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Principles of Telecommunication Services supported by a GSM PLMN

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No changes since the previously distributed version.

ETSI GSM

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Title: PRINCIPLES OF TELECOMMUNICATION SERVICES SUPPORTED BY A GSM PLMN

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0. SCOPE

The recommendation in the GSM 02 series cover the definition of the telecommunication services supported by a GSM PLMN. The purpose of this recommendation is to provide a method for the characterization and the description of these telecommunication services.

1. FRAMEWORK FOR THE DESCRIPTION OF TELECOMMUNICATION SERVICES

1.1 General

Telecommunication services supported by a GSM PLMN are the communication capabilities made available to customer by network operators. A GSM PLMN provides, in cooperation with other networks, a set of network capabilities which are defined by standardized protocols and functions and enable telecommunication service to be offered to customers.

A service provision by a network operator (e.g. an Administration or an RPOA) to a subscriber of a GSM PLMN may cover the whole or only part of the means required to fully support the service. The operational and commercial features associated with the provision of the service are included in the service concept.

The service classification and description which follow are independent of different possible arrangements for the ownership and provision to the customer of the means required to support a service.

1.2 The attribute method of characterization of telecommunication services

This characterization is made by using a set of attributes. A telecommunication service attribute is a specific characteristic of that service whole values distinguish it from other telecommunication services. Particular values are assigned to each attribute when a given telecommunication service is described and defined.

A list of definitions of attributes and values used for bearer services and teleservices is contained in, respectively, Annex A and Annex B.

2. DESCRIPTION OF TELECOMMUNICATION SERVICES BY THE ATTRIBUTE METHOD

2.1 General

Telecommunication services are described by attributes which define service characteristics as they apply at a given reference point where the customer accesses the service. The description of

a telecommunication service by the method of attributes is composed of :

- technical attributes as seen by the customer, and
- other attributes associated with the service provision, e.g. operational and commercial attributes.

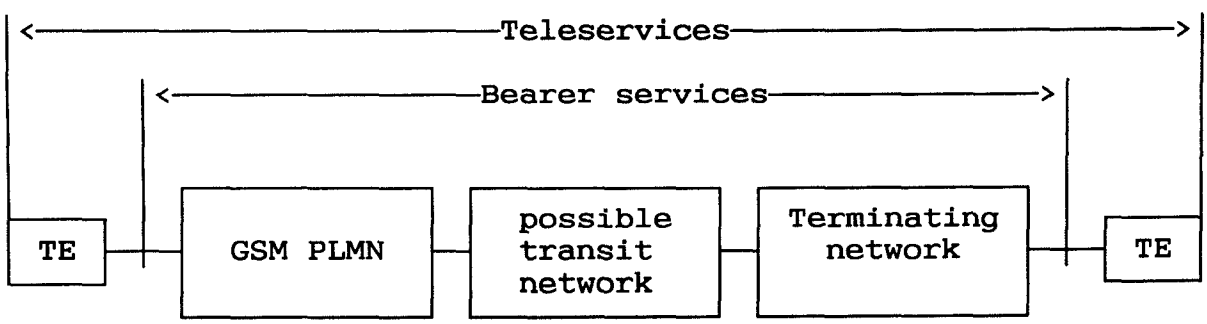
2.2 Bearer services and Teleservices

Telecommunication services are divided in two broad categories :

- bearer services, which are telecommunication services providing the capability of transmission of signals between access points (called user-network interfaces in ISDN)

- 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.

Figure 1/GSM 02.1 illustrates these definitions.



TE: terminal equipment

Figure 1/GSM 02.01: Bearer services and Teleservices supported by a GSM PLMN

Notes:

1) In the majority of cases, at least two networks of different types are involved in the support of a telecommunication service.

2) Figure 1/GSM 02.01 does not preclude any routing possibility.

3) In order to limit the complexity of the figure, only one transit network is shown.

4) The terminating network type may include a GSM PLMN, either the originating one or another one.

2.3 Supplementary services

A supplementary service modifies or supplements a basic telecommunication service. Consequently, it cannot be offered to a customer 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 telecommunication services.

Note: Supplementary services are not currently characterized by the attribute method (see Recommendation GSM 02.04)

2.4 Categorisation of telecommunication services

The concepts introduced in this recommendation are illustrated in Table1/GSM 02.01.

TELECOMMUNICATION SERVICES			
BEARER SERVICE		TELESERVICE	
Basic Bearer service	Basic Bearer service + supplementary services	Basic Teleservice	Basic Teleservice + supplementary services

Table 1/GSM 02.01: Categorisation of telecommunication services

3. CUSTOMER ACCESS TO TELECOMMUNICATION SERVICES SUPPORTED BY A GSM PLMN

3.1 Reference configuration and access points

Considering the reference configuration defined in Recommendation GSM 04.02, customers can access various telecommunication services at different access points. Figure 2/GSM 02.01 shows these access points. The reference configuration shows the MS to consist of mobile termination and terminal equipment.

Figure 2/GSM 02.01 takes into account that service provision by the network operator to a customer accessing a GSM PLMN may cover the whole or part of the means required to fully support the service.

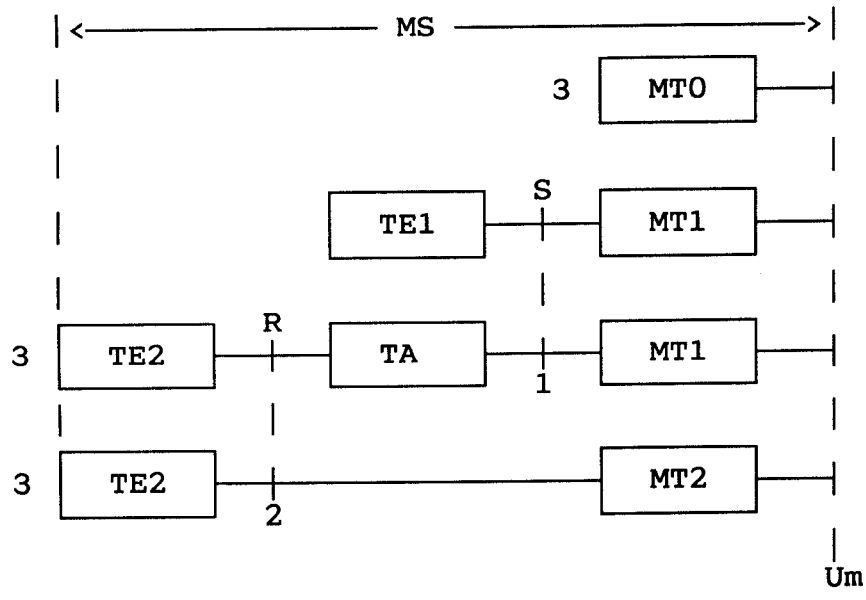


Figure 2/GSM 02.01: Customer access to services supported by a GSM PLMN

MS: Mobile Station

MT: Mobile Termination: supports function specific to management of the radio interface (Um) and adapting information flows at Um to those required by terminal functions at access points 1 or 2. For further descriptions of functions and types (MT0, MT1 and MT2) see Recommendation GSM 04.02.

TE: Terminal Equipment: supports man-machine (access point 3) to the user and may support a physical interface at access point 1 or 2.

TE1: TE presenting an ISDN interface.

TE2: TE presenting a non-ISDN (e.g. a CCITT V or X series) interface.

TA: ISDN Terminal Adapting functions: may be used to adapt between access points 1 and 2.

Um: Radio interface.

3.2 Access points and telecommunication services

The definition of the access points introduced in Figure 2/GSM 02.01 are as follows :

1) At access point 1 and 2, bearer services may be accessed ;

2) At access point 3 (user to terminal interface), teleservices are accessed - note that the teleservice concept includes the terminal capabilities.

3.3 Terminal equipment

It should be noted that a terminal equipment (TE) may consist of one or more pieces of equipment and may include the following entities :

- telephone set ;
- customer terminals, e.g. Data Terminal Equipments, Teletex terminals
- customer systems.

Note: the whole mobile station, customer terminals and systems may be privately owned or provided by network operators.

All terminal equipment accessing a GSM PLMN interface at one of the access points defined in section 3.2 must meet the specifications of the protocols at that interface for all the layers that are included in the definition of the telecommunication service used.

For some telecommunication services, the service definition also covers some terminal functions and characteristics in addition to those specified by the protocols at the interface.

4. CAPABILITIES TO SUPPORT A TELECOMMUNICATION SERVICE

4.1 General

The capabilities to fully support a telecommunication service for a customer accessing a GSM PLMN include :

- network capabilities (in the GSM PLMN and in most cases in another network) ;
- terminal capabilities, when required ;
- other service providing capabilities, when required ;
- operational and commercial features associated with the service provision.

4.2 Network capabilities

Network capabilities are described in detail in the GSM 03 series of recommendations. Two different levels of GSM PLMN network capabilities are introduced :

- low layer capabilities, which relate to bearer services ;
- high layer capabilities, which together with low layer capabilities relate to teleservices.

4.3 Terminal capabilities

Terminal capabilities are also described in terms of low layer and high layer capabilities. In the description of teleservices, the terminal capabilities, both low layer and high layer, are included in the service definition. In the case of bearer service definition, the terminal capabilities are not included but the terminal equipment must conform to the low layer capabilities of the bearer service.

4.4 Operational capabilities

The operational capabilities associated with a service offering may include capabilities for maintenance, charging, user control of service features, etc.

The use of such capabilities may involve terminal-network communication and may therefore be viewed as specific applications.

5. CHARACTERIZATION OF TELECOMMUNICATION SERVICES

5.1 General

A telecommunication service supported by a GSM PLMN is characterized and described by service attributes.

There are two groups of service attributes applicable to user information flow :

- low layer attributes ;
- high layer attributes.

Bearer services are characterized only by low layer attributes. Teleservices are characterized by both low layer attributes and high layer attributes.

The basic characteristics of a telecommunication service are described by the basic service attributes.

The additional characteristics associated with a supplementary service which modify or supplement a basic telecommunication service are described in Recommendation GSM 02.04.

5.2 Bearer services supported by a GSM PLMN

Bearer services supported by a GSM PLMN provide the capability for information transfer between a GSM PLMN access point 1 or 2 and an appropriate access point in a terminating network and involve only low layer functions (i.e. relating to layers 1-3 of the OSI Reference Model).

The customer may choose any set of high layer (at least 4-7) protocols for his communication, but a GSM PLMN will not insure compatibility at these high layers between customers.

Bearer services are characterized by a set of low layer attributes in Recommendation GSM 02.02. These attributes are classified into four categories :

- information transfer attributes ;
- access attributes ;
- interworking attributes ;
- general attributes, including operational and commercial attributes.

The bearer capability defines the technical features of a bearer service as they appear to the user at the appropriate access point. For the time being, the bearer capability is characterized by information transfer, access and interworking attributes. A bearer capability is associated with every bearer service.

The bearer service provides the user with the possibility of gaining access to various forms of communication, covering for example:

- information transfer between a user in a GSM PLMN and a user in a terminating network, including the same GSM PLMN, another GSM PLMN and other types of PLMNs ;
- information transfer between a user in a GSM PLMN and separate resource providing high layer functions.

5.3 Teleservices supported by a GSM PLMN

Teleservices provide the full capacity for communication by means of terminals and network functions and possibly functions provided by dedicated centres.

A teleservice supported by a GSM PLMN should use only one (or a small number of) bearer capability recommended by GSM. Examples of teleservices are telephony, Teletex, Videotex and access to message handling systems.

Teleservices are characterized by a set of low layer attributes, a set of high layer attributes and operational and commercial attributes.

Low layer attributes are those used to characterize the bearer capability (see section 5.2). High layer attributes are used in Recommendation GSM 02.03 to describe high layer (i.e. layer 4-7) information transfer related characteristics. They refer to functions and protocols of layers 4-7 in the CCITT Recommendation X.200 framework which are concerned with the transfer, storage and processing of user messages (provided by a subscriber's terminal, a retrieval centre or a network service centre).

Therefore, not all attributes can be applied directly at the user to terminal interface (access point 3) as they represent two kinds of features, the bearer capability and the terminal features, that are not directly perceived by the user.

A teleservice provides the user with the possibility of gaining access to various forms of applications (or teleservice APPLICATIONS) covering for example :

- teleservice application involving two terminals providing compatible or identical teleservice attributes at an access point in a GSM PLMN and an access point in a terminating network;

- teleservice application involving a terminal at one access point in a GSM PLMN and a system providing high layer functions (e.g. speech storage system, message handling system) located either within the GSM PLMN or in a terminating network.

6. PROVISION OF TELECOMMUNICATION SERVICES

A telecommunication service is provided at different access points by a network operator (e.g. an Administration, RPOA) and/or other service providers. Recommendations GSM 02.10 and 02.11 define some aspects of the provisions of telecommunication services by a GSM PLMN.

The provision of telecommunication services implies:

- subscription of basic services and possibly subscription to supplementary services (see Rec. GSM 02.13);

- registration into a service directory (see Rec. GSM 02.14);

- compatibility between terminals;

- interworking capabilities (see GSM 09 series of recommendations).

ANNEX A

LIST OF DEFINITION OF ATTRIBUTES AND VALUES USED FOR BEARER SERVICES

1. INFORMATION TRANSFER ATTRIBUTES

1.1 Information transfer capability

This attribute describes the capability associated with the transfer of different types of information through a GSM PLMN and another network or through a GSM PLMN.

Values:

- unrestricted digital information;
  transfer of information sequence of bits at its specified bit rate without alteration; this implies bit sequence independence, digit sequence integrity and bit integrity.

- speech;
  digital representation fo speech information and audible signalling tones of the PSTN coded according to the encoding rule defined in the GSM 06 series of recommendations.

- 3.1 kHz Ex PLMN;
  unrestricted digital information transfer within the PLMN and 3.1 kHz audio restricted within the ISDN.

1.2 Information transfer mode

This attribute describes the operational mode of transferring (transportation and switching) through a GSM PLMN.

Values:

- circuit

- (packet)

1.3 Information transfer rate

This attribute describes the bit rate (circuit mode) or the throughput (packet mode). It refers to the transfer of digital information between two access points or reference points.

Values:

- appropriate bit rate, throughput rate,

1.4 Structure

This attribute refers to the capability of the GSM PLMN and if involved other networks to deliver information to the destination access point or reference point in a structure (e.g. time interval for circuit mode, service data unit for packet mode) that was presented in a corresponding signal structured at the origin (access point or reference point).

Values :

- 8 kHz integrity;
  this value applies when (1) at each user-network interface intervals of 125 us are implicitly or explicitly demarcated, and (2) all bits submitted within a single demarcated 125 us interval are delivered within a corresponding single demarcated 125 us interval.

  Further study is required

- service data unit integrity;
  this value applies when (1) at each user-network interface protocols provide a mechanism for identifying the boundaries of service data units (e.g. X.25 complete packet sequence), and (2) all bits submitted within a single service data unit are delivered in a corresponding service data unit.

- unstructured;
  this value applies when the telecommunication service neither provides structural boundaries nor preserves structural integrity.

1.5 Establishment of communication

This attribute associated with a telecommunication service describes the mode of establishment used to establish and a given communication.

In every telecommunication service communication may be between users within the GSM PLMN or between a user in the GSM PLMN and a user in another network.

Values :

- demand mobile originated (MO) only;

- demand mobile terminated (MT) only;

- demand mobile originated or terminated (MO, MT).

1.6 Communication configuration

This attribute describes the spatial arrangement for transferring information between two or more access points. It completes the structure associated to a telecommunication services as it

associates the relationship between the access points involved and the flow of information between these access points.

Values :

- point-to-point communication;
  this value applies when there are only two access points.

- multipoint communication;
  this value applies when more than two access points (1) are provided by the service. The exact characteristics of the information flows must be specified separately based on functions provided by the GSM PLMN.

Note 1: the number of access points can be undefined.

- broadcast communication;
  this value applies when more than two access points (2) are provided by the service. The information flows are from a unique point (source) to the others (destination) in only one direction.

Note 2: the number of destination access points can be undefined.

1.7 Symmetry

This attribute describes the relationship of information flow between two (or more) access points or reference points involved in a communication.

It characterizes the structure associated to a communication service.

Values :

- unidirectional;
  this value applies when the information flow is provided only in one direction.

- bidirectional symmetric;
  this value applies when the information flow characteristics provided by the service are the same between two (or more) access points or reference points in the forward and backward directions.

- bidirectional asymmetric;
  this value applies when the information flow characteristics provided by the service are different in the two directions.

2. ATTRIBUTES DESCRIBING THE ACCESS AT THE MOBILE STATION

2.1 Signalling access

This attribute characterized the protocol on the signalling channel at a given access point or reference point (access point 1 or 2 at the MS in figure 2/GSM 02.01).

Values:

- manual;
- appropriate V-series protocol;
- appropriate X-series protocol;
- I-series stack of signalling protocols.

2.2 Information access

2.2.1 Rate

This attribute describes either the bit rate (circuit mode including transparent access to a PSPDN) or throughput (packet mode) used to transfer the user information at a given access point or reference point (access point 1 or 2 at the MS in figure 2/GSM 02.01).

Values :

- appropriate bit rate ;
- appropriate throughput.

2.2.2 Interface

This attribute describes the interface according to the protocol used to transfer user information at a given access point or reference point (access point 1 or 2 at the MS in figure 2/GSM 02.01).

Values:

- appropriate V-series DTE/DCE interface;
- appropriate X-series interface;
- S interface;
- analogue 4-Wire interface.

3. INTERWORKING ATTRIBUTE

3.1 Type of terminating network

Communication can be established between a MS in a GSM PLMN (originating network) and a terminal in a network (terminating network) including the same GSM PLMN or another GSM PLMN. The attribute designates the terminating network.

Note 1: the terms "originating" and "terminating" do not indicate the direction of communication establishment.

Note 2: this attribute does not reflect whether there is none, one or several transit networks between the originating and terminating networks.

Values:

- PSTN;
- ISDN;
- CSPDN;
- PSPDN;
- GSM PLMN;
- Direct access networks.

3.2 Terminal to terminating network interface

This attribute describes the interface between a terminal equipment and the terminating network.

Values:

- appropriate V-series (DTE/DCE) interface;
- appropriate X-series interface;
- analogue 2 resp. 4 wire interface;
- S interface (D+B+B).

4. GENERAL ATTRIBUTES

4.1 Supplementary services provided

This attribute refers to the supplementary services to a given telecommunication service.

Values:

- appropriate supplementary services.

4.2 Quality of service

This attribute is described by a group of specific sub-attributes, for example :

service reliability, service availability.

The description of these attributes and their values is contained in Recommendation GSM 02.08 "Quality of service".

4.3 Commercial and operational

4.4 Service interworking

ANNEX B

LIST OF DEFINITIONS OF ATTRIBUTES AND VALUES USED FOR TELESERVICES

1. HIGH LAYER ATTRIBUTES

1.1 Type of user information

This attribute describes the type of information which the communication offered to the user by the teleservice is based on.

Values:

- speech;
- short message;
- data;
- videotex;
- text (teletex or data);
- facsimile.

1.2 Layer 4 protocol functions

1.3 Layer 5 protocol functions

1.4 Layer 6 protocol functions

1.5 Layer 7 protocol functions

These attributes refer to the layer protocols characteristic of the different teleservices.

Values:

- speech and signalling tones;
- CCITT International Alphabet no 5;
- appropriate CCITT Recommendations (X and T-series);
- appropriate CEPT Recommendations (T/CD, T/TE).

2. LOW LAYER ATTRIBUTE (BEARER CAPABILITIES)

The low layer attributes describe the bearer capabilities which support the teleservice. These low layer attributes and their values are the same as presented in Annex A : List of definitions of attributes and values used for bearer services.

3. GENERAL ATTRIBUTES

The general attributes are the same as presented in Annex A: List of definitions and values used for bearer services.

ANNEX C

DEFINITION OF "BUSY" IN A GSM PLMN

1. SCOPE

This annex describes the conditions under which a given mobile subscriber (station) is considered as "busy". In general, this occurs whenever the resources associated with that MS (and needed to successfully complete the call) exist but are not available for that call. The description is based on the busy definition in the ISDN (CCITT I.221).

In addition, the operation of some Supplementary Services occurs when certain of these resources are busy. Therefore, these "resources busy" are also described herein.

This annex does not cover the cases, when network resources not associated with a given destination are unavailable, or when such resources are out-of-service or otherwise non-functional.

2. NETWORK DETERMINED USER BUSY (NDUB) CONDITION

This condition occurs, when a call is about to be offered, if the information (i.e. traffic) channel (Bm or Lm) is busy and the maximum number of total calls has been reached (see note).

When NDUB condition occurs, the PLMN will clear the call and indicate "busy" back towards the calling subscriber (see also section 4).

Note: The value of the maximum number of calls is 1 for the basic call. When the supplementary service "Call Waiting" is applicable the value is n+1 where n is the maximum number of calls that can be waiting.

3. USER DETERMINED USER BUSY (UDUB) CONDITION

This condition occurs when a call is offered to a Mobile Station and the MS responds "user busy" because the subscribers resources (terminal or person using them) are busy. Then the PLMN will clear the call with the indication "busy" back towards the calling subscriber (see also section 4).

4. MOBILE SUBSCRIBER BUSY

A mobile subscriber is considered to be busy if either a "Network Determined User Busy" or a "User Determined User Busy" condition occurs.

Some supplementary services (e.g. Call Forwarding on Busy) may cause the call not to be cleared when a busy condition occurs.