3G TS 22.121 V3.3.0 (2000-06)

Technical Specification

3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects
Service aspects;
The Virtual Home Environment
(3G TS 22.121 Release 1999)

Keywords
UMTS, VHE

3GPP

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Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (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 the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x   the first digit:

1   presented to TSG for information;

2   presented to TSG for approval;

3 or greater   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 document.

1 Scope

The present 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

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.

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]   3G TS 22.01: "Universal Mobile Telecommunications System (UMTS): Service Aspects; Service Principles".

[6]   3G 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]   3G TS 22.00 UMTS phase 1.

[10]   3G TS 23.127 "Virtual Home Environment/Open Service Architecture"

2.2 Informative references

[1]   3G 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 the present document, the following terms and 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: 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: 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 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: 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 the present document, the following abbreviations apply:

API	Application Programming Interface
CAMEL	Customised Application For Mobile Network Enhanced Logic
CAP	Camel Application Part
CORBA	Common Object Request Broker Architecture
CSE	Camel Service Environment

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

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 figure 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.
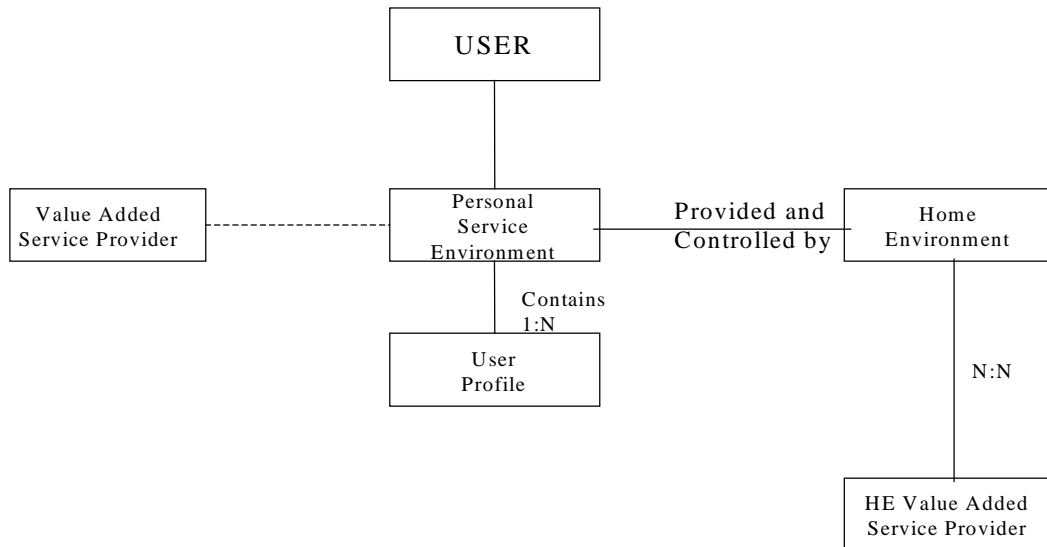
Figure 1: Service Provisioning From User's point of View

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 the present document.

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.
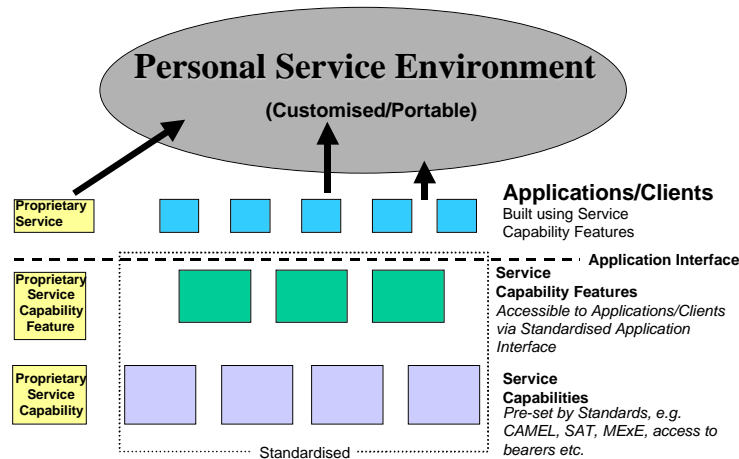
Figure 2: Framework for Services

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 figures 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. Note that the Service Capabilities (SCx) shown below are representatives of the different possible capabilities. It is not to be implied as the agreed architecture as this is a stage 2 issue.
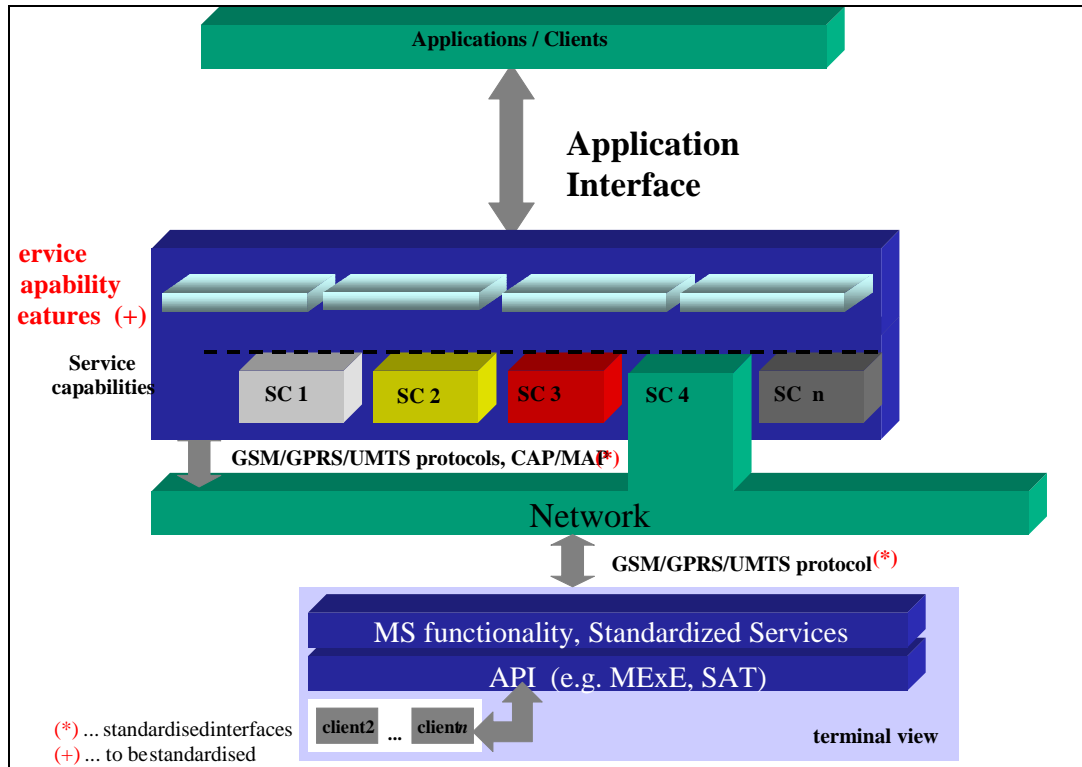
Figure 3: Possible realisation of Framework for Services

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 (e.g. CAP, MAP) or use GSM Bearers to transport applications and data, for example, from the MexE service environment of SAT server to the MS/SIM. The implementation of these operator specific services on the different platforms (CSE, MExE service environment /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 APIs, for example, MExE and SAT APIs, i.e. there will be no service capability features within the terminal.

The terminal can communicate, using GSM/UMTS bearers, with applications in the network via the service capability features which may be optionally realised for MExE service environment and SAT-servers.

```
                                   ┌──────────┐
                                   │   USER   │
                                   └────┬─────┘
                                        │
 ┌──────────────┐               ┌───────────────┐  Provided and  ┌──────────────┐
 │ Value Added  │ ─ ─ ─ ─ ─ ─ ─ │   Personal    │  controlled by │    Home      │
 │Service Provider│             │    Service     │───────────────│ Environment  │
 └──────────────┘               │  Environment  │                └──────┬───────┘
                                 └───────┬───────┘                       │
                                   Contains                              │
                                     1:N                                N:N
 ┌ ─ ─ ─ ─ ─ ─ ┐                 ┌───────────────┐                       │
 │ General User │ ─ ─ ─ ─ ─ ─ ─ │     User      │                       │
 │Preferences and│              │    Profile    │                       │
 │Subscribed Service│            └───────┬───────┘                       │
 └ ─ ─ ─ ─ ─ ─ ┘                   Contains                              │
                                     1:N                                 │
 ┌ ─ ─ ─ ─ ─ ─ ─ ┐               ┌───────────────┐                ┌──────┴───────┐
 │Service Profile, i.e.│─ ─ ─ ─ ─│    Service    │                │HE Value Added│
 │Specific Service │             └───────────────┘                │Service Provider│
 │Preferences     │                                               └──────────────┘
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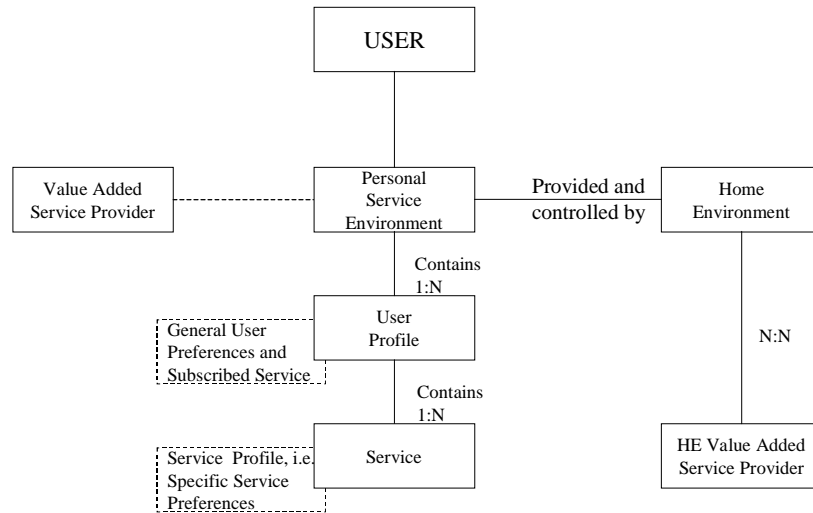
The set of services from the Users point of view

Figure 4

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 the present document.

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 feature**: this 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

The framework service capability features will be used e.g. for authentication, authorization, registration, notification, etc. and provide functionality that is independent of any particular type of service. Other commonly used features are described in more detail within TS 23.127, such as:

- Trust and Security Management:
  It provides mechanisms for applications and framework to initiate communications, authenticate each other and mechanisms for applications to be authorised and access network capability features.

- Integrity Management:
  It provides the support of integrity for both the OSA APIs and the Applications (e.g. load manager, fault manager, OAM and Heartbeat manager).

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 the present document.*

- **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 the present document.*

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 feature) 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 the present document*.

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 subclause 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 subclause 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 subclauses define generic service capability features e.g. for Session Control and Message Transfer.

10.2.1 Session Control service capability features

This subclause 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):

- allow the session to continue with modified information (e.g. changed destination number);

- release the session (i.e. removing all parties from the session);

- 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);

- collect information from user (i.e the application shall be able to request data from the user. For example, the user might enter some code number).

For each session it shall be possible to specify:

- 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 (Void)

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

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.

    Note: In Release 99 Terminal Capabilities can be provided by the Terminal Capability SCF only if the terminal is capable to supply them.

Terminals (e.g. MEXE-, WAP clients) may provide their Terminal Capabilities to the server (e.g. MEXE service environment or WAP gateway) either spontaneously or on request.

10.2.7   Information Transfer service capability features

The Information Transfer service capability feature shall enable an application to indicate to a user respectively an application in the UE or USIM about the presence of existing information for her. Physically, this indication may be sent by the underlying network e.g. as a SMS or USSD message to the terminal. The Information Transfer service capability feature provides the means to inform the underlying network that an indication shall be sent to the user.

    NOTE: For UMTS release 99 mechanisms like USSD or SMS may be employed to transfer the indication to the users terminal.

The following service capability feature shall be supported:

- **send information notification:**

    - the Send information notification service capability feature provides the means to inform the underlying network that an indication shall be sent to a user respectively an application in the UE or USIM about the presence of existing information for her;

- this indication shall contain sufficient information for the receiving entity to react in an appropriate manner, e.g. an announcement ID, URL, a string, etc. In addition the application or execution environment in the terminal (e.g. MExE SAT), that is to display this information, needs to be referenced.

- **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.

10.2.8 Reserved section

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 subclause 6.1 for more information on user profiles).

For release 99 the following information could be retrieved by an application:

- terminal capabilities, as described in the proper section,

- user information provided by and limited to CAMEL 3 R99 functionalities (ATI, ATN, ATM).

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 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 Service 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):
Service examples to be considered in VHE

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

Table A.1

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.

Annex B (informative): Change history

Version	Date	Comment
0.0.0	Sep 1998	Initial Draft at Ipswich
0.1.0	Oct 1998	Initial Draft at Uxbridge Meeting
0.2.0	Nov 1998	Draft at Newbury Meeting
0.3.0	Jan 1999	Draft after Stockholm meeting
0.4.0	Jan 1999	Draft to include requirement for R99
0.5.0	Feb 1999	Draft to include corrections from Ericsson and TTC requirements
0.6.0	Feb 1999	Draft to include changes made after adhoc meeting in Vienna
0.7.0	March 1999	Change to include text to fig 2 and 3 and for presentation to v1.0
1.0.0	March 12/99	Input text to state the inclusion of OSA requirements
1.1.0	March 17/99	Addition of Annex B, OSA text
1.2.0	April 30/99	Modification after Dublin Meeting
1.3.0	May 19/99	Modification after Hampton CT.
2.0.0	June 99	Modification at Sophia Antipolis
3.0.0	June 99	Approved Specification at SA#4 in Miami
3.1.0	October 1999	Inclusion of 3 CRs at SA#5, Kyongju, Korea
3.2.0	March 2000	Inclusion of CRs at SA#7, Madrid, Spain

TSG SA#	SA Doc.	SA1 Doc	Spec	CR	Rev	Rel	Cat	Subject/Comment	Old	New
SA#04			22.121							3.0.0
SP-05	SP-99442	S1-99809	22.121	002		R99	B	Virtual Home Environment.	3.0.0	3.1.0
SP-05	SP-99442	S1-99845	22.121	003		R99	B	Addition of IP4 Addressing	3.0.0	3.1.0
SP-05	SP-99442	S1-99535	22.121	004		R99	B	Charging capabilities	3.0.0	3.1.0
SP-07	SP-000067	S1-000107	22.121	005		R99	F	Clarification of service capabilities	3.1.0	3.2.0
SP-07	SP-000067	S1-000156	22.121	006		R99	C	Information Transfer service capability feature	3.1.0	3.2.0
SP-08	SP-000204	S1-000267	22.121	007		R99	F	Modification of section 10.2.6 on reducing the scope of the VHE/OSA reqirements	3.2.0	3.3.0
SP-08	SP-000204	S1-000283	22.121	008		R99	F	Removal of section 10.2.3 Address Translation SCF	3.2.0	3.3.0
SP-08	SP-000204	S1-000285	22.121	009		R99	F	Modification of section 10.2.9 to reduce scope of User Profile Management service capabilities	3.2.0	3.3.0
SP-08	SP-000204	S1-000334	22.121	010		R99	F	Alignment of VHE Stage 1 top VHE/OSA Stage 2 and stage 3	3.2.0	3.3.0