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PREFATORY NOTE

ETSI has constituted stable and consistent documents which give specifications for the implementation of the European Cellular Telecommunications System. Historically, these documents have been identified as "GSM recommendations".

Some of these recommendations may subsequently become Interim European Telecommunications Standards (I-ETSs) or European Telecommunications Standards (ETSs), whilst some continue with the status of ETSI-GSM Technical Specifications. These ETSI-GSM Technical Specifications are for editorial reasons still referred to as GSM recommendations in some current GSM documents.

The numbering and version control system is the same for ETSI-GSM Technical Specifications as for "GSM recommendations".

ETSI STC GSM3

Recommendation GSM 03.11 **Version 3.1.1**

Technical Realisation of Supplementary Services - General Aspects

Date: January 1990

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SECTION 1

SCOPE

This recommendation describes the general aspects on how supplementary services in the GSM system are realised from a technical point of view.

All supplementary services may require signalling on the radio path. Signalling procedures and messages used are defined in the GSM 04.8x series of recommendations. See also section 3 below.

For some supplementary services information needs to be transferred between the home location register (HLR), the visitor location register (VLR) and the mobile services switching centre (MSC). Signalling procedures for such information transfer are defined in recommendation GSM 09.02.

Definitions and descriptions of supplementary services are given in the GSM 02.8x series of recommendations.

SECTION 2

DEFINITION OF TERMS

2.1 Supplementary service

A supplementary service modifies or supplements a basic Telecommunication service.

Note: Provision of supplementary services by PLMN operators may be considered as essential (E) or additional (A). E-supplementary services shall be made available in all GSM PLMNs.
A-supplementary services may be offered by GSM PLMN operators for national service and can be made available internationally on the basis of bilateral agreement.

Note : Offered supplementary services may be used by subscribers/users at their discretion.

Note : Certain supplementary services need not be subscribed to be used.

2.2 Concepts associated with supplementary services

For the purpose of recommendations on the technical realization of supplementary services the following terms are defined:

Provision
An action to make a service available to a subscriber. The provision may be

- general: where the service is made available to all subscribers (subject to compatibility restrictions enforced) without prior arrangements being made with the service provider.

- pre-arranged: where the service is made available to an individual subscriber only after the necessary arrangements have been made with the service provider.

Withdrawal
An action taken by the service provider to remove an available service from a subscriber's access. The withdrawal may be

- general: where the service is removed from all subscribers provided with the service.

- specific: where the service is removed on an individual basis from subscribers provided with the service.

Registration
The programming by the service provider or subscriber of information to enable subsequent operation of a service. The programming action involves input of specific supplementary information.

For certain services the registration procedure may cause activation whilst for others the service may already be in the active phase.

Erasure
The deletion by the service provider, the subscriber or the system of information stored against a particular service by a previous registration(s).

Activation
An action taken by either the service provider, the subscriber or the system to enable a process to run as and when required by the service concerned.

The time during which the process is activated is defined as the active phase. During activation the service will be either "quiescent" or "operative" according to whether or not the system is actually using the service, e.g. to forward a call or to apply call waiting indication.

Deactivation
An action taken by either the service provider, the subscriber or the system to terminate the process started at the activation.

Invocation
An action to invoke the service required, taken by the subscriber (e.g. pressing a specific button) or automatically by the network or terminal as a result of a particular condition (e.g. calling number identification for each incoming call).

Normal operation with successful outcome
Description of the normal operation of the service, the normal served subscriber's actions and the system response. Decision points, timing and call progress signals would be some of the aspects defined for the service if they can be perceived by the subscriber.

Testing
The test procedure allows the subscriber to check whether or not the service is operating as he desires.

In some cases the use of the service is sufficient, for others a method of testing is included in the control procedure.

Interrogation
The request by the subscriber to the PLMN to provide information about a specific supplementary service. This information can be requested by a

- status check;

  The following values can be returned by the PLMN:

  - not supported
  - activated
  - deactivated

Not all values are applicable to all supplementary services.

- data check;

  This interrogation function compares the data input by the subscriber during an interrogation procedure with the information stored in the PLMN. The PLMN returns a standard tone, announcement or indications (e.g. "check is positive" or "check is negative").

- data request;

  This interrogation function enables the subscriber to obtain confirmation of his input data. The PLMN returns an appropriate announcement or indication (e.g. "the forwarded-to number is etc.").

Exceptional operation or unsuccessful outcome
Abnormal situations not described in "normal operation with successful outcome". Procedures on time-out, unexpected signalling response and other such events would be defined.

Interaction with other supplementary services
When more than one supplementary service is active, new logical situations, decisions, priorities, etc., may arise. This section would identify and define the resolution of such situations as they affect subscriber perception of the service. Special procedures may therefore be required, e.g. to allow, where possible, the simultaneous use of different supplementary services by one mobile subscriber.

Interworking considerations
Identification of subscriber perceptions when a call exits from an ISDN/PLMN to another CEPT specified network or enters an ISDN/PLMN from another CEPT specified network.

Note: The recommendations on the technical realization of supplementary services do not distinguish between subscriber, user and customer, since all three do not fully cover the textual needs. Generally the term "subscriber" is used, even if this person is not having the subscription.

Note : The terms "he", "his" and "him" are used as abbreviation of "he/she", "his/her" and "him/her" respectively.

SECTION 3

MS ACCESS TO SUPPLEMENTARY SERVICES

The functional signalling procedures for the control of supplementary services at the radio interface are specified in the GSM 04.8x series of recommendations. The defined procedures specify the basic methodology for the control (e.g. registration, erasure, invocation, etc.) of supplementary services.

Two categories of procedures are defined for the functional signalling for supplementary services.

The first category, called the Separate Message Approach utilizes separate message types to indicate a desired function. The HOLD and RETRIEVE families of messages are identified for this category.

The second category called the Common Information Element Procedure utilizes the Facility information element and applies only to supplementary services that do not require synchronization of resources between the mobile equipment and the network.

Both categories are specified in a symmetrical manner and can be signalled both in the mobile to network and the network to mobile directions.

The control of supplementary services by either the mobile station or the network includes the following cases:

a) the invocation of supplementary services during the establishment of a call;

b) the invocation of supplementary services during the clearing of a call;

c) the invocation of call related supplementary services during the active state of a call;

d) the invocation or registration of supplementary services independent from an active call;

e) the invocation of multiple, different supplementary services within a single message;

f) the invocation of supplementary services related to different calls;

g) cancellation of invoked supplementary services and notification to the initiator of the supplementary service.

The correlation of a call related supplementary service and the call which it modifies is provided by use of the transaction identifier (cases a, b, c, e and g).

The correlation of call independent supplementary service invocations and their responses, is provided by the combination of the transaction identifier of the messages containing the Facility information element and the invoke identifier present within the Facility information element itself (cases d, e and g).

The identification of different supplementary service invocations within one single message is provided by the Invoke identifier of the corresponding Facility information element (cases e and g).

The identification of supplementary service invocations related to different calls is provided by different FACILITY messages with the corresponding transaction identifier of the appropriate call (case f), i.e., different transaction identifier values are used to identify each call individually.

SECTION 4

ACTIVATION, DEACTIVATION, REGISTRATION, ERASURE, INTERROGATION, INVOCATION

Activation, deactivation, registration, erasure, interrogation and invocation can be generalized for all supplementary services. MS can either indicate to MSC to contact VLR for the necessary information ("the normal case") or to contact HLR, if the visited network does not support this specific supplementary service or if the subscriber does not know the local procedures. Besides this first information transfer, it might be necessary that HLR contacts VLR or vice versa to get all necessary information or to update the other LR. So basically there are 4 ways in which activation, deactivation, registration, erasure, interrogation and invocation of the supplementary service can be handled (see recommendation GSM 09.02): MS makes a request for one of the attributes (activation, deactivation, registration, erasure, interrogation, invocation) to MSC. MSC can

1. contact only VLR, if all necessary parameters are available in VLR (not very likely for registration and erasure) (supplementary service request);

2. contact only HLR, if the visited network does not support this specific supplementary service or if the subscriber does not know the local procedures (subscriber provided signalling data);

3. contact first VLR, which contacts HLR since not all necessary parameters are available in VLR (supplementary service request - category/supplementary service information);

4. contact HLR, after which HLR contacts VLR (subscriber provided signalling data - category/supplementary service updating).

Not every attribute for a specific supplementary service can be handled in all four ways. This is elaborated for each supplementary service.

SECTION 5

OVERVIEW OF SUPPLEMENTARY SERVICES

Table 5.1 gives an overview of the supplementary services described in this recommendation. The following information is contained in the table.

Column 1 Services: The name of the supplementary service as defined in GSM 02.8x series of recommendations is included.

Column 2 Type: The type is related to the following cases:

B: "binary" supplementary service, i.e. it does not require parameters,

P: the supplementary service requires one or more parameters. The parameters may be inserted at the time of registration or when the supplementary service is activated,

N: the supplementary service does not require any subscription with the PLMN.

Column 3 Per call: Here all supplementary services requiring activation on a per call basis are indicated by an A.

Column 4 Continuous: Here all supplementary services requiring registration (R) and activation for a period of time (A) are indicated.

Column 5 Parameters in HLR: Here all parameters stored in the HLR are listed.

Column 6 Parameters in VLR: Here all parameters which need to be transferred to a VLR are listed. For "binary" supplementary services a subscription indicator needs to be stored.

Column 7 Action taken by: Here it is indicated whether the actions associated with a supplementary service are taken by the HLR, the VLR and/or the MSC.

1	2	3	4	5	6	7
Service	Type	Per call	Continuous	Parameters in HLR	Parameters in VLR	Action by
Calling number identification presentation	B	-	R,A	Subscription indicator	Subscription indicator	VLR MSC
Calling number identification restriction	P	- or A	R,A or R	Subscription indicator Per call basis	Subscription indicator Per call basis	VLR MSC
Connected number identification presentation	B	-	R,A	Subscription indicator	Subscription indicator	VLR MSC
Connected number identification restriction	B	- or A	R,A or R	Subscription indicator Per call basis	Subscription indicator Per call basis	VLR MSC
Malicious call identification	P	-	R,A	Subscription indicator Activation status	Subscription indicator Activation status	VLR
Call forwarding unconditional	P	-	R,A	Subscription indicator Notification to the calling party Forwarded-to number Registration status Activation status	Subscription indicator Registration status Activation status	HLR
Call forwarding on mobile subscriber busy	P	-	R,A	Subscription indicator Notification to the calling party Notification to the forwarding party Forwarded-to number Registration status Activation status	Subscription indicator Notification to the calling party Notification to the forwarding party Forwarded-to number Registration status Activation status	VLR MSC
Call forwarding on no reply	P	-	R,A	Subscription indicator Notification to the calling party Notification to the forwarding party Forwarded-to number Registration status No reply condition timer Activation status	Subscription indicator Notification to the calling party Notification to the forwarding party Forwarded-to number Registration status No reply condition timer Activation status	VLR MSC
Call forwarding on mobile subscriber not reachable	P	-	R,A	Subscription indicator Notification to the calling party Forwarded-to number Registration status Activation status	Subscription indicator Notification to the calling party Forwarded-to number Registration status Activation status	VLR MSC HLR
Call transfer	B	-	R,A	Subscription indicator	Subscription indicator	VLR
Mobile access hunting	P	-	R,A	Subscription indicator Hunt group access selection order Activation status (ffs)	Subscription indicator Hunt group access selection order Activation status (ffs)	VLR MSC
Call waiting	P	-	R	Subscription indicator Activation status	Subscription indicator Activation status	VLR MSC
Call hold	P	-	R	Subscription indicator Notification to held/retrieved party	Subscription indicator Notification to held/retrieved party	VLR MSC
Completion of calls to busy subscribers	P	A	R	Subscription indicator Activation status	Subscription indicator Activation status	VLR MSC
Three party service	B	-	R,A	Subscription indicator	Subscription indicator	VLR MSC
Conference calling	P	-	R,A	Subscription indicator Maximum number of conferees	Subscription indicator Maximum number of conferees	VLR MSC

Table 5.1/GSM 03.11
Overview of supplementary services (sheet 1 of 2)

1	2	3	4	5	6	7
Service	Type	Per call	Continuous	Parameters in HLR	Parameters in VLR	Action by
Closed user group	P	-	R,A	Subscription indicator CUG facilities Preferential CUG facility CUG interlock code CUG index Barring of incoming calls within a CUG Barring of outgoing calls within a CUG	Subscription indicator CUG facilities Preferential CUG facility CUG interlock code CUG index Barring of incoming calls within a CUG	HLR VLR
Advice of charge	P	-	R,A	See Rec GSM 02.24	See Rec GSM 02.24	HLR VLR MSC
Freephone service	B	-	R,A	Subscription indicator	Subscription indicator	-
Reverse charging						
User-to-user signalling	P	A	R	Subscription indicator User-to-user signalling service indicator	Subscription indicator User-to-user signalling service indicator	VLR MSC
Barring of outgoing calls	P	-	R	Subscription indicator Control of barring services Activation status Registration status Call barring password	Subscription indicator Control of barring services Activation status Registration status Call barring password	VLR
Barring of outgoing international calls	P	-	R	Subscription indicator Control of barring services Activation status Registration status Call barring password	Subscription indicator Control of barring services Activation status Registration status Call barring password	VLR
Barring of outgoing international calls except those directed to the home PLMN country	P	-	R	Subscription indicator Control of barring services Activation status Registration status Call barring password	Subscription indicator Control of barring services Activation status Registration status Call barring password	VLR
Barring of incoming calls	P	-	R	Subscription indicator Control of barring services Activation status Registration status Call barring password	Subscription indicator Control of barring services Activation status Registration status Call barring password	HLR
Barring of incoming calls when roaming outside the home PLMN country	P	-	R	Subscription indicator Control of barring services Activation status Registration status Call barring password	Subscription indicator Control of barring services Activation status Registration status Call barring password	HLR

Table 5.1/GSM 03.11
Overview of supplementary services (sheet 2 of 2)

SECTION 6

FORMAT OF DESCRIPTION

The supplementary services are described according to the following format:

x.1 FUNCTIONS AND INFORMATION FLOWS
x.2 INFORMATION STORED IN HLR
x.3 INFORMATION STORED IN VLR
x.4 HANDOVER

SECTION 7

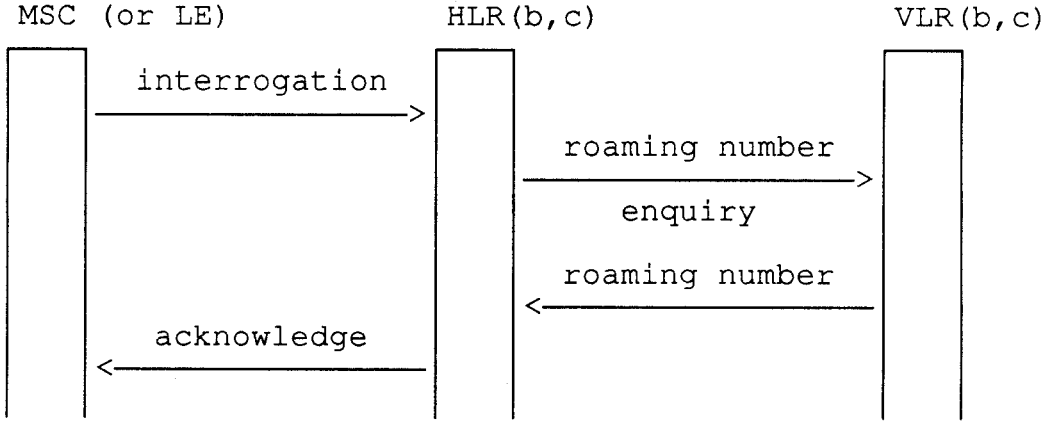
ALLOCATION OF THE MOBILE SUBSCRIBER ROAMING NUMBER (MSRN)

Two alternatives are available for assigning the MSRN to a roamed MS. These are:

Alternative 1 Assign an MSRN in the visited network upon initial registration or location updating and pass this to the HLR for routing calls to the MS;

Alternative 2 Assign an MSRN in the visited network upon demand by the HLR on a per call basis.

For most supplementary services the allocation of the MSRN only has an impact on the call set-up procedure. For these supplementary services only alternative 1 will be elaborated. If alternative 2 is used the following procedure should be added in each information flow at the point where the call is set-up.



The only supplementary service for which the information flows and the allocation of functions is essentially different for the two alternatives is call forwarding on mobile subscriber not registered. The two alternatives for this supplementary service will be elaborated in the corresponding section.