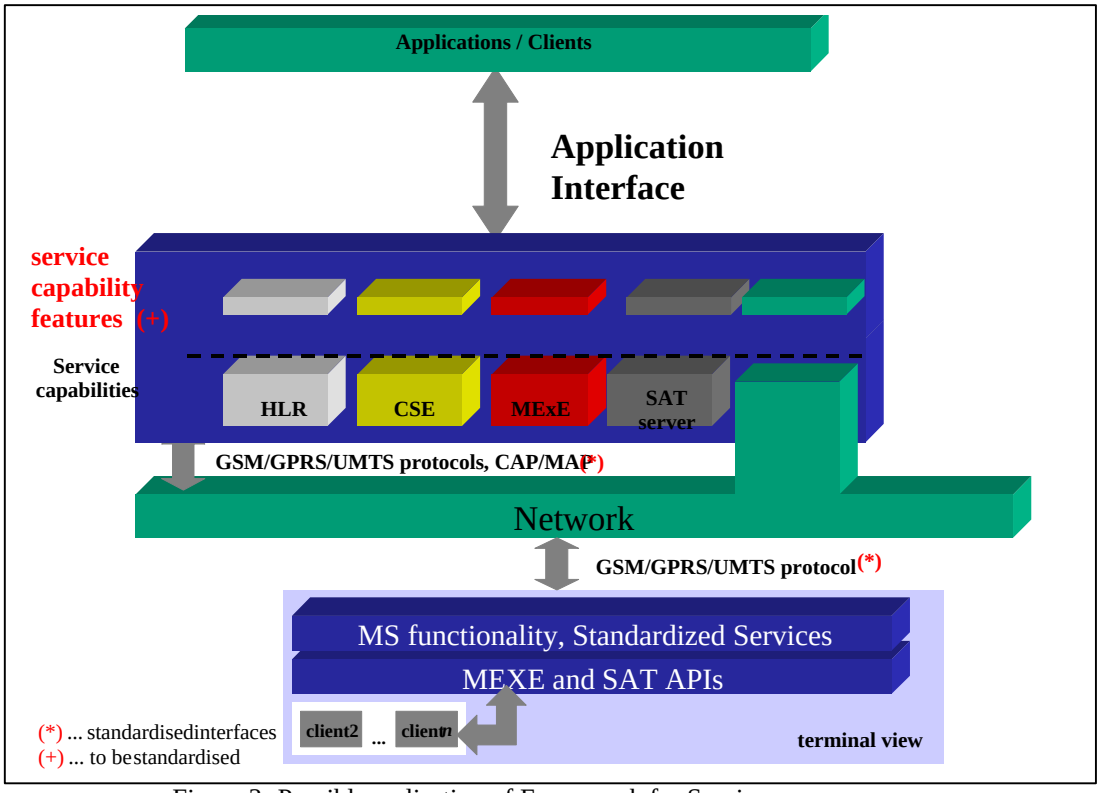

Figure 3 Possible realisation of Framework for Services

STANDARDISED SERVICES (Supplementary Services, Tele-Services, etc.) are implemented on existing GSM/UMTS entities (e.g. HLR , MSC/VLR and terminal) on a vendor specific basis, using standardised interfaces (MAP, etc.) for service communication (e.g. downloading of service data). Availability and maintenance of these Services is also vendor dependent.

OPERATOR SPECIFIC SERVICES (OSS) are not standardised and could be implemented at the GSM/UMTS entities (e.g. HLR) on a vendor specific basis or using GSM ph 2+ mechanisms (CAMEL, SAT, MExE). These tool-kits use standardised interfaces to the underlying network (CAP, MAP) or use GSM Bearers to transport applications and data from the MExE/SAT server to the MS/SIM. The implementation of these operator specific services on the different platforms (CSE, MExE/SAT Server, MSs) is done in a completely vendor specific way and uses only proprietary interfaces.

Other **APPLICATIONS** are like OSS not standardised. These applications will be implemented using standardised interfaces to the Service Capabilities (Bearers, Mechanisms). The functionality offered by the different Service Capabilities are defined by Service Capability Features. These Service Capability Features will be standardised and can be used by the application designers to build their applications.
-Within the terminals Service Capabilities are accessible via the existing MExE and SAT APIs, i.e. there will be no service capability features ~~and thus no service features~~ within the terminal.
The terminal can communicate, using GSM/UMTS bearers, with applications in the network via the service capability features defined for MExE- and SAT-servers.

6 User Requirements of VHE

The user shall have the possibility to manage services as well as the appearance of the services. It shall be possible for the user to:

- Personalise services.

- Personalised User Interface (within the capabilities of terminals)
- Access services from any network or terminal subject to network capabilities, terminal capabilities and any restrictions imposed by the home environment.

- Use services in a consistent manner irrespective of serving network and terminal, within the technical limitations.

- Access new services in the Home Environment.

- Modify a user profile(for example to include new services) from any location

- Activate or deactivate user services.
- Discover which local services are available

- Access local services in a secure manner.

- Interrogate current user service and user interface settings
- select a particular User Profile;
- indicate (on a session by session basis if necessary) to which subscription charges are to be applied to ;
- recover MS resident User Profile information to protect against loss or damage of user equipment.

Be aware of limitations of services, which may result from different terminals and or serving network capabilities.

6.1 Personal Service Environment

The Personal Service Environment describes how the user wishes to manage and interact with their communications services. The PSE is a combination of a list of subscriptions (detailing provisioned services), preferences associated with those services, terminal interface preferences and other information related to the user's experience of the system. Within the PSE the user can manage multiple subscriptions e.g. both business and personal, multiple terminal types and express location and temporal preferences. The Personal Service Environment is defined in terms of one or more User Profiles.

6.1.1 User Profiles

A combination of different preferences is described by a User Profile. The user can define one or more User Profiles according to their needs.
Each User Profile consists of two kinds of information:
- interface related information (**User Interface Profile**);
- services related information (**User Services Profile**).

A User Interface Profile consists of the following type of information:
- menu settings, e.g. menu items shown, menu structure, the placement of icons;
- terminal settings, e.g. ringing tone and volume, font type and size, screen and text colour, language, content types and sizes accepted
- network related preferences e.g. language used for announcements, *(editor's note: for clarification)*

A User Services Profile consists of the following information:

- a list of services subscribed to and references to Service Preferences for each of those services if applicable. Service Preferences could be information such as redirection numbers, redirection conditions, caller screening lists, time-of-day variations etc;
- service status (active/deactive).

The user may define one or more User Interface Profiles and many User Services Profiles, but a given User Profile consists of a single combination of these. In this way a user could for example have a different User Profile to suit each of the three different terminals she owns. The User Services Profile is the same in each case but the User Interface Profile is different to suit the display capabilities of each terminal. User Profiles could also exist which use the same User Interface Profile but different User Services Profiles. This might simply imply that business calls are forwarded to an answering service when the user leaves the office because a new User Profile is now active.
Where the user has more than one User Profile the activation of a particular one could be done in the following ways:

- *Statically*: the user explicit selects one of the User Profiles as the active one;
- *Dynamically*: the appropriate User Profile is selected automatically based upon some criteria such as time of day, location, terminal used or many other possibilities.

Each User Profile must have an identity.
For UMTS Release '99 the information in the User Profiles enables the service capabilities SAT, MExE and CAMEL toolkits in R'99 and existing GSM services to support the user's PSE across network boundaries and between different terminals.
It shall be possible for the service capabilities to access the user profile information from the home environment if appropriate.

6.1.2 User Profiles and Multiple Subscriptions

The user may wish to manage more than one subscription in their PSE. This would allow them to have a single USIM but specify different preferences for the services provisioned in each subscription. In this case the User Services Profile will need to detail all of the services provided per subscription and provide references to the service preferences for each service. When initiating a chargeable event the user will need to indicate which subscription the charges should be applied to.

6.1.3 Management of the user profile

The user and the home environment may modify the user's characterisation of the Personal Service Environment as described in the User Profiles at any time, and changes become effective at the earliest possible opportunity. The home environment shall be able to update distributed User Profiles to reflect any user or home environment modification of the user's Personal Service Environment.
The User Profiles may be stored in the Mobile Station (the SIM or the ME), and/or the home environment. The information in User Services Profiles is distributed between the home environment and the MS. In the event of loss/damage of mobile station (SIM or ME), the User Profiles must be fully recoverable and be used to reconfigure a new mobile station.
Some aspects of the User Profiles such as aspects related to terminal configuration, must be stored in a standardised format to support VHE.
(Note: To ensure that User Profiles are applicable to as wide a community of terminal and network types as possible, existing work on this topic in other standards fora should be considered. One possibility is the work of the World Wide Web Consortium on the Composite Capability/Preference Profile [2].

6.1.4 Requirements for Standardisation

To facilitate the provision of PSE and User Profiles the standard shall:

- uniquely identify User Profiles;
- provide a standardised format for describing terminal configuration preferences;

7 Home Environment Requirements for VHE Provision

- It shall be possible for the home environment to:

- Control access to services depending on the location of the user, and serving network.
- Control access to services on a per user basis e.g subject to subscription.
- Control access to services depending on available service capabilities in the serving network, and terminals
- Manage service delivery based on for example end to end capabilities and/or user preferences
- Request version of specific services supported in serving network and terminal
- Request details (e.g. protocol versions and API versions) of available service capabilities supported in the serving network, and terminals.
- Define the scope for management of services by the user, for services provided by the HE.
- Handle charging for services (as defined in clause 11)
- Deploy services to users or groups of users
- Manage provision of services to users or groups of users

8 Serving Network Requirements for VHE Provision

- The serving network should not need to be aware of the services offered via the home environment.
- The user/home environment may request capabilities, which are necessary to support, home environment services.
- It shall be possible for the serving network to perform the following:
- The serving network shall support user access to services in the home environment;
- The serving network shall provide the necessary service capabilities to support the services from the home environment as far as possible;
- Dynamically provide information on the available service capabilities in the serving network;
- Provide transparent communication between clients and servers in terminals and networks;

9 VASP Relationship to VHE

The user may access services directly from Value Added Service Providers. Services obtained directly from VASPs are not managed by the Home Environment and therefore are not part of the VHE offered by the Home Environment. A mechanism should be provided which allows the user to automate access to those services obtained directly from VASPs and personalise those services. However such a mechanism is outside of the scope of this specification.
There may be some information, which is shared between the Home Environment and the HE-VASP (for example current capabilities).
The Home Environment may grant the HE-VASP access to standardised service capabilities in order to allow the development and deployment of services on behalf of the Home Environment.
There are no VASP requirements to support VHE.

10 Service Capability Features

Services Capability Features are open, technology independent building blocks accessible via a standardised application interface. This interface shall be applicable for a number of different business and applications domains (including besides the telecommunication network operators also service provider, third party service providers acting as HE-VASPs, etc.).
All of these businesses have different requirements, ranging from simple telephony and call routing, virtual private networks, fully interactive multimedia to using MS based applications.
The service capability features shall enable applications to make use of the service capabilities (e.g. CAMEL, MExE, etc) of the underlying UMTS network in an open and secure way.
Application/Clients access the service capability features via the standardised application interface. This means that a single service capability feature is accessible and visible to application/clients via the method/operation invocations in the interface.
Two different types of service capability features can be distinguished:

- **Framework service capability features**: these shall provide commonly used utilities, necessary for the non-framework service capability features to be accessible, secure, resilient and manageable.
- **Non-Framework service capability features**: these shall enable the applications to make use of the functionality of the underlying network capabilities (e.g. User Location service capability features).

10.1 Framework service capability features

Framework service capability features will be used e.g. for authentication, registration, notification, etc. and provide functionality that is independent of any particular type of service. Other commonly used service capability features may be added later.

10.1.1 Authentication service capability feature

Authentication is used to verify the identity of an entity (user, network, and application).
Three types of authentication are distinguished:

- **User-Network Authentication**. Before a user can access her subscribed applications, the user has to be authenticated by the network that provides access to the application. This allows the network to check to what applications the user has subscribed to. User-network authentication *is handled within the network and therefore outside the scope of this specification.*
- **Application-Network Authentication**. Before an application can use the capabilities from the network, a service agreement has to be established between the application and the network. Establishment of such a service agreement starts with the mutual authentication between application and network. If a service agreement already exists, modification might be needed or a new agreement might supersede the existing.
- **User-Application Authentication**. Before a user can use an application or perform other activities (e.g. modifying profile data) the application provider must authenticate the user. When the network already authenticates the user, authentication is not needed anymore. When the network is transparent and the user accesses an application directly, authentication is needed between user and application but *this is outside the scope of this specification.*

10.1.2 Authorisation service capability feature

Authorisation is the activity of determining what an authenticated entity (user, network, and application) is allowed to do (note: authentication must therefore precede authorisation).
Two types of authorisation are distinguished:

- **Application-Network Authorisation**. The network verifies what non-framework service capability features s (or even some framework service capability features) the application is allowed to use. Once an application has been authorised to use one, more or all (non-framework) service capability features no further authorisation is required as long as the "allowed" (non-framework) service capability ~~features are~~features are used.
- **User-Application Authorisation**. The application verifies what actions the user is allowed to perform (e.g. [deactivation of functionality, modification of application data). This is transparent to the network and therefore *outside the scope of this specification*.

10.1.3 Registration service capability feature

The Registration service capability feature enables the non-framework service capability features (e.g. User Location) to register at the Framework. Registration must take place before authorised applications can find out from the Framework which non-framework service capability features are available. This means that the non-framework service capability features must be registered before they can be discovered and used by authorised applications.
Note that only the non-framework service capability features have to be registered. The Framework service capability features (defined in section 10.1) are available by default since they provide basic mechanisms.

10.1.4 Discovery service capability feature

The Discovery service capability feature enables the application to identify the total collection of service capability features that it can use. Upon request of the application, the Discovery service capability feature will indicate the non-framework service capability features that are available for the application. The list of available service capability features is created through the Registration process described in section 10.1.3. This means that a service capability feature must be registered at the Framework before it can be discovered by the application.

10.1.5 Notification service capability feature

The Notification service capability feature allows applications to enable, disable and receive notifications of application related events that have occurred in the underlying GSM/UMTS network, e.g. indication that a new call is set-up or a message is received.
Note: It should be further studied if Notification is only a Framework service capability feature or also specialised as non-framework service capability features (e.g. for notifications on location update, disconnected party etc.)

10.2 Non-Framework service capability features

The Non-Framework service capability features represent the total collection of service capability features that are not included in the Framework. These non-framework service capability ~~features enable~~features enable the application to make use of the functionality provided by the network and service capabilities.
Service capability features shall be defined as much as possible in a generic way to hide the network specific implementation. To achieve this, it is necessary to identify the functionality that is provided by more than one service capabilities. For example, User Location can be produced in several underlying ways. This functionality can be captured once when defined the service capability features in a generic way. It is important that the generic part becomes as large as possible.
When applications use the generic service capability features, these applications become independent of (portable over) underlying service capabilities. Applications shall however still be able to request service capability features specific to a service capability (e.g. Call Setup from CAMEL). This will increase dependency of the used service capability.
The following sections define generic service capability features e.g. for Session Control and Message Transfer.

10.2.1 Session Control service capability features

This section details the Session Control related service capability features. Session Control service capability features shall offer the functionality to establish, maintain, modify and release bearers to/from other parties or entities.
Herein, the term “session” can mean anything from a simple voice call to a complex multimedia “call” (including exchange of non delay-sensitive data). To define the necessary service capability features it is proposed to use a generic model (including the "session party handling").
For example, the following Session Control service capability features shall be provided (the list is not exhaustive):

- initiate and create session (e.g. used to set-up a Telephony session “out of the blue”)
- allow the session to continue with modified information (e.g. changed destination number)
- release the session (i.e. removing all parties from the session)
- add bearer to the session
- remove bearer from the session
- resume bearer to the session (i.e. move party from “on-hold” into Telephony Session)
- suspend bearer from the session (i.e. move party from Telephony Session to “on hold”)
- request session information (i.e. information like session duration, session end time)

- supervise session (e.g. monitor for session duration or data volume, tariff switching moments and changes in QoS)
- presentation of, or restriction of, information associated with a party involved in a session (e.g. calling line ID, calling name)

For each session it shall be possible to specify:

- the desired media type (e.g. video, voice, non-real time data etc.)
- the events on which monitoring is required ([3])

Note: the mapping to service capabilities is for further study. (It shall be investigated to which extend the requirements above fit to CAMEL, MEXE and other service capabilities.)

10.2.2 Security/Privacy service capability features

For the Security/Privacy the following service capability features shall be supported:

- encryption of user data and signalling;

10.2.3 Address Translation service capability features

The Address Translation enables the application to find out from the underlying network what the user's addresses are. Based on a known user address, the application may request another address (e.g. based on the E.164 number, the user's e-mail is retrieved). The range of addressing options includes:

- E.164 Numbering (e.g. GSM MS-ISDN);
- ASEA Numbering (ATM);
- IP v6 numbering;
- X.25 Numbering;
- Internet symbolic naming.

10.2.4 User Location service capability features

The User Location service capability features provide an application with information concerning the user's location.
The user location information contains the following attributes:

- **location** (e.g. in terms of universal latitude and longitude co-ordinates)
- **accuracy** (value depending on local regulatory requirements and level of support in serving/home networks; note that the accuracy of the serving network might differ from that in the home environment)
- **age** of location information (last known date/time made available in GMT)

The following service capability features shall be provided:

- **Report of location information**
  The application shall be able to request user location information.
  By default the location information is provided once; the application may also request periodic location reporting (i.e. multiple reports spread over a period of time)

- **Notification of location update**
  The application shall be able to request to be notified when the user's location changes, i.e. when:
  - the user enters or leaves a specified geographic area
  - the user's location changes more than a specified lower boundary. The lower boundary can be selected from the options provided by the network.

  The application shall be able for each user to start/stop receipt of notifications and to modify the required accuracy by selecting another option from the network provided options.

- **Access control to location information**
  The user shall be able to restrict/allow access to the location information. The restriction can be overridden by the network operator when appropriate (e.g. emergency calls).

10.2.5 User Status service capability features

The User Status service capability features enable an application to retrieve the user's status, i.e. to find out on which terminals the user is available.
The following service capability features shall be provided:

- **Retrieval of User Status**

  The application shall be able to retrieve the status of the user
- **Notification of User Status Change**

  The application shall receive notifications when the user's terminal attaches or detaches.
  - Detach: the user's terminal is switched on or the network initiates detach upon location update failure
  - Attach: the user's terminal is switched on or there has been a successful location update after network initiated detach.

  The application shall be able for each terminal to start/stop receipt of notifications.

10.2.6 Terminal Capabilities service capability features

(Editor's note: this section needs to be checked against the MExE specifications *)*
The Terminal Capabilities service capability features enable the application to find out what capabilities the user's terminal supports (note: "terminal" covers both (mobile) equipment and USIM).
The following service capability features shall be provided:

- **Retrieval of Terminal Capabilities**
  The application shall be able to retrieve the capabilities of the terminal. This includes:
  - the media that the terminal is capable to deal with (e.g. audio, video, PC data, WAP data; this information is needed by the application e.g. when the user wants to download messages from the mailbox);
  - the number of calls that the terminal can deal with simultaneously.

10.2.7 Message Transfer service capability features

The Message Transfer service capability features enable an application to put a message in the user's mailbox and to send message notifications to the user. A message can e.g. be of type video, audio, e-mail, fax, SMS etc.; a message can also contain an attachment (e.g. a video file attached to an e-mail).
The following service capability features shall be supported:

- **Send message to mailbox**
  The application shall be able to put a message in the user's mailbox. The application can e.g. leave a message for a user indicating a missed call. The type of the message (video, audio, e-mail) needs to be specified. Messages may contain attachments.

- **Send message to user**

  The application shall be able to send a message to the user directly (i.e. the message is not stored in the mailbox). Examples are a fax message and an announcement like "your call is being diverted".

- **Get message from mailbox**

  The application shall be able to fetch a message from the mailbox (when requested by the user to do so).

- **Send message notification**
  The application shall be able to send a notification to the user e.g. when it has put a message in the mailbox or when it has received a notification from the mailbox that a new message has arrived for the user.
- **Request message receipt notification**
  The application can request to receive a notification every time a message is received in the mailbox for the user. This allows the application to take the appropriate action, e.g. informing the user.

- **Collect message/data from user**
  The application shall be able to collect a message/data from the user. For example, the user might enter a PIN code.

10.2.8 Data Download service capability features

To allow the support of home environment / serving network specific services the following service capability features shall be supported;

- capability to download applications, data to the terminal;
- capability to download applications, data to the USIM;

10.2.9 User Profile Management service capability features

The User Profile Management service capability features allow the application to retrieve the user profile (see section 7.1 for more information on user profiles).

10.2.10 Charging service capability features

The Charging service capability features enable the application to instruct the network and inform the user with charging information and to add some additional charging information to the network generated Call Detail Records.
The following service capability features shall be provided:

- Define session duration, data volume, etc.
- Send charging data (this data is included in a “free format” field in the network generated Call Detail Records. It may contain information like a application generated Call Id, used by the application provider to relate application generated charging information to the network generated charging information)
- Transfer of Advice of Charge data (as defined in GSM02.24) to the terminal.

11 Service~~VHE~~ execution environment

The following service execution environments shall be standardised and could be used to provide a VHE for the user:

- User equipment execution environment
- IC card execution environment
- Network execution environment not required for R99

For UMTS release 99 one or more of the following shall provide the execution environments:

- MExE
- SIM Application Tool kit (SAT)
- CAMEL

12 Charging requirements

Services, which are provided as part of the VHE, may be subject to charge at the discretion of the home environment
There are several forms of charging which shall be available to the home environment. It shall be possible for the home environment to charge in the following instances: -

- Subscription;

  the user’s registration to use services may be subject to charge;

- Service transfer;

  the transfer of services and/or information to the user MS or USIM may be subject to charge;

- Service upgrading;

  the upgrading of previously transferred services to the user's MS or USIM may be subject to charge (automated upgrading of services may be subject to a different charge);

- Service usage;

  the usage of services by a user may be subject to a charge;

- Roaming

  the usage of VHE services when roaming may be subject to additional charges;

Refer to UMTS 22.15 for further details.
Other charging requirements may be identified and are for FFS.

13 Security requirements

The mechanisms supporting VHE shall maintain a secure environment for the user and home environment.

The specific security requirements are FFS.

Annex A (Informative)

The following table shows the service examples to be considered in VHE

Benchmark Services	Abb	Priority
Abbreviated Dialling	ABD	A
Account Card Calling	ACC	B
Automatic Alternative Billing	AAB	A
Call Distribution	CD	A
Call Forwarding	CF	A
Call Hold	CH	A
Call Rerouting Distribution	CRD	A
Call Transfer	TRA	A
Call Waiting	CW	A
Completion of Call to Busy Subscriber	CCBS	A
Conference Calling	CON	A
Credit Card Calling	CCC	B
Destination Call Routing	DCR	A
Follow-Me Diversion	FMD	A
Freephone	FPH	A
Global Virtual Network Service	GVNS	A
Hot Line	HOT	A
International Telecommunication Charge Card	ITCC	B
Internetwork Freephone	IFPH	A
Internetwork Mass Calling	IMAS	A
Internetwork Premium Rate	IPRM	A
Internetwork Televoting	IVOT	A
Malicious Call Identification	MCID	A
Mass Calling	MAS	A
Message store and forward	MSF	A
Multimedia	MMD	B
Originating Call Screening	OCS	A
Premium Rate	PRM	A
Security Screening	SEC	A

Selective Call Forward on Busy / Dont' answer	SCF	A
Split Charging	SPL	A
Televoting	VOT	A
Terminating Call Screening	TCS	A
Terminating Key Code Protection	TCKP	B
Universal Access Number	UAN	B
Universal Personal Telecommunication	UPT	A
User-Defined Routing	UDR	B (FFS)
Virtual Private Network	VPN	A

Benchmark services listed above could be realised by service capability features.

TSG-SA Working Group 1 (Services) meeting #5
Munich 28th Sep to 1st Oct 1999

TSGS1#5(99)845

Agenda 6.3.5

CHANGE REQUEST No :	**003**	*Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*			
Technical Specification / Report UMTS	22.121	Version:	3.0.0		
Submitted to TSG_SA *list TSG plenary meeting no. here ↑*	5	for approval	X	without presentation ("non-strategic")	X
		for information		with presentation ("strategic")	

PT SMG CR cover form is available from: http://docbox.etsi.org/tech-org/smg/Document/smg/tools/CR_form/crf28_1.zip

Proposed change affects: *(at least one should be marked with an X)*

USIM	TE	Network
		X

Work item: Virtual Home Environment

Source: Fujitsu Europe Telecom **Date:** 01/10/99

Subject: Addition of IP4 Addressing

Category: *(one category and one release only shall be marked with an X)*

			Release:		
F	Correction			Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			UMTS 99	X

Reason for change:

Although it is IP v6 addressing that is referred to in the specification it is IP v4 that is currently in use and should be included in the specification.

Clauses affected: 10.2.3 .

Other specs affected:

Other releases of same spec		→ List of CRs:	
Other core specifications		→ List of CRs:	
MS test specifications / TBRs		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

3G TS 22.121 3.1~~00~~.0 (1999-06)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects
Service aspects;
The Virtual Home Environment
(3G TS 22.121 version 3.0.0)

10.2 Non-Framework service capability features

The Non-Framework service capability features represent the total collection of service capability features that are not included in the Framework. These non-framework service capability ~~features enable~~features enable the application to make use of the functionality provided by the network and service capabilities.
Service capability features shall be defined as much as possible in a generic way to hide the network specific implementation. To achieve this, it is necessary to identify the functionality that is provided by more than one service capabilities. For example, User Location can be produced in several underlying ways. This functionality can be captured once when defined the service capability features in a generic way. It is important that the generic part becomes as large as possible.
When applications use the generic service capability features, these applications become independent of (portable over) underlying service capabilities. Applications shall however still be able to request service capability features specific to a service capability (e.g. Call Setup from CAMEL). This will increase dependency of the used service capability.
The following sections define generic service capability features e.g. for Session Control and Message Transfer.

10.2.1 Session Control service capability features

This section details the Session Control related service capability features. Session Control service capability features shall offer the functionality to establish, maintain, modify and release bearers to/from other parties or entities.
Herein, the term “session” can mean anything from a simple voice call to a complex multimedia “call” (including exchange of non delay-sensitive data). To define the necessary service capability features it is proposed to use a generic model (including the "session party handling").
For example, the following Session Control service capability features shall be provided (the list is not exhaustive):

- initiate and create session (e.g. used to set-up a Telephony session “out of the blue”)
- allow the session to continue with modified information (e.g. changed destination number)
- release the session (i.e. removing all parties from the session)
- add bearer to the session
- remove bearer from the session
- resume bearer to the session (i.e. move party from “on-hold” into Telephony Session)
- suspend bearer from the session (i.e. move party from Telephony Session to “on hold”)
- request session information (i.e. information like session duration, session end time)
- supervise session (e.g. monitor for session duration or data volume, tariff switching moments and changes in QoS)
- presentation of, or restriction of, information associated with a party involved in a session (e.g. calling line ID, calling name)

For each session it shall be possible to specify:

- the desired media type (e.g. video, voice, non-real time data etc.)
- the events on which monitoring is required ([3])

Note: the mapping to service capabilities is for further study. (It shall be investigated to which extend the requirements above fit to CAMEL, MEXE and other service capabilities.)

10.2.2 Security/Privacy service capability features

For the Security/Privacy the following service capability features shall be supported:

- encryption of user data and signalling;

10.2.3 Address Translation service capability features

The Address Translation enables the application to find out from the underlying network what the user's addresses are. Based on a known user address, the application may request another address (e.g. based on the E.164 number, the user's e-mail is retrieved). The range of addressing options includes:

- E.164 Numbering (e.g. GSM MS-ISDN);
- ASEA Numbering (ATM);
- IP v4 numbering;
- IP v6 numbering;
- X.25 Numbering;
- Internet symbolic naming.

10.2.4 User Location service capability features

The User Location service capability features provide an application with information concerning the user's location.
The user location information contains the following attributes:

- **location** (e.g. in terms of universal latitude and longitude co-ordinates)
- **accuracy** (value depending on local regulatory requirements and level of support in serving/home networks; note that the accuracy of the serving network might differ from that in the home environment)
- **age** of location information (last known date/time made available in GMT)

The following service capability features shall be provided:

- **Report of location information**
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  By default the location information is provided once; the application may also request periodic location reporting (i.e. multiple reports spread over a period of time)

- **Notification of location update**
  The application shall be able to request to be notified when the user's location changes, i.e. when:
  - the user enters or leaves a specified geographic area
  - the user's location changes more than a specified lower boundary. The lower boundary can be selected from the options provided by the network.

  The application shall be able for each user to start/stop receipt of notifications and to modify the required accuracy by selecting another option from the network provided options.

- **Access control to location information**
  The user shall be able to restrict/allow access to the location information. The restriction can be overridden by the network operator when appropriate (e.g. emergency calls).

TSG-SA Working Group 1 (Services) meeting #4 *TSGS1#4(99)535*
Québec, Canada, 5th-9th July 1999 **Agenda 6.5.5**

CHANGE REQUEST No : **004** *Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

Technical Specification / Report UMTS 22.121 Version: 3.0.0

Submitted to TSG_SA	5	for approval	X	without presentation ("non-strategic")	
list TSG plenary meeting no. here ↑		for information		with presentation ("strategic")	X

PT SMG CR cover form is available from: http://docbox.etsi.org/tech-org/smg/Document/smg/tools/CR_form/crf28_1.zip

Proposed change affects: *(at least one should be marked with an X)* USIM [ ] TE [ ] Network [X]

Work item: VHE

Source: France Télécom, TIM **Date:** July 8th , 1999

Subject: Charging capabilities

Category: *(one category and one release only shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			UMTS 99	X

Reason for change: To allow for prepaid services

Clauses affected: 7, 8, 10

Other specs affected:

Other releases of same spec		→ List of CRs:	
Other core specifications		→ List of CRs:	
MS test specifications / TBRs		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

3rd Generation Partners
Technical Specification Group Services and System
Aspects
Service aspects;
The Virtual Home Environment
(3G TS 22.121 version 3.0.0)

Reference
DTS/TSGS-0122121U

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Contents

Foreword

This Technical Specification has been produced by the 3GPP.
The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version 3.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 Indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the specification;

1 Scope

This document specifies the content of the stage one requirement for realisation of VHE.
Virtual Home Environment (VHE) is defined as a concept for personal service environment (PSE) portability across network boundaries and between terminals. The concept of the VHE is such that users are consistently presented with the same personalised features, User Interface customisation and services in whatever network and whatever terminal (within the capabilities of the terminal and the network), wherever the user may be located.
A key feature to support VHE is the ability to build services using a standardised application interface.
Requirements not applicable for R99 will be explicitly indicated.

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] GSM 01.04 (ETR 350): ”Digital cellular telecommunication system (Phase 2+);

[2] GSM 02.57: ”Digital cellular telecommunication system (Phase 2+); Mobile Station Application Execution Environment (MExE); Service description”

[3] GSM 02.78: ”Digital cellular telecommunication system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL); Service definition - Stage 1”

[4] GSM 11.14: ”Digital cellular telecommunication system (Phase 2+); Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment; (SIM - ME) interface”

[5] UMTS TS 22.01: ”Universal Mobile Telecommunications System (UMTS): Service Aspects; Service Principles”

[6] UMTS TS 22.05: ”Universal Mobile Telecommunications System (UMTS); Services and Service Capabilities”

[7] ITU-T Recommendation Q.1701, Framework for IMT-2000 networks

[8] ITU-T Recommendation Q.1711, Network Functional Model for IMT-2000

[9] UMTS TS 22.00 UMTS phase 1

2.2 Informative references

[1] UMTS TR 22.70: ”Universal Mobile Telecommunications System (UMTS);

[2] World Wide Web Consortium Composite Capability/Preference Profiles (CC/PP): A user side framework for content negotiation (www.w3.org)

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this TS, the following definitions apply:
HE-VASP: Home Environment Value Added Service Provider. This is a VASP that has an agreement with the Home Environment to provide services.
Local Service: A service, which can be exclusively provided in the current serving network by a Value added Service Provider.
Service Capabilities: Bearers defined by parameters, and/or mechanisms needed to realise services. These are within networks and under network control.
Service Capability Feature: Functionality offered by service capabilities that are accessible via the standardised application interface**Services:** Services are made up of different service capability features.
Applications / Clients: These are services, which are designed using service capability features.
Application Interface: Standardised Interface used by application/clients to access service capability features.
Personal Service Environment: contains personalised information defining how subscribed services are provided and presented towards the user. The Personal Service Environment is defined in terms of one or more User Profiles.
Home Environment: responsible for overall provision of services to users
User Interface Profile: Contains information to present the personalised user interface within the capabilities of the terminal and serving network.
User Services Profile: Contains identification of subscriber services, their status and reference to service preferences.

User Profile: This is a label identifying a combination of one user interface profile, and one user services profile.
Value Added Service Provider: provides services other than basic telecommunications service for which additional charges may be incurred.
Virtual Home Environment: A concept for personal service environment portability across network boundaries and between terminals.

Further UMTS related definitions are given in 3G TS 22.101.

3.2 Abbreviations

For the purposes of this TS the following abbreviations apply:

API	Application Programming Interface
CAMEL	Customised Application For Mobile Network Enhanced Logic
CORBA	Common Object Request Broker Architecture
FFS	For Further Study
ME	Mobile Equipment
MExE	Mobile Station (Application) Execution Environment
MMI	Man Machine Interface
MS	Mobile Station
MSC	Mobile Switching Centre
HLR	Home Location Register

GSN	GPRS Support Nodes
SSF	Service Switching Function
PLMN	Public Land Mobile Network
HE	Home Environment
SAT	SIM Application Tool-Kit
SIM	Subscriber Identity Module
SMS	Short Message Service
USIM	User Service Identity Module
USSD	Unstructured Supplementary Service Data
VASP	Value Added Service Provider
HE-VASP	Home Environment Value Added Service Provider
PSE	Personal Service Environment
VHE	Virtual Home Environment
LCS	LoCation Services
CAP	Camel Application Part
MAP	Mobile Application Part
CSE	Camel Service Environment
OSA	Open Service Architecture

Further GSM related abbreviations are given in GSM 01.04. Further UMTS related abbreviations are given in UMTS TS 22.01.

4 General Description of the VHE

Virtual Home Environment (VHE) is defined as a concept for personal service environment portability across network boundaries and between terminals. The concept of the VHE is such that users are consistently presented with the same personalised features, User Interface customisation and services in whatever network and whatever terminal (within the capabilities of the terminal and network), where ever the user may be located.

The key requirements of the VHE are to provide a user with a personal service environment which consist of:

- Personalised services;
- Personalised User Interface (within the capabilities of terminals);
- Consistent set of services from the user's perspective irrespective of access e.g. (fixed, mobile, wireless etc. Global service availability when roaming

The standards supporting VHE requirements should be flexible enough such that VHE can be applicable to all types of future networks as well as providing a framework for the evolution of existing networks. Additionally the standards should have global significance so that user's can avail of their services irrespective of their geographical location. This implies that VHE standards should:

- provide a common access for services in future networks;
- enable the support of VHE by future networks.
- enable the creation of services,
- enable personal service environment to be recoverable (e.g in the case of loss/damage of user equipment)

Roles and components involved in realisation of VHE consist of the following also see fig 1:

- Home Environment
- User Identifiers
- Users
- Terminals (simultaneous activation of terminals providing the same service per single subscription is not allowed)
- Serving Networks
- Subscriptions
- Possibly Value added service providers.
- Personal Service Environment
- User Profiles

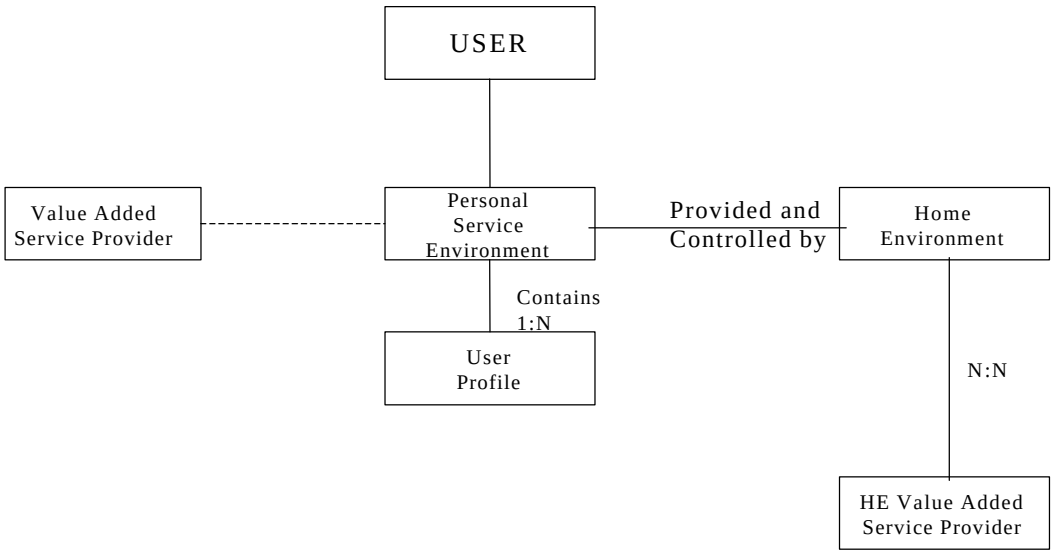

Fig 1: The Set of Services from the User's Point of View

The Home Environment provides and controls services to the user in a consistent manner. The User's personal service environment is a combination of services and personalisation information (described in the user profile). The user may have a number of user profiles which enable her to manage communications according to different situations or needs, for example being at work, in the car or at home. Services provisioned to the user may allow or require personalisation by the user.

The Home Environment provides services to the user in a managed way, possibly by collaborating with HE-VASPs, but this is transparent to the user. The same service could be provided by more than one HE-VASP and HE-VASP can provide more than one service.

Additionally, but not subject to standardisation, the user may access services directly from Value Added Service Providers. The Home Environment does not manage services obtained directly from VASPs. A mechanism may be provided which allows the user to automate access to those services obtained directly from VASPs and personalise those services. However such a mechanism is outside of the scope of this specification.

5. Framework for Services

The implementation of VHE in UMTS release 99 shall support both GSM phase 2+ release 99 teleservices, bearer services and supplementary services as applied in 3G TS 22.100 and new services built by service capability features. Later UMTS developments will provide support for a wider range of services in later releases.

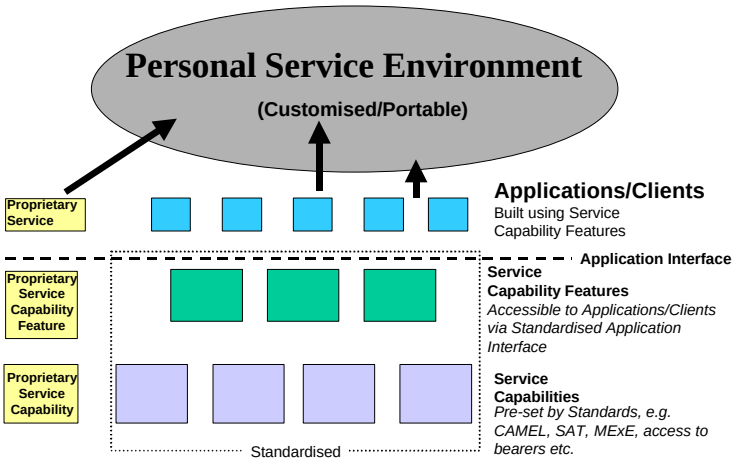

Fig 2: Framework for Services.

The goal of standardisation in UMTS with respect to services is to provide a framework within which services can be created based on standardised service capability features see figure 2 and 3. UMTS services will generally not rely on the traditional detailed service engineering (evident for supplementary services in second-generation systems), but instead provides services using generic toolkits.

Services can be built using service capability features ([1] [2],[3],[4],[9], [10]), which are accessed via a standardised interface. An example of how a service can be built on service capability features could be "call to nearest restaurant", this will make use of call set-up, authorisation, location and database lookup.
The available service capability features are visible to applications through the standardised application interface. The application interface can be realised in a non-generic way (implying applications must have knowledge of the underlying mechanisms used) and/or a generic way (implying applications need not have knowledge of underlying mechanisms used). The functionality provided in both cases is the same and both solutions are independent of vendor specific solution.
For example, in the non-generic way, the User Location service capability features can be provided by a location server (e.g HLR, LCS). In the generic way the application will only see a single User Location service capability feature and does not know which location server provides it.

- The standardised application interface shall be:Independent of vendor specific solutions,
- Independent of programming languages, operating systems etc used in the service capabilities.
- Secure scalable and extensible

In the case of realising the standardised application interface in the generic way, the following additional requirements apply:

- Independent of the location where service capabilities are implemented,
- Independent of supported server capabilities in the network and,

Access to Service Capability Features shall be realised using modern state of the art access technologies, e.g. distributed object oriented technique might be considered.

5.1 Ways to realise services

The information contained in this clause is only to aid understanding and is not an extensive list.
Figure 3 illustrates how the concept of VHE makes use of the standardised application interface and how that fits to the service capability features and service capabilities for release 99. It is not to be implied as the agreed architecture as this is a stage 2 issue.

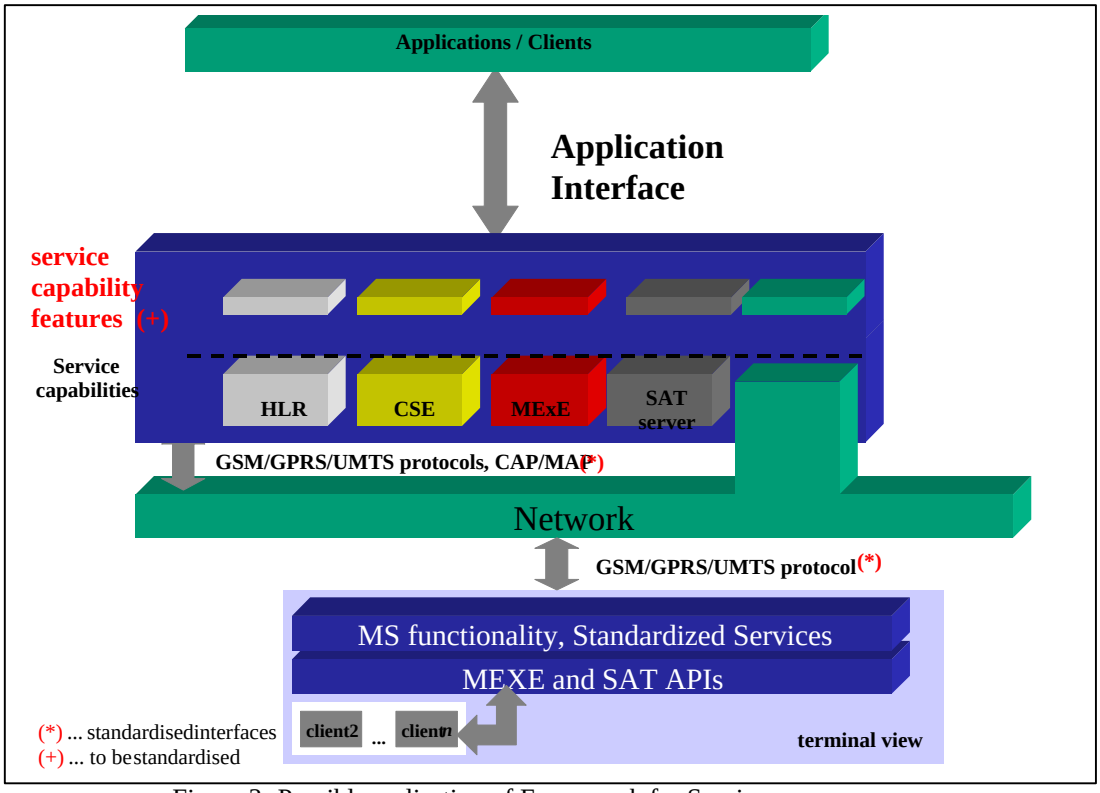

Figure 3 Possible realisation of Framework for Services

STANDARDISED SERVICES (Supplementary Services, Tele-Services, etc.) are implemented on existing GSM/UMTS entities (e.g. HLR , MSC/VLR and terminal) on a vendor specific basis, using standardised interfaces (MAP, etc.) for service communication (e.g. downloading of service data). Availability and maintenance of these Services is also vendor dependent.

OPERATOR SPECIFIC SERVICES (OSS) are not standardised and could be implemented at the GSM/UMTS entities (e.g. HLR) on a vendor specific basis or using GSM ph 2+ mechanisms (CAMEL, SAT, MExE). These tool-kits use standardised interfaces to the underlying network (CAP, MAP) or use GSM Bearers to transport applications and data from the MExE/SAT server to the MS/SIM. The implementation of these operator specific services on the different platforms (CSE, MExE/SAT Server, MSs) is done in a completely vendor specific way and uses only proprietary interfaces.

Other **APPLICATIONS** are like OSS not standardised. These applications will be implemented using standardised interfaces to the Service Capabilities (Bearers, Mechanisms). The functionality offered by the different Service Capabilities are defined by Service Capability Features. These Service Capability Features will be standardised and can be used by the application designers to build their applications.

Within the terminals Service Capabilities are accessible via the existing MExE and SAT APIs, i.e. there will be no service capability features and thus no service features within the terminal.
The terminal can communicate, using GSM/UMTS bearers, with applications in the network via the service capability features defined for MExE- and SAT-servers.

6 User Requirements of VHE

The user shall have the possibility to manage services as well as the appearance of the services. It shall be possible for the user to:

- Personalise services.

- Personalised User Interface (within the capabilities of terminals)
- Access services from any network or terminal subject to network capabilities, terminal capabilities and any restrictions imposed by the home environment.

- Use services in a consistent manner irrespective of serving network and terminal, within the technical limitations.

- Access new services in the Home Environment.

- Modify a user profile(for example to include new services) from any location

- Activate or deactivate user services.
- Discover which local services are available

- Access local services in a secure manner.

- Interrogate current user service and user interface settings
- select a particular User Profile;
- indicate (on a session by session basis if necessary) to which subscription charges are to be applied to ;
- recover MS resident User Profile information to protect against loss or damage of user equipment.

Be aware of limitations of services, which may result from different terminals and or serving network capabilities.

6.1 Personal Service Environment

The Personal Service Environment describes how the user wishes to manage and interact with their communications services. The PSE is a combination of a list of subscriptions (detailing provisioned services), preferences associated with those services, terminal interface preferences and other information related to the user's experience of the system. Within the PSE the user can manage multiple subscriptions e.g. both business and personal, multiple terminal types and express location and temporal preferences. The Personal Service Environment is defined in terms of one or more User Profiles.

6.1.1 User Profiles

A combination of different preferences is described by a User Profile. The user can define one or more User Profiles according to their needs.
Each User Profile consists of two kinds of information:
- interface related information (**User Interface Profile**);
- services related information (**User Services Profile**).

A User Interface Profile consists of the following type of information:
- menu settings, e.g. menu items shown, menu structure, the placement of icons;
- terminal settings, e.g. ringing tone and volume, font type and size, screen and text colour, language, content types and sizes accepted
- network related preferences e.g. language used for announcements, *(editor's note: for clarification)*

A User Services Profile consists of the following information:

- a list of services subscribed to and references to Service Preferences for each of those services if applicable. Service Preferences could be information such as redirection numbers, redirection conditions, caller screening lists, time-of-day variations etc;
- service status (active/deactive).

The user may define one or more User Interface Profiles and many User Services Profiles, but a given User Profile consists of a single combination of these. In this way a user could for example have a different User Profile to suit each of the three different terminals she owns. The User Services Profile is the same in each case but the User Interface Profile is different to suit the display capabilities of each terminal. User Profiles could also exist which use the same User Interface Profile but different User Services Profiles. This might simply imply that business calls are forwarded to an answering service when the user leaves the office because a new User Profile is now active.
Where the user has more than one User Profile the activation of a particular one could be done in the following ways:

- *Statically*: the user explicit selects one of the User Profiles as the active one;
- *Dynamically*: the appropriate User Profile is selected automatically based upon some criteria such as time of day, location, terminal used or many other possibilities.

Each User Profile must have an identity.
For UMTS Release '99 the information in the User Profiles enables the service capabilities SAT, MExE and CAMEL toolkits in R'99 and existing GSM services to support the user's PSE across network boundaries and between different terminals.
It shall be possible for the service capabilities to access the user profile information from the home environment if appropriate.

6.1.2 User Profiles and Multiple Subscriptions

The user may wish to manage more than one subscription in their PSE. This would allow them to have a single USIM but specify different preferences for the services provisioned in each subscription. In this case the User Services Profile will need to detail all of the services provided per subscription and provide references to the service preferences for each service. When initiating a chargeable event the user will need to indicate which subscription the charges should be applied to.

6.1.3 Management of the user profile

The user and the home environment may modify the user's characterisation of the Personal Service Environment as described in the User Profiles at any time, and changes become effective at the earliest possible opportunity. The home environment shall be able to update distributed User Profiles to reflect any user or home environment modification of the user's Personal Service Environment.
The User Profiles may be stored in the Mobile Station (the SIM or the ME), and/or the home environment. The information in User Services Profiles is distributed between the home environment and the MS. In the event of loss/damage of mobile station (SIM or ME), the User Profiles must be fully recoverable and be used to reconfigure a new mobile station.
Some aspects of the User Profiles such as aspects related to terminal configuration, must be stored in a standardised format to support VHE.
(Note: To ensure that User Profiles are applicable to as wide a community of terminal and network types as possible, existing work on this topic in other standards fora should be considered. One possibility is the work of the World Wide Web Consortium on the Composite Capability/Preference Profile [2].

6.1.4 Requirements for Standardisation

To facilitate the provision of PSE and User Profiles the standard shall:

- uniquely identify User Profiles;
- provide a standardised format for describing terminal configuration preferences;

7 Home Environment Requirements for VHE Provision

- It shall be possible for the home environment to:

- Control access to services depending on the location of the user, and serving network.
- Control access to services on a per user basis e.g subject to subscription.
- Control access to services depending on available service capabilities in the serving network, and terminals
- Manage service delivery based on for example end to end capabilities and/or user preferences
- Request version of specific services supported in serving network and terminal
- Request details (e.g. protocol versions and API versions) of available service capabilities supported in the serving network, and terminals.
- Define the scope for management of services by the user, for services provided by the HE.
- Handle charging for services (as defined in clause 11)
- Inform the serving network of the type of charging (i.e. prepaid or/and postpaid) for any required service,
- Inform the serving network of the threshold set for a given service required by the user and charged on a prepaid account,
- Inform the serving network how to manage a service for which the threshold has been reached,
- Manage the prepaid accounts (e.g. increase, decrease the credit, or pass the information to any application which manages the credit)
- Deploy services to users or groups of users
- Manage provision of services to users or groups of users

8 Serving Network Requirements for VHE Provision

- The serving network should not need to be aware of the services offered via the home environment.
- The user/home environment may request capabilities, which are necessary to support, home environment services.
- It shall be possible for the serving network to perform the following:
- The serving network shall support user access to services in the home environment;
- The serving network shall provide the necessary service capabilities to support the services from the home environment as far as possible;
- Dynamically provide information on the available service capabilities in the serving network;
- Provide transparent communication between clients and servers in terminals and networks;
- Request the charging information (type of charging, threshold for prepaid services and behaviour if the threshold is reached) for any service possibly required by the user;
- Handle the call according to the instructions received by the home environment regarding charging activities,
- Inform the home environment of the chargeable events (e.g. send CDRs,…).

9 VASP Relationship to VHE

The user may access services directly from Value Added Service Providers. Services obtained directly from VASPs are not managed by the Home Environment and therefore are not part of the VHE offered by the Home Environment. A mechanism should be provided which allows the user to automate access to those services obtained directly from VASPs and personalise those services. However such a mechanism is outside of the scope of this specification.
There may be some information, which is shared between the Home Environment and the HE-VASP (for example current capabilities).
The Home Environment may grant the HE-VASP access to standardised service capabilities in order to allow the development and deployment of services on behalf of the Home Environment.
There are no VASP requirements to support VHE.

11 Service Capability Features

Services Capability Features are open, technology independent building blocks accessible via a standardised application interface. This interface shall be applicable for a number of different business and applications domains (including besides the telecommunication network operators also service provider, third party service providers acting as HE-VASPs, etc.).
All of these businesses have different requirements, ranging from simple telephony and call routing, virtual private networks, fully interactive multimedia to using MS based applications.
The service capability features shall enable applications to make use of the service capabilities (e.g. CAMEL, MExE, etc) of the underlying UMTS network in an open and secure way.
Application/Clients access the service capability features via the standardised application interface. This means that a single service capability feature is accessible and visible to application/clients via the method/operation invocations in the interface.
Two different types of service capability features can be distinguished:

- **Framework service capability features**: these shall provide commonly used utilities, necessary for the non-framework service capability features to be accessible, secure, resilient and manageable.
- **Non-Framework service capability features**: these shall enable the applications to make use of the functionality of the underlying network capabilities (e.g. User Location service capability features).

10.1 Framework service capability features

Framework service capability features will be used e.g. for authentication, registration, notification, etc. and provide functionality that is independent of any particular type of service. Other commonly used service capability features may be added later.

10.1.1 Authentication service capability feature

Authentication is used to verify the identity of an entity (user, network, and application).
Three types of authentication are distinguished:

- **User-Network Authentication**. Before a user can access her subscribed applications, the user has to be authenticated by the network that provides access to the application. This allows the network to check to what applications the user has subscribed to. User-network authentication *is handled within the network and therefore outside the scope of this specification.*
- **Application-Network Authentication**. Before an application can use the capabilities from the network, a service agreement has to be established between the application and the network. Establishment of such a service agreement starts with the mutual authentication between application and network. If a service agreement already exists, modification might be needed or a new agreement might supersede the existing.
- **User-Application Authentication**. Before a user can use an application or perform other activities (e.g. modifying profile data) the application provider must authenticate the user. When the network already authenticates the user, authentication is not needed anymore. When the network is transparent and the user accesses an application directly, authentication is needed between user and application but *this is outside the scope of this specification.*

10.1.2 Authorisation service capability feature

Authorisation is the activity of determining what an authenticated entity (user, network, and application) is allowed to do (note: authentication must therefore precede authorisation).
Two types of authorisation are distinguished:

- **Application-Network Authorisation**. The network verifies what non-framework service capability features s (or even some framework service capability features) the application is allowed to use. Once an application has been authorised to use one, more or all (non-framework) service capability features no further authorisation is required as long as the "allowed" (non-framework) service capability features are used.

- **User-Application Authorisation**. The application verifies what actions the user is allowed to perform (e.g. [deactivation of functionality, modification of application data). This is transparent to the network and therefore *outside the scope of this specification*.

10.1.3 Registration service capability feature

The Registration service capability feature enables the non-framework service capability features (e.g. User Location) to register at the Framework. Registration must take place before authorised applications can find out from the Framework which non-framework service capability features are available. This means that the non-framework service capability features must be registered before they can be discovered and used by authorised applications.
Note that only the non-framework service capability features have to be registered. The Framework service capability features (defined in section 10.1) are available by default since they provide basic mechanisms.

10.1.4 Discovery service capability feature

The Discovery service capability feature enables the application to identify the total collection of service capability features that it can use. Upon request of the application, the Discovery service capability feature will indicate the non-framework service capability features that are available for the application. The list of available service capability features is created through the Registration process described in section 10.1.3. This means that a service capability feature must be registered at the Framework before it can be discovered by the application.

10.1.5 Notification service capability feature

The Notification service capability feature allows applications to enable, disable and receive notifications of application related events that have occurred in the underlying GSM/UMTS network, e.g. indication that a new call is set-up or a message is received.
Note: It should be further studied if Notification is only a Framework service capability feature or also specialised as non-framework service capability features (e.g. for notifications on location update, disconnected party etc.)

10.2 Non-Framework service capability features

The Non-Framework service capability features represent the total collection of service capability features that are not included in the Framework. These non-framework service capability features enable the application to make use of the functionality provided by the network and service capabilities.
Service capability features shall be defined as much as possible in a generic way to hide the network specific implementation. To achieve this, it is necessary to identify the functionality that is provided by more than one service capabilities. For example, User Location can be produced in several underlying ways. This functionality can be captured once when defined the service capability features in a generic way. It is important that the generic part becomes as large as possible.
When applications use the generic service capability features, these applications become independent of (portable over) underlying service capabilities. Applications shall however still be able to request service capability features specific to a service capability (e.g. Call Setup from CAMEL). This will increase dependency of the used service capability.
The following sections define generic service capability features e.g. for Session Control and Message Transfer.

10.2.1 Session Control service capability features

This section details the Session Control related service capability features. Session Control service capability features shall offer the functionality to establish, maintain, modify and release bearers to/from other parties or entities.
Herein, the term “session” can mean anything from a simple voice call to a complex multimedia “call” (including exchange of non delay-sensitive data). To define the necessary service capability features it is proposed to use a generic model (including the "session party handling").

For example, the following Session Control service capability features shall be provided (the list is not exhaustive):

- initiate and create session (e.g. used to set-up a Telephony session “out of the blue”)
- allow the session to continue with modified information (e.g. changed destination number)
- release the session (i.e. removing all parties from the session)
- add bearer to the session
- remove bearer from the session
- resume bearer to the session (i.e. move party from “on-hold” into Telephony Session)
- suspend bearer from the session (i.e. move party from Telephony Session to “on hold”)
- request session information (i.e. information like session duration, session end time)
- supervise session (e.g. monitor for session duration or data volume, tariff switching moments and changes in QoS)
- presentation of, or restriction of, information associated with a party involved in a session (e.g. calling line ID, calling name)

For each session it shall be possible to specify:

- the desired media type (e.g. video, voice, non-real time data etc.)
- the events on which monitoring is required ([3])

Note: the mapping to service capabilities is for further study. (It shall be investigated to which extend the requirements above fit to CAMEL, MEXE and other service capabilities.)

10.2.2 Security/Privacy service capability features

For the Security/Privacy the following service capability features shall be supported:

- encryption of user data and signalling;

10.2.3 Address Translation service capability features

The Address Translation enables the application to find out from the underlying network what the user's addresses are. Based on a known user address, the application may request another address (e.g. based on the E.164 number, the user's e-mail is retrieved). The range of addressing options includes:

- E.164 Numbering (e.g. GSM MS-ISDN);
- ASEA Numbering (ATM);
- IP v6 numbering;
- X.25 Numbering;
- Internet symbolic naming.

10.2.4 User Location service capability features

The User Location service capability features provide an application with information concerning the user’s location.
The user location information contains the following attributes:

- **location** (e.g. in terms of universal latitude and longitude co-ordinates)
- **accuracy** (value depending on local regulatory requirements and level of support in serving/home networks; note that the accuracy of the serving network might differ from that in the home environment)
- **age** of location information (last known date/time made available in GMT)

The following service capability features shall be provided:

- **Report of location information**
  The application shall be able to request user location information.

By default the location information is provided once; the application may also request periodic location reporting (i.e. multiple reports spread over a period of time)

- **Notification of location update**
  The application shall be able to request to be notified when the user's location changes, i.e. when:
  - the user enters or leaves a specified geographic area
  - the user's location changes more than a specified lower boundary. The lower boundary can be selected from the options provided by the network.

  The application shall be able for each user to start/stop receipt of notifications and to modify the required accuracy by selecting another option from the network provided options.

- **Access control to location information**
  The user shall be able to restrict/allow access to the location information. The restriction can be overridden by the network operator when appropriate (e.g. emergency calls).

10.2.5 User Status service capability features

The User Status service capability features enable an application to retrieve the user's status, i.e. to find out on which terminals the user is available.
The following service capability features shall be provided:

- **Retrieval of User Status**

  The application shall be able to retrieve the status of the user
- **Notification of User Status Change**

  The application shall receive notifications when the user's terminal attaches or detaches.
  - Detach: the user's terminal is switched on or the network initiates detach upon location update failure
  - Attach: the user's terminal is switched on or there has been a successful location update after network initiated detach.

  The application shall be able for each terminal to start/stop receipt of notifications.

10.2.6 Terminal Capabilities service capability features

(Editor's note: this section needs to be checked against the MExE specifications *)*
The Terminal Capabilities service capability features enable the application to find out what capabilities the user's terminal supports (note: "terminal" covers both (mobile) equipment and USIM).
The following service capability features shall be provided:

- **Retrieval of Terminal Capabilities**
  The application shall be able to retrieve the capabilities of the terminal. This includes:
  - the media that the terminal is capable to deal with (e.g. audio, video, PC data, WAP data; this information is needed by the application e.g. when the user wants to download messages from the mailbox);
  - the number of calls that the terminal can deal with simultaneously.

10.2.7 Message Transfer service capability features

The Message Transfer service capability features enable an application to put a message in the user's mailbox and to send message notifications to the user. A message can e.g. be of type video, audio, e-mail, fax, SMS etc.; a message can also contain an attachment (e.g. a video file attached to an e-mail).
The following service capability features shall be supported:

- **Send message to mailbox**
  The application shall be able to put a message in the user's mailbox. The application can e.g. leave a message for a user indicating a missed call. The type of the message (video, audio, e-mail) needs to be specified. Messages may contain attachments.

- **Send message to user**

The application shall be able to send a message to the user directly (i.e. the message is not stored in the mailbox). Examples are a fax message and an announcement like "your call is being diverted".

- **Get message from mailbox**

  The application shall be able to fetch a message from the mailbox (when requested by the user to do so).

- **Send message notification**
  The application shall be able to send a notification to the user e.g. when it has put a message in the mailbox or when it has received a notification from the mailbox that a new message has arrived for the user.
- **Request message receipt notification**
  The application can request to receive a notification every time a message is received in the mailbox for the user. This allows the application to take the appropriate action, e.g. informing the user.
- **Collect message/data from user**
  The application shall be able to collect a message/data from the user. For example, the user might enter a PIN code.

10.2.8 Data Download service capability features

To allow the support of home environment / serving network specific services the following service capability features shall be supported;

- capability to download applications, data to the terminal;

- capability to download applications, data to the USIM;

10.2.9 User Profile Management service capability features

The User Profile Management service capability features allow the application to retrieve the user profile (see section 7.1 for more information on user profiles).

10.2.10 Charging service capability features

The Charging service capability features enable the application to instruct the network and inform the user with charging information and to add some additional charging information to the network generated Call Detail Records.
The following service capability features shall be provided:

- Define and manage ~~session duration, data volume, etc.~~the threshold (e.g. session duration, data volume) for the required service,
- Send charging data (this data is included in a “free format” field in the network generated Call Detail Records. It may contain information like a application generated Call Id, used by the application provider to relate application generated charging information to the network generated charging information)
- Transfer of Advice of Charge data (as defined in GSM02.24) to the terminal.

11 VHE execution environment

The following service execution environments shall be standardised and could be used to provide a VHE for the user:

- User equipment execution environment
- IC card execution environment
- Network execution environment not required for R99

For UMTS release 99 one or more of the following shall provide the execution environments:

- MExE
- SIM Application Tool kit (SAT)
- CAMEL

12 Charging requirements

Services, which are provided as part of the VHE, may be subject to charge at the discretion of the home environment
There are several forms of charging which shall be available to the home environment. It shall be possible for the home environment to charge in the following instances: -

- Subscription;

  the user's registration to use services may be subject to charge;

- Service transfer;

  the transfer of services and/or information to the user MS or USIM may be subject to charge;

- Service upgrading;

  the upgrading of previously transferred services to the user's MS or USIM may be subject to charge (automated upgrading of services may be subject to a different charge);

- Service usage;

  the usage of services by a user may be subject to a charge;

- Roaming

  the usage of VHE services when roaming may be subject to additional charges;

Refer to UMTS 22.15 for further details.
Other charging requirements may be identified and are for FFS.

13 Security requirements

The mechanisms supporting VHE shall maintain a secure environment for the user and home environment.

The specific security requirements are FFS.

Annex A (Informative)

The following table shows the service examples to be considered in VHE

Benchmark Services	Abb	Priority
Abbreviated Dialling	ABD	A
Account Card Calling	ACC	B
Automatic Alternative Billing	AAB	A
Call Distribution	CD	A
Call Forwarding	CF	A
Call Hold	CH	A
Call Rerouting Distribution	CRD	A
Call Transfer	TRA	A
Call Waiting	CW	A
Completion of Call to Busy Subscriber	CCBS	A
Conference Calling	CON	A

Credit Card Calling	CCC	B
Destination Call Routing	DCR	A
Follow-Me Diversion	FMD	A
Freephone	FPH	A
Global Virtual Network Service	GVNS	A
Hot Line	HOT	A
International Telecommunication Charge Card	ITCC	B
Internetwork Freephone	IFPH	A
Internetwork Mass Calling	IMAS	A
Internetwork Premium Rate	IPRM	A
Internetwork Televoting	IVOT	A
Malicious Call Identification	MCID	A
Mass Calling	MAS	A
Message store and forward	MSF	A
Multimedia	MMD	B
Originating Call Screening	OCS	A
Premium Rate	PRM	A
Security Screening	SEC	A
Selective Call Forward on Busy / Dont' answer	SCF	A
Split Charging	SPL	A
Televoting	VOT	A
Terminating Call Screening	TCS	A
Terminating Key Code Protection	TCKP	B
Universal Access Number	UAN	B
Universal Personal Telecommunication	UPT	A
User-Defined Routing	UDR	B (FFS)
Virtual Private Network	VPN	A

Benchmark services listed above could be realised by service capability features.

TSG-SA Working Group 1 (Services) meeting #5 *TSGS1#4(99)746*
Munich 27th Sep to 1st Oct - 1999 **Agenda 6.3**

CHANGE REQUEST No : **015** *Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.*

Technical Specification / Report UMTS 22.105 Version: 3.5.0

Submitted to TSG_SA	5	for approval	X	without presentation ("non-strategic")	
list TSG plenary meeting no. here ↑		for information		with presentation ("strategic")	X

PT SMG CR cover form is available from: http://docbox.etsi.org/tech-org/smg/Document/smg/tools/CR_form/crf28_1.zip

Proposed change affects: *(at least one should be marked with an X)* USIM [ ] TE [ ] Network [X]

Work item: Services and Service Capabilities

Source: Fujitsu Europe Telecom **Date:** 28/9/99

Subject: Service Capabilities and Service Capabilities Features.

Category: *(one category and one release only shall be marked with an X)*

F	Correction		**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature	X		Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			UMTS 99	X

Reason for change: To align service capabilities and service capabilities features definitions with definitions in VHE specification 22.121.Revised version

Clauses affected: 3.1, 4.3, 4.4, 8.0, and annex. ~~7, 8, 10~~

Other specs affected:

Other releases of same spec	[ ]	→ List of CRs:
Other core specifications	[ ]	→ List of CRs:
MS test specifications / TBRs	[ ]	→ List of CRs:
BSS test specifications	[ ]	→ List of CRs:
O&M specifications	[ ]	→ List of CRs:

Other comments:

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3G TS 22.105 3.5.0 (1999-05)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects
Service aspects;
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Contents

Foreword

This Technical Specification has been produced by the 3GPP.
The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version 3.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 Indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the specification;

1 Scope

Pre-UMTS systems have largely standardised the complete sets of bearer services, teleservices and supplementary services which they provide. One major difference between UMTS and pre-UMTS systems is that service capabilities rather than services are standardised for UMTS, allowing service differentiation and system continuity. This Technical Specification (TS) describes how and what kind of services the UMTS user has access to.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, 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] GSM 02.02: "Digital cellular telecommunications system (Phase 2+); Bearer services supported by a GSM Public Land Mobile Network (PLMN)".

[2] GSM 02.03: "Digital cellular telecommunications system (Phase 2+); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".

[3] GSM 02.04: "Digital cellular telecommunications system (Phase 2+); General on supplementary services".

[4] GSM 02.42: "Digital cellular telecommunications system (Phase 2+); Network Identity and Timezone (NITZ); Service description; Stage 1".

[5] GSM 02.43: "Digital cellular telecommunications system (Phase 2+); Support of Localised Service Area (SoLSA); Service description; Stage 1".

[6] GSM 02.57: "Digital cellular telecommunications system (Phase 2+); Mobile Station Application Execution Environment (MExE); Service description; Stage 1".

[7] GSM 02.71: "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Service definition - Stage 1".

[8] GSM 02.78: "Digital cellular telecommunications system (Phase 2+); Customised Applications for Mobile network Enhanced Logic (CAMEL); Service definition - Stage 1".

[9] GSM 02.90: "Digital cellular telecommunications system; Unstructured Supplementary Service Data (USSD) - Stage 1".

[10] GSM 22.01: "Universal Mobile Telecommunications System (UMTS); Service aspects; Service principles".

[11] GSM 22.20: "Universal Mobile Telecommunications System (UMTS); Virtual Home Environment (VHE), Stage 1".

[12] GSM 23.10: "Universal Mobile Telecommunications System (UMTS); UMTS Access Stratum; Services and Functions".

2.2 Informative references

[1] ITU-T recommendation F.700: "Framework recommendation for audio-visual/multimedia services".

[2] GSM 02.01: "Digital cellular telecommunications system (Phase 2+); Principles of telecommunication services supported by a GSM Public Land Mobile Network (PLMN)".

3 Definitions and abbreviations

3.1 Definitions

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

Basic telecommunication service : this term is used as a common reference to both bearer services and teleservices.

Bearer service : is a type of telecommunication service that provides the capability of transmission of signals between access points.

Call : a logical association between several users (this could be connection oriented or connection less).

Connection : is a communication channel between two or more end-points (e.g. terminal, server etc.).

Mobile termination : the mobile termination is the component of the mobile station which supports functions specific to management of the radio interface (Um).

Multimedia service : Multimedia services are services that handle several types of media. For some services, synchronisation between the media is necessary (e.g. synchronised audio and video). A multimedia service may involve multiple parties, multiple connections, and the addition or deletion of resources and users within a single call.

Nomadic Operating Mode : Mode of operation where the terminal is transportable but being operated while stationary and may in addition require user co-operation (e.g. close to open spaces, antenna setup...).

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.

~~**Service feature :** Standardised building block used to create services.~~

Service Capabilities: Bearers defined by parameters, and/or mechanisms needed to realise services. These are within networks and under network control.
Service Capability Feature: Functionality offered by service capabilities that are accessible via the standardised application interface
Services: Services are made up of different service capability features.

Supplementary service : is a service which modifies or supplements a basic telecommunication service. Consequently, it cannot be offered to a user 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 basic 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.

3.2 Abbreviations

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

BER	Bit Error Rate
B-ISDN	Broadband ISDN
CAMEL	Customised Application for Mobile network Enhanced Logic
DTMF	Dual Tone Multiple Frequency
TR	Technical Report
TS	Technical Specification
ETSI	European Telecommunications Standards Institute
FAX	Facsimile
FER	Frame Erasure Rate
GSM	Global System for Mobile Communications
HE	Home Environment
IMUN	International Mobile User Number
IN	Intelligent Network
ISDN	Integrated Services Digital Network
ISO	International Organisation for Standardisation
ITU	International Telecommunication Union
LCS	Location Services
MExE	Mobile station Execution Environment
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
USIM	User Service Identity Module
SMS	Short Message Service
SAT	SIM Application Toolkit
SN	Serving Network
SoLSA	Support of Localised Service Area
UMTS	Universal Mobile Telecommunications System

4 Framework for the description of telecommunication services and applications

4.1 General

Telecommunication services supported by UMTS are the communication capabilities made available to users by home environment and serving network. A UMTS network provides, in co-operation with other networks, a set of network capabilities which are defined by standardised protocols and functions and enable telecommunication services to be offered to users.
A service provision by a HE/SN to a UMTS user may cover the whole or only part of the means required to fully support the service.
The service classification and description which follow are independent of different possible arrangements for the ownership and provision to the user of the means required to support a service.

4.2 Basic telecommunication services

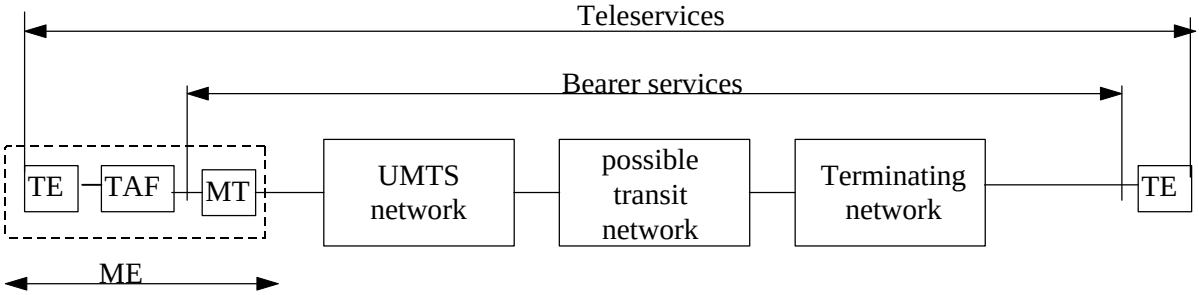
Basic telecommunication services are divided in two broad categories;

- bearer services, which are telecommunication services providing the capability of transmission of signals between access points;

- teleservices, which are telecommunication services providing the complete capability, including terminal equipment functions, for communication between users according to protocols established by agreement between network operators.

The communication link between the access points consists of UMTS, one or more transit networks and a terminating network. The networks between the two access points typically use different means for bearer control.

Figure 1 illustrates these definitions.



ME: Mobile Station
MT: Mobile Termination
TE: Terminal Equipment
TAF: Teminal Adaption Function

NOTE 1: In order to limit the complexity of the figure, only one transit network is shown.

NOTE 2: The terminating network type may include a UMTS network, either the originating one or another one.

NOTE 3: The bearer service terminates in the mobile station.

NOTE 4: The terminating network may be a non UMTS network such as: PSTN, N-ISDN, GSM, IP networks/LANs and X.25

Figure 1; Basic telecommunication services supported by a UMTS network

4.2.1 Bearer services

The characterisation of a bearer service is made by using a set of characteristics that distinguishes it from other bearer services. Particular values are assigned to each characteristic when a given bearer service is described and defined.
The service characteristics as they apply at a given reference point where the user accesses the bearer service.
In the general case networks between the two access points use different control mechanisms. In this case the bearer services of each network throughout the communication link have to be translated at the network interfaces to realize an end to end bearer service.
A list of definitions of attributes and values used for bearer services is contained in clause 5.
The bearer services are negotiable and can be used flexibly by applications.

4.2.2 Teleservices

Section 6 defines both standardised and non-standardised teleservices. Some teleservices are standardised because that interworking with other systems have been recognised as a requirement. Other teleservices shall not be standardised. A decoupling between lower layer (i.e. bearer attributes) and higher layer capabilities will be necessary for the development of teleservices.

4.3 Supplementary services

A supplementary service modifies or supplements a basic telecommunication service. Consequently, it cannot be offered to a user as a stand alone service. It must be offered together or in association with a basic telecommunication service. The same supplementary service may be applicable to a number of basic telecommunication services.
Two methods are used for the characterisation of supplementary services;

- The first method is used for the description of existing standardised supplementary services. These services are specified through the detailing of each of the operations involved in service provision and service usage (the provision/withdrawal, registration/erasure, activation/deactivation, invocation and interrogation operations). Clause 7 lists these services.

- The second method enables the provision of HE/SN specific supplementary services. To make this possible, services can be built using service capability features which are ~~accessed via~~accessed via the standardised application interface. ~~standardised building blocks referred to as service features are specified in clause 8. The combination and parametrisation of these service features allow the creation of supplementary services.~~

UMTS shall be able to handle multiple supplementary services within a call. Interactions shall be handled when several supplementary services are activated in the same call.. When multiple supplementary services can be activated concurrently, some prioritisation of the services will be necessary. Certain services may override or deactivate other services.
Interactions between operator specific supplementary services are not defined.

The following issues need consideration when interactions between services occur;

- Different phases of a call.

- A service spanning on more than one network.

- Service interactions that may occur between services offered to a single user, as well as between services offered to different interacting users.

NOTE: The methods defined for characterisation of services are description methods. They do not imply or restrict different implementations.

4.4 Service Capabilities.~~features~~

UMTS service capabilities ~~features~~ are based on functionality and mechanisms/toolkits such as provided by SAT, MExE, IN and CAMEL. ~~These toolkits are the basic building blocks for the VHE~~. These service capabilities ~~features~~ can be made visible to the ~~used both by standardised and non-standardised~~ applications~~services~~ through the ~~UMTS~~ Application ~~Programming~~ Interface. ~~The UMTS services and applications get access to UMTS service capabilities (bearers) for transport of user data through the UMTS adaptation layer. This lowest layer of the VHE is responsible for the selection of appropriate service capabilities according to the requirements of services and applications.~~

~~High level service features requirements :~~

- ~~. support of wide range of user applications,~~
- ~~. support of rapid application/service development,~~
- ~~. support of easy deployment of new services,~~
- ~~. scalability.~~

5 Bearer Services

5.1 Definition of bearer services

Bearer services provide the capability for information transfer between access points and involve only low layer functions. These functions are sometimes referred as low layer capabilities (in reference to OSI layers). The user may choose any set of high layer protocols for his communication and the UMTS network does not ascertain compatibility at these layers between users.
In the general case a communication link between access points provides a general service for information transport. The communication link may span over different networks such as Internet, Intranets, LANs and ATM based transit networks, having network specific means for bearer control. Each network contributes to the end-to-end QoS perceived by the end-user.

5.2 Description of bearer services

Bearer services are characterised by a set of end-to-end characteristics with requirements on QoS. The characteristics and requirements shall cover major network scenarios, i.e. the cases when the terminating network is PSTN, N-ISDN, GSM, IP networks/LANs, X.25 and a UMTS network.
Quality of Service is the quality of a requested service (Teleservice or Bearer Service or any other service, e.g. customer care) as perceived by the customer (ITU-T M.xxxx). QoS is always meant end-to-end. Network Performance of several network elements of the originating and terminating network(s) contribute to the QoS as perceived by the customer including terminals and terminal attachments. In order to offer the customer a certain QoS the serving network need to take into account network performance components of their network, reflect the performance of the terminal and ad sufficient margin for the terminating networks in case network performance requirements cannot be negotiated.
As far as the QoS to 3rd Generation subscriber is concerned 3G network elements have to provide sufficient performance (reflecting possible performance constraints in terminating networks) that 3G networks cannot be considered as a bottleneck.
This section outlines the requirements on bearer services in two main groups;

- Requirements on information transfer, which characterise the networks transfer capabilities for transferring user data between two or more access points.

- Information quality characteristics, which describe the quality of the user information transferred between two or more access points.

It shall be possible to negotiate / re negotiate the characteristics of a bearer service at session / connection establishment and during an on going session / connection.

5.2.1 Information transfer

Connection oriented / conectionless services
Both Connection oriented and connectionless services shall be supported.

Traffic type- It is required that the bearer service provides guaranteed/constant bit rate and a non-guaranteed/dynamically variable bit rate.
Real time and non real time applications shall be supported.

- Real time video, audio and speech must be supported. This implies the:
- ability to provide a real time stream of guaranteed bit rate, end to end delay and delay variation.
- ability to provide a real time conversational service of guaranteed bit rate, end to end delay and delay variation.
- Non real time interactive and file transfer service must be supported. This implies the:
- ability to support message transport with differentiation as regards QoS between different users.
- Multimedia applications shall be supported. This implies the:
- ability to support several user flows to/from one user having different traffic types (e.g. real time, non real time)

Traffic characteristics
It shall be possible for an application to specify its traffic requirements to the network by requesting a bearer service with one of the following configurations

1) Point-to-Point
   - Uni-Directional
   - Bi-Directional
     - Symmetric
     - Asymmetric
2) Uni-Directional Point-to-Multipoint
   - Multicast
   - Broadcast

A multicast topology is one in which sink parties are specified before the connection is established, or by subsequent operations to add or remove parties from the connection. The source of the connection will always be aware of all parties to which the connection travels.
A broadcast topology is one in which the sink parties are not always known to the source. The connection to individual sink parties is not under the control of the source, but is by request of each sink party.
In the case of a mobile termination with several active bearer services simultaneously, it shall be possible for each bearer service to have independent configurations and source/sink parties.5.2.2 Information quality

5.2.2 Information Quality

Information quality a characterizes the bit integrity and delay requirements of the applications.
Other parameters may be needed.

Maximum transfer delay

Transfer delay is the time between the request to transfer the information at one access point to its delivery at the other access point. In clause 5.5 requirements on maximum transfer delay is defined.

Delay variation
The delay variation of the information received information over the bearer has tobe controlled to support real-time services. The possible values for delayvariation are not a limited set, but a continuous range of values.

Bit error ratio
The ratio between incorrect and total transferred information bits. The possible values for Bit error ratio are not a limited set, but a continuous range of values.

Data rate
The data rate is the amount of data thranserfered between the two access points in a given period of time.

5.3 Supported bit rates

It shall be possible for one application to specify its traffic requirements to the network by requesting a bearer service with any of the specified traffic type, traffic characteristics, maximum transfer delay, delay variation, bit error ratios & data rates. It shall be possible for the network to satisfy these requirements without wasting resources on the radio and network interfaces due to granularity limitations in bit rates.
It shall be possible for one mobile termination to have several active bearer services simultaneously, each of which could be connection oriented or connectionless.
The only limiting factor for satisfying application requirements shall be the cumulative bit rate per mobile termination at a given instant (i.e. when summing the bit rates of one mobile termination's simultaneous connection oriented and connectionless traffic, irrespective of the traffic being real time or non real time) in each radio environment:

- At least 144 kbits/s in satellite radio environment (Note 1).
- At least 144 kbits/s in rural outdoor radio environment.
- At least 384 kbits/s in urban/suburban outdoor radio environments.
- At least 2048 kbits/s in indoor/low range outdoor radio environment.

NOTE 1 : This Peak Bit Rate may only be achieved in a nomadic operating mode.

5.4 Range of QoS requirements

It shall be possible for one application to specify its QoS requirements to the network by requesting a bearer service with any of the specified traffic type, traffic characteristics maximum transfer delay, delay variation, bit error ratios & data rates.
The following table indicates the range of values that shall be supported by UMTS. These requirements are valid for both connection and connectionless traffic. It shall be possible for the network to satisfy these requirements without wasting resources on the radio and network interfaces due to granularity limitations in QoS.

	Real Time (Constant Delay)	Non Real Time (Variable Delay)
Operating environment	**BER/Max Transfer Delay**	**BER/Max Transfer Delay**
Satellite (Terminal relative speed to ground up to 1000 km/h for plane)	Max Transfer Delay less than 400 ms BER 10-3 - 10-7 (Note 1)	Max Transfer Delay 1200 ms or more (Note 2) BER = 10-5 to 10-8
Rural outdoor (Terminal relative speed to ground up to 500 km/h) (Note 3)	Max Transfer Delay 20 - 300 ms BER 10-3 - 10-7 (Note 1)	Max Transfer Delay 150 ms or more (Note 2) BER = 10-5 to 10-8
Urban/ Suburban outdoor (Terminal relative speed to ground up to 120 km/h)	Max Transfer Delay 20 - 300 ms BER 10-3 - 10-7 (Note 1)	Max Transfer Delay 150 ms or more (Note 2) BER = 10-5 to 10-8
Indoor/ Low range outdoor (Terminal relative speed to ground up to 10 km/h)	Max Transfer Delay 20 - 300 ms BER 10-3 - 10-7 (Note 1)	Max Transfer Delay 150 ms or more (Note 2) BER = 10-5 to 10-8
NOTE 1; There is likely to be a compromise between BER and delay. NOTE 2; The Max Transfer Delay should be here regarded as the target value for 95% of the data. NOTE 3; The value of 500 km/h as the maximum speed to be supported in the rural outdoor environment was selected in order to provide service on high speed vehicles (e.g. trains). This is not meant to be the typical value for this environment (250 km/h is more typical).		

5.5 Supported End User QoS

This section outlines the QoS that shall be provided to the end user / applications. Figure 2 below summarises the major groups of application in terms of QoS requirements. Applications and new applications may be applicable to one more groups.
The following tables further elaborate UMTS end user / application QoS requirements.

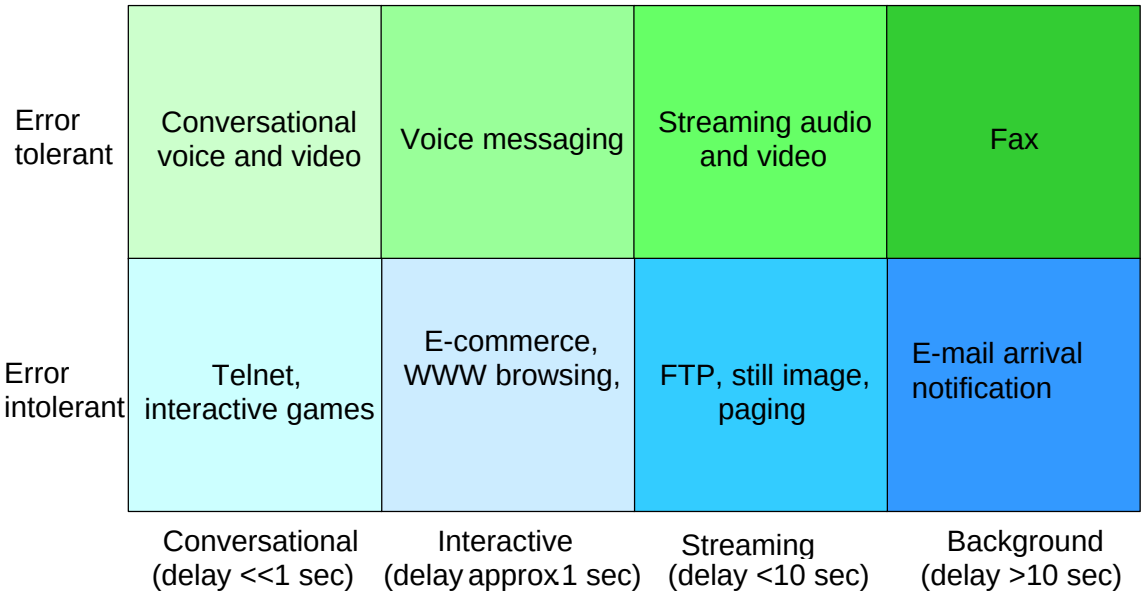


Table 1: End-user Performance Expectations - Conversational / Real-time Services

Medium	**Application**	**Degree of symmetry**	**Data rate**	**Key performance parameters and target values**		
				One-way Delay	Delay Variation	Information loss
Audio	Conversational voice	Two-way	4-25 kb/s	<150 msec preferred <400 msec limit	< 1 msec	< 3% FER
Video	Videophone	Two-way	32-384 kb/s	< 150 msec preferred <400 msec limit Lip-synch : < 100 msec		< 1% FER
Data	Telemetry - two-way control	Two-way	<28.8 kb/s	< 250 msec	N.A	Zero
Data	Interactive games	Two-way	< 1 KB	< 250 msec	N.A	Zero
Data	Telnet	Two-way (asymmetric)	< 1 KB	< 250 msec	N.A	Zero

[Note: The values provided in table 1 need to be further reviewed and may be revised in the next version of this specification]

Table 2: End-user Performance Expectations - Interactive Services

Medium	**Application**	**Degree of symmetry**	**Data rate**	**Key performance parameters and target values**		
				One-way Delay	Delay Variation	Information loss
Audio	Voice messaging	Primarily one-way	4-13 kb/s	< 1 sec for playback < 2 sec for record	< 1 msec	< 3% FER
Data	Web-browsing - HTML	Primarily one-way		< 4 sec /page	N.A	Zero
Data	Transaction services – high priority e.g. e-commerce, ATM	Two-way		< 4 sec	N.A	Zero
Data	E-mail (server access)	Primarily One-way		< 4 sec	N.A	Zero

[Note: The values provided in table 2 need to be further reviewed and may be revised in the next version of this specification]

Table 3: End-user Performance Expectations - Streaming Services

Medium	**Application**	**Degree of symmetry**	**Data rate**	**Key performance parameters and target values**		
				One-way Delay	Delay Variation	Information loss
Audio	High quality streaming audio	Primarily one-way	32-128 kb/s	< 10 sec	< 1 msec	< 1% FER
Video	One-way	One-way	32-384 kb/s	< 10 sec		< 1% FER
Data	Bulk data transfer/retrieval	Primarily one-way		< 10 sec	N.A	Zero
Data	Still image	One-way		< 10 sec	N.A	Zero
Data	Telemetry - monitoring	One-way	<28.8 kb/s	< 10 sec	N.A	Zero

[Note: The values provided in table 3 need to be further reviewed and may be revised in the next version of this specification]

5.6 Radio Interface optimisation

The following requirements shall lead the radio interface optimisation process;

- support of high bit rate (around the Peak Bit Rate), bursty, asymmetric, non-real time bearer capabilities;

- support of high bit rate (around the Peak Bit Rate), bursty, asymmetric, real time bearer capabilities;

- the ability to extend or reduce bandwidth associated to a bearer capability in order to adapt to bit rate or radio condition variations, to add or drop service components.

However, the services provided by GSM (speech in particular) shall be supported in a spectrally efficient manner (at least as efficiently as in GSM) for the same quality of service.
In order to allow the support of flexible, bandwidth on demand services, bearer services should be provided with the finest possible granularity that can be efficiently supported.

5.7 Support of GSM general bearer services

UMTS shall support GSM General Bearer Services (GBS) and interworking scenarios as specified in 02.02.

6 Teleservices

6.1 Definition of teleservices

Teleservices provide the full capabilities for communications by means of terminal equipment, network functions and possibly functions provided by dedicated centres.

6.2 Description of teleservices

The basic reference in UMTS for the description of teleservices is the ITU-T F700 recommendation. F700 provides a generic, network independent, description of multimedia services. The methodology used covers both monomedia and multimedia services, the monomedia services being a particular type of multimedia services. Multimedia services are classified into categories with similar functional characteristics. The six categories are multimedia conference services, multimedia conversational services, multimedia distribution services ,multimedia retrieval services, multimedia messaging services and multimedia collection services.
The rest of clause 6 describes the teleservices and options that will be provided by UMTS networks.
A teleservice can be viewed as set of upper layer capabilities utilising the lower layer capabilities described by the set of attributes in clause 5.
Multimedia teleservices support the transfer (and in some case retrieval, messaging, distribution) of several types of information (service components). For this reason, there are service attributes (relating to all the components of a teleservice) and service component attributes (relating to only one service component).

6.3 Support of teleservices in UMTS networks

The realisation of teleservices requires the association of terminal and network capabilities. In the terminals and in the network, both upper layer capabilities and lower layer capabilities are necessary. The term upper layer capabilities is used because it relates to the OSI upper layers. Decoupling between upper layers and lower layers (transfer) is required. Even if this de-coupling may impact radio interface optimisation, it is nevertheless the only way of designing a system that is not outdated;

- Each time the information rate associated with an already supported teleservice is decreased by more efficient source coding techniques.

- Each time a new service is introduced that requires transfer capabilities not used by currently

available teleservices.

Taking the example of two application that exchange information through a teleservice, the upper layer capabilities can be located in various places;

- In the two terminals if the two applications are connected to a UMTS network.

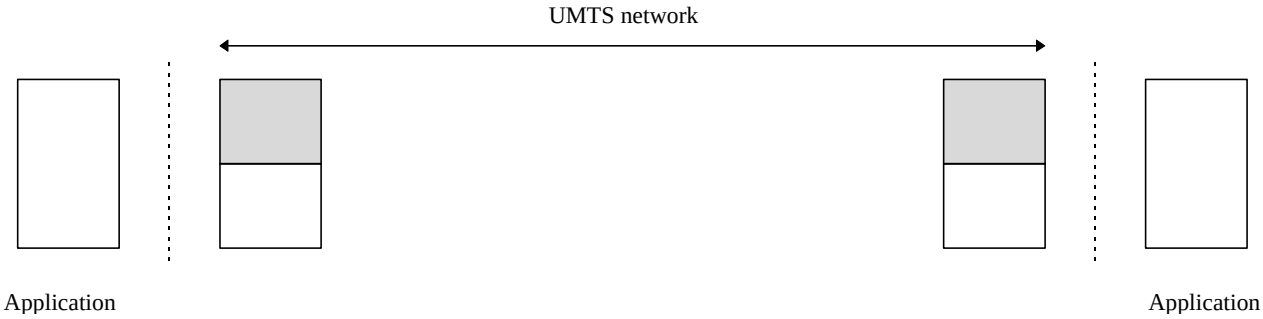


Figure 2; UMTS teleservice

In the terminal of the application connected to a UMTS network and in the upper layer interworking unit that is at the border of the UMTS network and the target network if one application is connected to a UMTS network and the other one is connected to another type of system. The upper layer interworking unit makes the adaptation between the UMTS network and the target network at a service level.

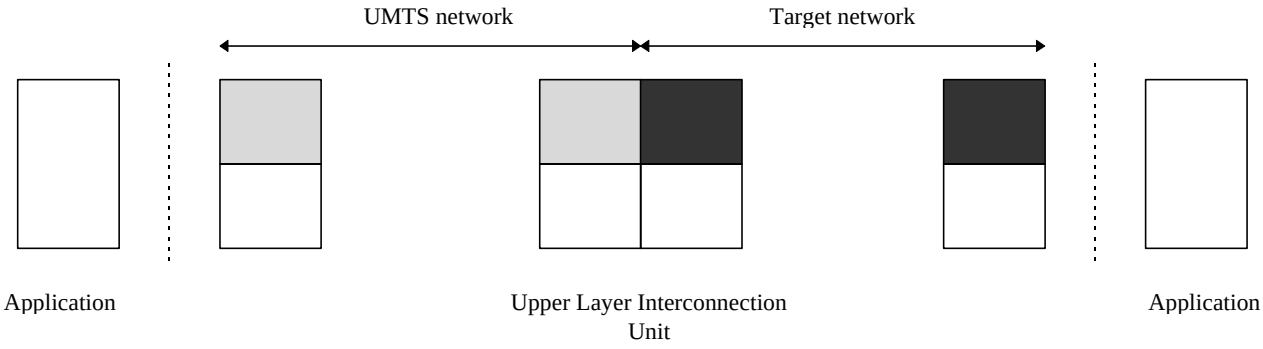


Figure 3; Teleservice with upper layer interworking

In the terminal of the application connected to a UMTS network and in the terminal of the application connected to a target network if one application is connected to a UMTS network and the other one is connected to another type of system, but only lower layer interconnecting unit is used at the border of the two networks. In this case, the interconnecting unit makes the adaptation between the UMTS network and the target network at the transmission level.

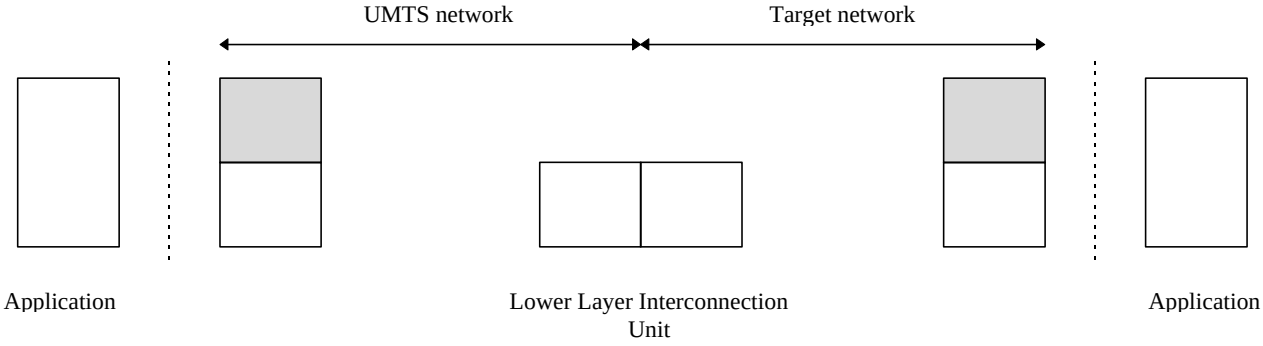


Figure 4; Teleservice with lower layer interworking

6.4 Existing Teleservices supported by UMTS networks

The subset of standardised teleservices shall be supported by UMTS for interworking with teleservices provided on other networks. The means to support the following set of teleservices will be standardised;

- Speech;
- Emergency call;
- Short message service;

6.4.1 Speech

The speech service as defined in international standards should be supported by UMTS. The international reference for the speech is ITU E.105 recommendation. UMTS networks should contain interworking units which allow calls to be received from or destined to users of existing networks like PSTN, ISDN, GSM. This will include interworking units for generation of DTMF or other tones (the entire DTMF tone set would at minimum be available) and detection of DTMF tones.

Speech (7kHz) communications via bi-directional and symmetric channels between UMTS users or with fixed wireline or GSM users with equivalent or better quality than the audio quality of G.722 shall be supported in Phase 1, but not in Release 99.

A default speech codec shall be specified to provide speech service across the UTRAN. The selected speech codec shall be capable of operating with minimum discernible loss of speech on handover between the GSM access network and UTRAN.

6.4.2 Emergency Call

This service will use components of Speech. There are however compared to Telephony reduced authentication requirements and a requirement for specific routing. Additionally Emergency Calls may have higher priority than normal calls, etc.. The reference for the emergency call service is GSM 02.03.

6.4.3 Short Message Service - Point to Point (SMS-PP)

The short message service point to point as specified in GSM 02.03 shall be supported in UMTS. A short message service shall be provided seamlessly (as far as the user or the users terminal equipment is concerned) across the UMTS and GSM access network. Additional features are planned for SMS in Release 99.

6.4.4 Short Message Service - Cell Broadcast (SMS-CB)

A short message service cell broadcast shall be provided seamlessly (as far as the user or the users terminal equipment is concerned) across the UMTS and GSM network.

6.5 Internet Access

UMTS shall provide means to interwork with external data networks. This interworking shall satisfy, within the constraints introduced by the mobile radio environment, the QoS requirements of the interworked-with network. For UMTS the Internet is seen as the most important interworked-with network, therefore the specification of an optimised access to Internet shall be part of the UMTS standard. The most important benefits achieved by the definition of Internet Access would be:

- Optimised transmission of IP traffic over the UMTS radio interface to minimise the amount of information transmitted.
- Optimised usage of encryption protocols/algorithms over the UMTS radio interface.
- Inter-operation of QoS mechanisms used in both, UMTS and in Internet.

For the purposes of optimised access to Internet one or more of the UMTS generic bearers will be used. On top of the bearer a UMTS protocol profile will be defined. This profile would be based on the work done by IETF or other relevant fora, and will consist of a recommended set of parameters and standardised protocols providing similar services than the Internet ones but optimised for wireless access. In the case of Internet traffic it would be possible for the user to select the encryption to be used (e.g. no encryption, end-to-end encryption, encryption over UMTS radio, etc.). The QoS mechanisms defined for UMTS packet access mode shall be harmonised with those defined for Internet (e.g. Differentiated Services).

7 Supplementary Services

Supplementary services are used to complement and personalise the usage of basic telecommunication services (bearer services and teleservices). The capabilities standardised in UMTS shall enable all the supplementary services specified in GSM 02.04 and the 02.8x set to be provided.

8 Service Capability features

Services Capability Features are open, technology independent building blocks accessible via a standardised application interface. This interface shall be applicable for a number of different business and applications domains (including besides the telecommunication network operators also service provider, third party service providers acting as HE-VASPs, etc.).
All of these businesses have different requirements, ranging from simple telephony and call routing, virtual private networks, fully interactive multimedia to using MS based applications.
The service capability features shall enable applications to make use of the service capabilities (e.g. CAMEL, MExE, etc) of the underlying UMTS network in an open and secure way.
Application/Clients access the service capability features via the standardised application interface. This means that a single service capability feature is accessible and visible to application/clients via the method/operation invocations in the interface.
Two different types of service capability features can be distinguished:

- **Framework service capability features**: these shall provide commonly used utilities, necessary for the non-framework service capability features to be accessible, secure, resilient and manageable.
- **Non-Framework service capability features**: these shall enable the applications to make use of the functionality of the underlying network capabilities (e.g. User Location service capability features).

Reference should be made to TS 22.121

8.1 Framework service capability features

Framework service capability features will be used e.g. for authentication, registration, notification, etc. and provide functionality that is independent of any particular type of service. Other commonly used service capability features may be added later.

Examples of Framework Service Capability features are (TS 22.121 session 10.1):

- Authentication
  - User-Network Authentication
  - Application-Network Authentication
  - User-Application Authentication
- Authorisation
  - Application-Network Authorisation
  - User-Application Authorisation
- Registration
- Discovery
- Notification.

8.2 Non-Framework service capability features

The Non-Framework service capability features represent the total collection of service capability features that are not included in the Framework. These non-framework service capability features enable the application to make use of the functionality provided by the network and service capabilities.
Service capability features shall be defined as much as possible in a generic way to hide the network specific implementation. To achieve this, it is necessary to identify the functionality that is provided by more than one service capabilities. For example, User Location can be produced in several underlying ways. This functionality can be captured once when defined the service capability features in a generic way. It is important that the generic part becomes as large as possible.
When applications use the generic service capability features, these applications become independent of (portable over) underlying service capabilities. Applications shall however still be able to request service capability features specific to a service capability (e.g. Call Setup from CAMEL). This will increase dependency of the used service capability.

Examples of Non-Framework service capability features are (TS 22.121 session 10.2):

- Session Control
- Security/Privacy
- Address Translation
- Location

  The precision of the location shall be network design dependent, i.e. an operator choice. This precision may vary from one part of a network to another. It may be chosen to be as low as hundreds of meters in some place and as accurate as 5 meters in other place. It is required that a minimum precision of around 50 meters can be achieved in all types of terrestrial radio environment. Technical issues may constrain the precision to be mobile state dependent as well (mobile idle / mobile in communication). Several design optional features (e.g. size of the cell, adaptive antenna technique, path loss estimation technique...) shall allow the network operator to reach cost effectively the target precision.

  Because there may be very different uses of the location information;

  - It shall be possible to make the information available to the user, HE/SN and value added service providers. The user shall be able to restrict access to the location information (permanently or on a per call basis). The restriction can be overridden by the network operator when appropriate (e.g. emergency calls).

  - It shall be possible to set the delay to get the location information (the situation is quite different whether the information is needed for call routing or if it is needed by a user application).

  - It shall be possible to select the frequency of the location information update.

  - to identify and report when the user's terminal enters or leaves a specified geographic area.

  - It shall be possible to specify the area as a circular zone (centre and radius) to a resolution that will be limited by the accuracy capability of the part of the serving network where the user is registered.

- User Status
- Terminal Capabilities
- Messaging
- Data Download
- User Profile Management
- Charging

~~Service features are building blocks which can be used to create services. The functionality offered by a service feature may depend upon the underlying service capability used to realise the service feature e.g. CAMEL, MExE etc.. Service features may be used to offer the user some control over a service such as the ability to modify a service, subscribe or unsubscribe to a service.~~

Service features are associated with call/session control, bearer control, mobility management. The term calls is used to encompass not only circuit switched (e.g. voice) calls, but also virtual circuit sessions set up to handle packet data traffic.
The following service features are required;

- security/privacy;
- access control;
- address translation;
- call/session/bearer control;
- location;
- messaging;
- service control;
- user interaction.

8.1 Security/Privacy features

- presentation of or restriction of information associated with a party involved in a call or a session (e.g. calling line ID, calling name, location...);
- encryption of user data and signalling;

8.2 Access Control features

The access control features are defined to provide access to the UMTS network to the UMTS users over the serving network's air interface. These features include;

- user registration;
- user de-registration;
- mutual authentication.

8.3 Address Translation Features

This address translation feature shall allow UMTS to offer the wide range of addressing options including;

- E.164 Numbering (e.g. GSM MS-ISDN);
- ASEA Numbering (ATM);
- IP v6 Numbering;
- X.25 Numbering;
- Internet symbolic naming.

8.4 Call/Session/Bearer Control Features

These features will be used to establish, handle and terminate calls. The following service features shall be supported;

- call/session set-up (point-to-point, point-to-multi-point, multi-point-to-multi-point);
- add/delete a party from a call/session;
- call/session termination;

- call/session establishment e.g. answering of calls;
- monitoring of call/session states and events;
- modification of the bearer service attributes.
- capability at initial call set-up to modify or reject the called party address;
- capability for an incoming call to modify or reject the called party address both at early and late stage of the call;
- capability to suspend and resume a call;
- capability to re-route a call;
- capability to be notified when a specified terminal is free or is ready to accept the call.

8.5 Location Features

Location features shall also be supported, to allow new and innovative location based services to be developed;

- to identify and report in a standard format (e.g. geographical co-ordinates) the current location of the user's terminal.
- The precision of the location shall be network design dependent, i.e. an operator choice. This precision may vary from one part of a network to another. It may be chosen to be as low as hundreds of meters in some place and as accurate as 5 meters in other place. It is required that a minimum precision of around 50 meters can be achieved in all types of terrestrial radio environment. Technical issues may constrain the precision to be mobile state dependent as well (mobile idle / mobile in communication). Several design optional features (e.g. size of the cell, adaptive antenna technique, path loss estimation technique...) shall allow the network operator to reach cost effectively the target precision.
- Because there may be very different uses of the location information;
  - It shall be possible to make the information available to the user, HE/SN and value added service providers. The user shall be able to restrict access to the location information (permanently or on a per call basis). The restriction can be overridden by the network operator when appropriate (e.g. emergency calls).
  - It shall be possible to set the delay to get the location information (the situation is quite different whether the information is needed for call routing or if it is needed by a user application).
  - It shall be possible to select the frequency of the location information update.
- If the terminal is switched off, then the last known position and time/date shall be available. The time of last known location shall be recorded and be made available in universal time.
- to identify and report when the user's terminal enters or leaves a specified geographic area.
- It shall be possible to specify the area as a circular zone (centre and radius) to a resolution that will be limited by the accuracy capability of the part of the serving network where the user is registered.

8.6 Messaging features

Messages are a block of data that may range from a few bytes to megabytes. Message delivery may involve store and forward of messages in transit. To be able to exchange and to control the exchange of messages between user the following service features shall be supported;

- capability to send messages;

- capability to receive messages;
- capability to request confirmation of receipt;
- capability to modify the content as well as the recipient of message;
- capability to reject a outgoing and/or incoming message;
- capability to re-route a message.

8.7 Service control features

To allow the support of HE/SN specific services the following service features shall be supported;

- capability to download service software to network nodes;
- capability to download service software to terminals;
- capability to download service software to the USIM;
- capability to negotiate of supported capabilities between USIM, terminals, HE and SN;
- capability to negotiate bearer services and service capabilities

8.8 User Interaction Features

To allow the support of HE/SN specific user interfaces, databases containing user profiles shall be provided. This user profile functionality shall provide the following interaction features :

- capability to indicate information to the user;
- capability to collect user information;
- capability to activate and deactivate a special user profile;
- capability to change the user profile.

9 Standardised Protocols and Capabilities

This clause introduces a list of standardised protocols and capabilities that shall be supported by UMTS for the control and creation of services. The access protocols and the execution environment described below are essential for UMTS.

9.1 Access protocols

The access protocols shall allow the support of multimedia services. These services are characterised by the ability to dynamically change the number of participants and the number of connections during a call. The characteristics of the connections (confer the list of attributes used to describe a connection) may differ from one connection to another. They are negotiated during call set-up. They may be independently and dynamically re-negotiated on application (the telecommunication requirements of the application changes) or network initiative (change of network load conditions, during a handover procedure) during the call.
The application may require synchronisation between some of the connections. Later, this synchronisation shall not be lost during handover procedures.
Whenever a call is terminated in other types of networks, the negotiation shall take into account the limitations of these networks. Interworking shall be possible with PSTN, GSM, ISDN and Internet networks. Later it shall also be possible to interwork with B-ISDN networks.
The access protocols shall allow a mobile station to have several calls active simultaneously .

9.2 Execution Environment

The execution environment is a set of standardised capabilities that shall allow the support of HE/SN specific services (i.e. both applications, teleservices and supplementary services). The execution environment shall be distributed between the IC card, terminal and network nodes. The terminal and the serving network capabilities shall be the only limiting factor for the support of the services designed to run on the execution environment. The execution environment is composed of the following building blocks;

- A standardised content description language for support of NO/SP specific user interfaces (both for information output and user input). This is intended only for platforms which are terminals.

- A standardised procedural language for support of NO/SP specific scripts. This language shall be common to all types of platforms. The scripts could be used for e.g. improving the user interface, adding new features to the terminal like the latest version of a codec, controlling the execution of a service.

- Standardised application programming interfaces for opening platform resources and capabilities to the scripts written with the standardised procedural language. These interfaces would be platform type dependent. The interfaces shall include primitives for accessing to the basic control functions, as illustrated on the figures 5 and 6 below.

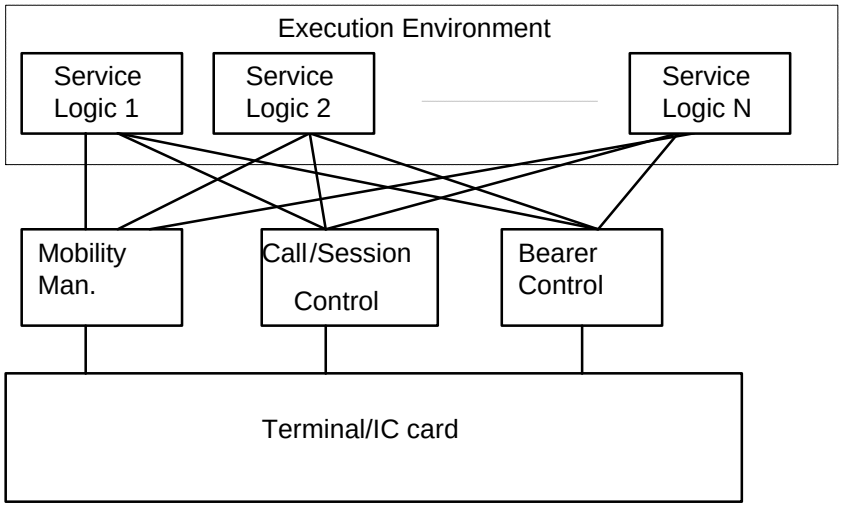


Figure 5: Execution Environment in the Mobile Station

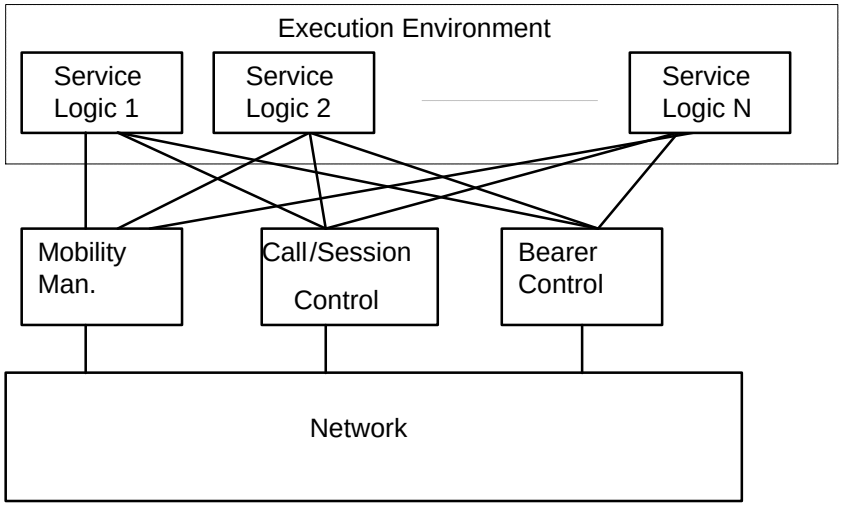


Figure 6: Execution Environment in the Network

- Call states, messages, information elements, values of information elements shall serve as triggers for subsequent interaction with service logic. The list of triggers is for further study and is likely to incorporate CAMEL, SIM Toolkit, MExE.

- Means to turn triggers on and off, and associate them with service logic shall be standardised.
- A standardised certification scheme and security model with several levels of trusts in order to control the scripts access rights to the platform resources and capabilities. This would be used to allow e.g. the SP and the SP only to access to USIM data.
- Standardised protocols for allowing the download of content description pages and scripts in the platform.

10 Existing GSM System features

Following GSM system features shall be supported by G-UMTS standards (for networks based on GSM evolution).

10.1 Network Identity and Time Zone (NITZ)

NITZ is specified in GSM 02.42.

10.2 Support of Localised Service Area (SoLSA)

SoLSA is specified in GSM 02.43.
Note : SoLSA modifications due to UTRAN related aspects are FFS.

10.3 Mobile station Execution Environment (MExE)

MExE is specified in GSM 02.57.

10.4 Location Services (LCS)

LCS is specified in GSM 02.71.
Note : LCS modifications due to UTRAN related aspects are FFS.

10.5 Customised Application for Mobile network Enhanced Logic (CAMEL)

CAMEL is specified in GSM 02.78.

10.6 Unstructured Supplementary Service Data (USSD)

USSD is specified in GSM 02.90
Note : USSD modifications due to UTRAN related aspects are FFS.

Annex A (informative): Examples of services built from service capabilities features

Call Barring
In standard GSM, the Call Barring services allow to prevent outgoing calls to certain sets of destinations, based on the number dialled and whether the user is roaming. In UMTS, it is proposed that this service allows to block outgoing calls based on a wider range of parameters which could include factors such as the time of day, day of week, location, type of call requested, cost of the service and/or destination. This would allow to develop Call Barring services tailored to business and personal markets to avoid abuse.
This service is invoked during the initial outgoing call set-up procedure and allow the call to be blocked prior to incurring any charges. This Service can be applied to any teleservice for both connection-oriented and connectionless-oriented services.

Call Filtering/Forwarding
In standard GSM, there is no call filtering service. All calls are presented to the user unless a call forwarding service is used to re-direct calls; there is no different call handling depending on the incoming call parameters (although differentiation on call type (voice/data) is possible).
In UMTS, the call filtering service allows the control of whether incoming calls are accepted, forwarded or terminated. The parameters which can be used to determine the final destination of a call may include the caller ID (CLI), original number dialled, time of day, current user location/network, user profile settings and current state of the terminal.
This service shall be two-stage; immediate call filtering (handled regardless of whether the terminal is online or not) and late call filtering (handled only if the terminal is online). It shall be possible to create and operate new call filtering services which can access any of the key parameters to handle calls in this way.

Hold
This service allows an established call to be maintained, whilst suspending use of the bearer from the incoming access point of the network. This saves on both air interface and network traffic resources when a call is temporarily suspended. The incoming access point in the network means either the originating UMTS terminal, or interworking point with another network.

Transfer
This service allows either an established or held call to be redirected to another destination. This may either be used by setting up a new call to the destination first, or simply redirecting the existing call to the new destination. It shall be possible to revert such a call back to the diverting terminal at any time before it is accepted (answered) by the new destination. The UMTS system shall ensure that an optimal traffic route is used after the call has been answered by its new (final) destination.

Call-back When Free
This service can be invoked where a call (or a connectionless message) cannot be delivered to its destination because it is in use. The UMTS system will inform the requesting entity when the destination is next able to accept the call, allowing a new call to be originated. This allows existing GSM services, such as Call-back When Free to be implemented. Where multiple requests are outstanding for a terminal which becomes available, the system will determine in which order the requests are handled, probably in a serial manner. Ideally, it shall be possible to create the service logic which determines the order used from a range of accessible parameters.

Annex B (informative): Description and analysis of communication schemes

This annex gives a high level classification and description of communications requirements from end users and applications.

B.1 Communication schemes

The requirements on bearer services are based on an analysis of user and application needs. Four end-user groups are identified according to four distinctly different communication schemes; Conversational - real time, Interactive services, Streaming services and Background services.

B.2 QoS related performance requirements for example end user applications

A typical user is not concerned with how a particular service is provided. However, the user is interested in comparing one service with another in terms of universal, user-oriented performance parameters which apply to any end-to-end service. From a user's perspective, performance should be expressed by parameters which:

- Focus on user-perceivable effects, rather than their causes within the network
- Are independent of the networks internal design
- Take into account all aspects of the service from the user's point of view which can be objectively measured at the service access point
- Can be assured to a user by the service providers(s)

With these considerations in mind, this section examines the requirements of typical end user applications that can be expected in UMTS.

B.2.1 Performance requirements for conversational real-time

The most well known use of this scheme is telephony speech (e.g. GSM), but with Internet and multimedia a number of new applications will require this scheme, for example voice over IP and video conferencing tools. Real time conversation is always performed between peers (or groups) of live (human) end-users. This is the only scheme where the required characteristics are strictly given by human perception (the senses). Therefore this scheme raises the strongest and most stringent QoS requirements.

The real time conversation scheme is characterised by that the transfer time must be low because of the conversational nature of the scheme and at the same time that the time relation (variation) between information entities of the stream must be preserved in the same way as for real time streams. The maximum transfer delay is given by the human perception of video and audio conversation. Therefore the limit for acceptable transfer delay is very strict, as failure to provide low enough transfer delay will result in unacceptable lack of quality. The transfer delay requirement is therefore both significantly lower and more stringent than the round trip delay of the interactive traffic case.

Real time conversation - fundamental characteristics for QoS:

- preserve time relation (variation) between information entities of the stream
- conversational pattern (stringent and low delay)

The resulting overall requirement for this communication scheme is to support conversational real time services with low transfer delay as given by the human perception. (There are less hard requirements on packet loss ratio.)
A real-time streaming application is one that delivers time-based information in real-time, where time-based information is user data that has an intrinsic time component. Video, audio and animation are examples of time-based information, in that they consist of a continuous sequence of data blocks that must be presented to the user in the right sequence at pre-determined instants.

Conversational voice

Audio transfer delay requirements depends on the level of interactivity of the end users. To preclude difficulties related to the dynamics of voice communications, ITU-T Recommendation G.114 recommends the following general limits for one-way transmission time (assuming echo control already taken care of):

0 to 150 ms	preferred range [<30ms, user does not notice any delay at all, <100ms, user does not notice delay if echo cancellation is provided and there are no distortions on the link]
150 to 400 ms	acceptable range (but with increasing degradation)
above 400 ms	unacceptable range

The human ear is highly intolerant of short-term delay variation (jitter) it is therefore paramount that this is reduced as lower level as is practical. A limit as low as 1 msec is suggested as a target.
Requirements for information loss are influenced by the fact that the human ear is tolerant to a certain amount of distortion of a speech signal. It is has been suggested in studies that acceptable performance is typically obtained with frame erasure rates (FER) up to 3 %.
A connection for a conversation normally requires the allocation of symmetrical communication resources, with the average hold time of a call being in the region of 2 minutes.

Videophone

Videophone implies a full-duplex system, carrying both video and audio and intended for use in a conversational environment. As such, in principle the same delay requirements as for conversational voice will apply, i.e. no echo and minimal effect on conversational dynamics, with the added requirement that the audio and video must be synchronised within certain limits to provide “lip-synch” (i.e. synchronisation of the speaker's lips with the words being heard by the end user). In fact, due to the long delays incurred in even the latest video codecs, it will be difficult to meet these requirements.
Once again, the human eye is tolerant to some loss of information, so that some degree of packet loss is acceptable depending on the specific video coder and amount of error protection used. It is expected that the latest video codecs will provide acceptable video quality with frame erasure rates up to about 1%.

Interactive games

Requirements for interactive games are obviously very dependent on the specific game, but it is clear that demanding applications will require very short delays, and a value of 250 msecs is proposed, consistent with demanding interactive applications.

Two-way control telemetry

Two-way control telemetry is included here as an example of a data service which does require a real-time streaming performance. Clearly, two-way control implies very tight limits on allowable delay and a value of 250 msec is proposed, but a key differentiator from the

voice and video services in this category is the zero tolerance for information loss (obvious if you are controlling an important industrial process, for example).

Telnet

Telnet is included here with a requirement for a short delay in order to provide essentially instantaneous character echo-back.

B.2.2 Performance requirements for Interactive Services

When the end-user, that is either a machine or a human, is on line requesting data from remote equipment (e.g. a server), this scheme applies. Examples of human interaction with the remote equipment are: web browsing, data base retrieval, server access. Examples of machines interaction with remote equipment are: polling for measurement records and automatic data base enquiries (tele-machines).
Interactive traffic is the other classical data communication scheme that on an overall level is characterised by the request response pattern of the end-user. At the message destination there is an entity expecting the message (response) within a certain time. Round trip delay time is therefore one of the key attributes. Another characteristic is that the content of the packets must be transparently transferred (with low bit error rate).
Interactive traffic - fundamental characteristics for QoS:

– request response pattern
– preserve payload content

The resulting overall requirement for this communication scheme is to support interactive non-real time services with low round-trip delay.

Voice messaging and dictation

Requirements for information loss are essentially the same as for conversational voice, but a key difference here is that there is more tolerance for delay since there is no direct conversation involved. The main issue, therefore becomes one of how much delay can be tolerated between the user issuing a command to replay a voice message and the actual start of the audio. There is no precise data on this, but a delay of the order of a few seconds appears reasonable for this application.

Data

Although there may be some exceptions, as a general rule it is assumed that from a user point of view, a prime requirement for any data transfer application is to guarantee essentially zero loss of information. At the same time, delay variation is not applicable. The different applications therefore tend to distinguish themselves on the basis of the delay which can be tolerated by the end-user from the time the source content is requested until it is presented to the user.

Web-browsing

In this category we will refer to retrieving and viewing the HTML component of a Web page, other components eg images, audio/video clips are dealt with under their separate categories. From the user point of view, the main performance factor is how fast a page appears after it has been requested. A value of 2-4 seconds per page is proposed, however improvement on these figures to a target figure of 0.5 seconds wound be desirable.

High-priority transaction services (E-commerce)

The main performance requirement here is to provide a sense of immediacy to the user that the transaction is proceeding smoothly. A value of 2-4 seconds is suggested to be acceptable to most users.

E-mail (server access)

E-mail is generally thought to be a store and forward service which in principle can tolerate delays of several minutes or even hours. However, it is important to differentiate between communications between the user and the local email server and server to server transfer. When the user communicates with the local mail server, there is an expectation that the mail will be transferred quite rapidly, although not necessarily instantaneously. Consistent with the research findings on delay tolerance for Web-browsing, a requirement of 2-4 seconds is proposed.

B.2.3 Performance requirements for streaming services

When the user is looking at (listening to) video (audio) the scheme streams applies. The real time data flow is always aiming at a live (human) destination. It is a one way transport.
This scheme is one of the newcomers in data communication, raising a number of new requirements in both telecommunication and data communication systems. First of all it is a mainly unidirectional stream with high continuous utilisation (i.e. having few idle/silent periods.) It is also characterised by that the time relations (variation) between information entities (i.e. samples, packets) within a flow must be preserved, although it does not have any requirements on low transfer delay.
The delay variation of the end-to-end flow must be limited, to preserve the time relation (variation) between information entities of the stream. But as the stream normally is time aligned at the receiving end (in the user equipment), the highest acceptable delay variation over the transmission media is given by the capability of the time alignment function of the application. Acceptable delay variation is thus much greater than the delay variation given by the limits of human perception.
Real time streams - fundamental characteristics for QoS:

- unidirectional continuous stream
- preserve time relation (variation) between information entities of the stream

The resulting overall requirement for this communication scheme is to support streaming real time services having unidirectional data flows with continuous utilisation. (There are less stringent requirements on delay and packet loss ratio, i.e. the ratio of lost or corrupted packets out of all packets sent.)

Audio streaming

Audio streaming is expected to provide better quality than conventional telephony, and requirements for information loss in terms of packet loss will be correspondingly tighter. However, as with voice messaging, there is no conversational element involved and delay requirements can be relaxed, even more so than for voice-messaging.

One-way video

The main distinguishing feature of one-way video is that there is no conversational element involved, meaning that the delay requirement will not be so stringent, and can follow that of streaming audio.

Bulk data

This category includes file transfers, and is clearly influenced by the size of the file. As long as there is an indication that the file transfer is proceeding, it is reasonable to assume some what longer tolerance to delay than for a single Web-page.

Still image

This category includes a variety of encoding formats, some of which may be tolerant to information loss since they will be viewed by a human eye. However, given that even single

bit errors can cause large disturbances in other still image formats, it is argued that this category should in general have zero information loss. However, delay requirements for still image transfer are not stringent, given that the image tends to be built up as it is being received, which provides an indication that data transfer is proceeding.

Telemetry (monitoring)

Monitoring covers a wide range of applications, but in this category it is taken to apply to relatively low priority activities, eg status updating, rather than control.

B.2.4 Performance requirements for Background applications

When the end-user, that typically is a computer, sends and receives data-files in the background, this scheme applies. Examples are background delivery of E-mails, SMS, download of databases and reception of measurement records.
Background traffic is one of the classical data communication schemes that on an overall level is characterised by that the destination is not expecting the data within a certain time. The scheme is thus more or less delivery time insensitive. Another characteristic is that the content of the packets must be transparently transferred (with low bit error rate).
Background traffic - fundamental characteristics for QoS:

- the destination is not expecting the data within a certain time
- preserve payload content

The resulting overall requirement for this communication scheme is to support non-real time services without any special requirement on delay.
A background application is one that does not carry delay information. In principle, the only requirement for applications in this category is that information should be delivered to the user essentially error free. However, there is still a delay constraint, since data is effectively useless if it is received too late for any practical purpose.

Fax

Fax is included in this category since it is not normally intended to be an accompaniment to real-time communication. Nevertheless, there is an expectation in most business scenarios that a fax will be received within about 30 seconds. The information loss requirement is based on established wireline requirements for a Group 3 fax. As for the symmetry this should provide the required through put in the sending direction and the control signalling in backwards direction, hence an asymmetric connection is required.

Low priority transaction services

An example in this category is Short Message Service (SMS). 30 seconds is proposed as an acceptable delivery delay value.

Email (server to server)

This category is included for completeness, since as mentioned earlier, the prime interest in email is in the access time. There is a wide spread in user expectation, with a median value of several hours.

B.3 Adaptability and bearer service negotiation

Applications using the *interactive* or *real time conversational* communication schemes can also be described according to their possibilities for adapting to different environmental conditions as follows:

- Rigid applications; these applications can not adapt at all (e.g. GSM full rate speech.)

- Adaptive applications; these applications can adapt to the environment; they therefore require the network to support service negotiation. (e.g. multi-rate speech codecs)
- Elastic applications; these applications adapt totally to the environment and do therefore not require service negotiation (e.g. web browsing.)

The resulting overall requirement is to support service negotiation.