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Digital cellular telecommunications system (Phase 2+) (GSM); Technical realization of Supplementary Services (GSM 03.11 version 7.0.1 Release 1998)

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# ETSI EN 300 928 V7.0.1 (2000-01)

*European Standard (Telecommunications series)*

## Digital cellular telecommunications system (Phase 2+); Technical realization of Supplementary Services (GSM 03.11 version 7.0.1 Release 1998)

**GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS**

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# Foreword

This European Standard (Telecommunications series) has been produced by the Special Mobile Group (SMG).

The present document describes the general aspects on how supplementary services within the digital cellular telecommunications system.

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

Version 7.x.y

where:

7 indicates Release 1998 of GSM Phase 2+;

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

y the third digit is incremented when editorial only changes have been incorporated in the specification.

The specification from which the present document has been derived was originally based on CEPT documentation, hence the presentation of the present document may not be entirely in accordance with the ETSI rules.

| National transposition dates | |
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| Date of adoption of this EN: | 31 December 1999 |
| Date of latest announcement of this EN (doa): | 31 March 2000 |
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| Date of withdrawal of any conflicting National Standard (dow): | 30 September 2000 |

# 1     Scope

The present document describes the general aspects on how supplementary services in the GSM system are realized from a technical point of view.

Description of technical realization for specific supplementary services can be found in GSM 03.8x and 03.9x-series technical specifications.

All supplementary services may require signalling on the radio path. Signalling procedures and messages used are defined in the GSM 04.8x and 04.9x-series of technical specifications.

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 GSM 09.02.

Definitions and descriptions of supplementary services are given in the GSM 02.8x and 02.9x-series of technical specifications.

Definitions are given in GSM 02.04.

> NOTE: The technical specifications 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.

## 1.1     References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

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

- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1]          GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

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

[3]          GSM 02.30: "Digital cellular telecommunications system (Phase 2+); Man-Machine Interface (MMI) of the Mobile Station (MS)".

[4]          GSM 03.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 2".

[5]          GSM 03.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 2".

[6]          GSM 03.83: "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 2".

[7]          GSM 03.84: "Digital cellular telecommunications system (Phase 2+); MultiParty (MPTY) supplementary services - Stage 2".

[8]         GSM 03.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 2".

[9]         GSM 03.86: "Digital cellular telecommunications system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 2".

[10]        GSM 03.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 2".

[11]        GSM 03.90: "Digital cellular telecommunications system (Phase 2+); Unstructured supplementary services operation - Stage 2".

[12]        GSM 04.80: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 supplementary services specification  Formats and coding".

[13]        GSM 04.81: "Digital cellular telecommunications system (Phase 2+); Line identification supplementary services - Stage 3".

[14]        GSM 04.82: "Digital cellular telecommunications system (Phase 2+); Call Forwarding (CF) supplementary services - Stage 3".

[15]        GSM 04.83: "Digital cellular telecommunications system (Phase 2+); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 3".

[16]        GSM 04.84: "Digital cellular telecommunications system (Phase 2+); MultiParty (MPTY) supplementary services - Stage 3".

[17]        GSM 04.85: "Digital cellular telecommunications system (Phase 2+); Closed User Group (CUG) supplementary services - Stage 3".

[18]        GSM 04.86: "Digital cellular telecommunications system (Phase 2+); Advice of Charge (AoC) supplementary services - Stage 3".

[19]        GSM 04.88: "Digital cellular telecommunications system (Phase 2+); Call Barring (CB) supplementary services - Stage 3".

[20]        GSM 04.90: "Digital cellular telecommunications system (Phase 2+); Unstructured supplementary services operation - Stage 3".

[21]        GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

## 1.2    Abbreviations

Abbreviations used in the present document are listed in GSM 01.04.

# 2    Activation, deactivation, registration, erasure, interrogation and invocation

## 2.1    General

Activation, deactivation, registration, erasure, interrogation and invocation are defined independently from a particular supplementary service. Whether they are applicable to a particular supplementary service or not is defined in the corresponding GSM 03.8x and 03.9x-series.

The invocation of a supplementary service is executed as described in the corresponding stage 2 description and always includes a MSC and a location register.

When a MSC receives a request for either activation/deactivation or registration/erasure or an interrogation, it invokes one of the following procedures.

The MSC then can:

- contact only the current VLR (e.g. interrogation of a call forwarding conditional supplementary service);

- contact only the HLR (e.g. interrogation of the supplementary service call forwarding unconditional);

- contact the HLR, after which the HLR updates the VLR (e.g. registration of a forwarding number for a conditional call forwarding supplementary service).

Which of the above listed procedures is applied for a call independent supplementary service operation is described in the corresponding GSM 03.8x and 03.9x-series.

Successful activation, deactivation, registration and erasure change the service state at the HLR. These transitions (if applicable to a particular service) are defined in the GSM 03.8x and 03.9x-series. Note that the HLR may also change the service state due to "HLR Induction" (see subclause 2.1.1).

In connection with supplementary service operations the served subscriber or remote subscribers may get notifications from the network.

## 2.1.1  Definition of "state vectors"

In order to provide a tool to define service states the concept of a "state vector" is introduced. The state vector is used to represent the state of the service in terms of four variables:

1) Provisioning State,

   possible values are "Provisioned" or "Not Provisioned";

2) Registration State,

   possible values are "Registered", "Erased", or "Not Applicable";

3) Activation State,

   possible values are "Not Active", "Active and Operative" or "Active and Quiescent";

4) HLR Induction State,

   possible values are "Induced" or "Not Induced".

The state vector represents the state of the service by using all four variables together. The state vector is represented using the notation:

*(Provisioning State, Registration State, Activation State, HLR Induction State)*

e.g.: (Provisioned, Registered, Not Active, Not Induced).

Note that the state vector is a logical (not a physical) representation of the service state. Note also that though some parts of the state vector are similar to elements of SS-Status the mapping between the state vector and SS-Status is not one to one. The use of state vectors is not intended to specify any particular implementation internally in a node. There is a relationship specified between the state vector and parts of the transfer syntax. This relationship is not a direct one-to-one mapping.

The following text specifies the semantics of each variable in the state vector.

The three variables "Provisioning State", "Registration State" and "Activation State" are used to represent the state of the service according to the normal behaviour based on service provider and user actions.

The "HLR Induction State" records whether or not the HLR has temporarily induced the service (e.g. if the VLR does not support CUG, the HLR may induce an outgoing barring service). The Provisioning State, Registration State and Activation State are not affected by HLR induction of a service.

**Provisioning State**

- has value "provisioned", if the subscriber has a subscription to the service;

- has value "Not Provisioned" otherwise.

**Registration State**

- has value "Not Applicable", if registration is not applicable to the service;

- has value "Registered", if registration is applicable, and there is registration data available;

- has value "Erased" otherwise.

**Activation State**

- has value "Active and Operative", if the service is in a state where it can be invoked (and this is not due to HLR induction);

- has value "Active and Quiescent", if the service is in a state where it cannot be invoked, but where it will automatically move to the "Active and Operative" state when conflicting conditions are removed;

- has value "Not Active" otherwise.

**HLR Induction State**

- has the value "Induced" if the HLR has induced the service (e.g. if the VLR does not support CUG, the HLR may induce an outgoing barring service);

- has the value "Not Induced" otherwise.

    For further information about how HLR induction applies to particular services refer to the GSM 03.8x and 03.9x-series.

## 2.1.2 Handling of service states at the HLR

Valid states (represented by state vectors) are defined on a service-by-service basis in the GSM 03.8x and 03.9x-series. For each service the set of valid states represents the logical states that can exist in the HLR. The HLR contains the master copy of service state information.

### 2.1.2.1 Encoding of SS-Status

To send service state information to the VLR or the MS, the HLR often uses the SS-Status parameter. This parameter contains four bits (referred to here as the "P bit", "R bit", "A bit" and "Q bit"). In a phase 2 context the HLR shall encode the SS-Status using the mapping defined in this subclause from the service states to SS-Status.

    If the HLR Induction State is "Not Induced" then:

- If the Provisioning State is "Provisioned", then the P bit shall be 1, otherwise the P bit shall be 0.

- If the Registration State is "Registered", the R bit shall be 1. If the Registration State is "Not Registered" the R bit shall be 0. If the Registration State is "Not Applicable" the R bit shall be either 0 or 1.

- If the Activation State is "Active and Operative" the A bit shall be 1 and the Q bit shall be 0. If the Activation State is "Active and Quiescent" the A bit shall be 1 and the Q bit shall be 1. If the Activation State is "Not Active" the A bit shall be 0 and the Q bit shall be either 0 or 1.

If the HLR Induction State is "Induced" then the P bit shall be 1, the R bit shall be 0 or 1, the A bit shall be 1 and the Q bit shall be 0.

**Table 2.1: Encoding of the P, R, A and Q bits in the SS-Status parameter**

| HLR Induction State    "Not Induced" | P bit | R bit | A bit | Q bit |
|---|---|---|---|---|
| Provisioning State    "Provisioned"<br>        "Not Provisioned" | 1<br>0 | | | |
| Registration State    "Registered"<br>        "Not Registered"<br>        "Not Applicable" | | 1<br>0<br>0/1 | | |
| Activation State   "Active and Operative"<br>        "Active and Quiescent"<br>        "Not Active" | | | 1<br>1<br>0 | 0<br>1<br>0/1 |
| | **P bit** | **R bit** | **A bit** | **Q bit** |
| **HLR Induction State    "Induced"** | 1 | 0/1 | 1 | 0 |

## 2.1.2.2    Invocation of services at the HLR

If the service can be invoked at the HLR (e.g. to bar an incoming call) then invocation is possible only if the Activation State is "Active and Operative". Note that the concept of HLR induction does not apply to services invoked at the HLR as the HLR can invoke the effect of these services without needing to induce them first.

## 2.1.3    Handling of SS-Status at the VLR

The VLR shall store sufficient information to support VLR based invocation, interrogation and notifications from the VLR to the MS.

The VLR shall not check the internal consistency of SS-Status values received from the HLR (i.e. it shall not impose any rules relating values of some bits in SS-Status to other bits). The VLR shall not check that the SS-Status received from the HLR is valid according to the VLR's definition of the relevant service.

## 2.1.3.1    Invocation of services at the VLR

The ability to invoke the service at the VLR (e.g. to forward a call, or create an MPTY call) is based on the A and Q bits of SS-Status. The service can only be invoked if A=1 and Q=0. Other bits in SS-Status are not relevant to invocation at the VLR.

## 2.1.3.2    Interrogation of the service at the VLR and notifications from VLR

If the VLR sends a notification or an interrogation result that includes an SS-Status parameter the VLR shall set the P, R, A and Q bits to the same values received from the HLR. Unless stated otherwise in individual service specifications, it the service is not provisioned and the VLR has not received a value for SS-Status from the HLR then if the VLR has to send SS-Status for that service it shall set the P, R, A, and Q bits to 0.

## 2.1.4    Handling of SS-Status at the MS

The MS has to interpret SS-Status values received from the network. The following information is provided as guidance as to how to treat the SS-Status information:

-    The P, A and Q bits are relevant for all phase 2 supplementary services for which the MS may receive SS-Status information from the network.

-    The value of the R bit is only relevant if registration is applicable to the supplementary service the SS-Status relates to.

-    The A and Q bits shall be treated as a pair with the following meanings assumed:

    If A=1 and Q=0, then the service is "Active and Operative";