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Foreword

This European Telecommunication Standard (ETS) has been produced by the Special Mobile Group (SMG) Technical Committee (TC) of the European Telecommunications Standards Institute (ETSI).

This ETS defines service access procedures presented to the user within the European digital cellular telecommunications system (Phase 2) and corresponds to GSM Technical Specification (GSM-TS) 02.11 version 4.6.1.

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

Reference is made within this ETS to GSM-TSs (NOTE).

Reference is also made within this ETS to GSM 03.xx. series. The specifications in the series can be identified, with their full title, within the normative reference Clause of this ETS by the first two digits of their GSM reference number e.g. GSM 03.xx series, refers to GSM 03.01, GSM 03.02 etc.

NOTE: TC-SMG has produced documents which give the technical specifications for the implementation of the European digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TSs). These TSs may have subsequently become I-ETSs (Phase 1), or ETSs (Phase 2), whilst others may become ETSI Technical Reports (ETRs). GSM-TSs are, for editorial reasons, still referred to in GSM ETSs.

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0 Introduction

0.1 Scope

The technical realization of service accessibility in terms of registration, handover, roaming and system selection is defined in the 03 series of GSM Specifications.

The purpose of this Specification is to describe the service access procedures as presented to the user.

Definitions and procedures are provided in this specification for international roaming, national roaming and regionally provided service. These are mandatory in relation to the technical realisation of the Mobile Station.

0.2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

[1] GSM 01.04 (ETR 100): "European digital cellular telecommunication system (Phase 2); Definitions, abbreviations and acronyms".

[2] GSM 02.07 (ETS 300 505): "European digital cellular telecommunication system (Phase 2); Mobile Station (MS) features".

[3] GSM 03.01 (ETS 300 521): "European digital cellular telecommunication system (Phase 2); Network functions".

[4] GSM 03.02 (ETS 300 522): "European digital cellular telecommunication system (Phase 2); Network architecture".

[5] GSM 03.03 (ETS 300 523): "European digital cellular telecommunication system (Phase 2); Numbering, addressing and identification".

[6] GSM 03.04 (ETS 300 524): "European digital cellular telecommunication system (Phase 2); Signalling requirements relating to routeing of calls to mobile subscribers".

[7] GSM 03.07 (ETS 300 525): "European digital cellular telecommunication system (Phase 2); Restoration procedures".

[8] GSM 03.08 (ETS 300 526): "European digital cellular telecommunication system (Phase 2); Organisation of subscriber data".

[9] GSM 03.09 (ETS 300 527): "European digital cellular telecommunication system (Phase 2); Handover procedures".

[10] GSM 03.10 (ETS 300 528): "European digital cellular telecommunication system (Phase 2); GSM Public Land Mobile Network (PLMN) connection types".

[11] GSM 03.11 (ETS 300 529): "European digital cellular telecommunication system (Phase 2); Technical realization of supplementary services".

[12] GSM 03.12 (ETS 300 530): "European digital cellular telecommunication system (Phase 2); Location registration procedures".

[13] GSM 03.13 (ETS 300 531): "European digital cellular telecommunication system (Phase 2); Discontinuous Reception (DRX) in the GSM system".

[14] GSM 03.14 (ETS 300 532): "European digital cellular telecommunication system (Phase 2); Support of Dual Tone Multi-Frequency signalling (DTMF) via the GSM system".

[15] GSM 03.15 (ETS 300 533): "European digital cellular telecommunication system (Phase 2); Technical realization of operator determined barring".

[16] GSM 03.20 (ETS 300 534): "European digital cellular telecommunication system (Phase 2); Security related network functions".

[17] GSM 03.22 (ETS 300 535): "European digital cellular telecommunication system (Phase 2); Functions related to Mobile Station (MS) in idle mode".

[18] GSM 03.38 (ETS 300 628): "European digital cellular telecommunication system (Phase 2); Alphabets and language-specific information".

[19] GSM 03.40 (ETS 300 536): "European digital cellular telecommunication system (Phase 2); Technical realization of the Short Message Service (SMS) Point to Point (PP)".

[20] GSM 03.41 (ETS 300 537): "European digital cellular telecommunication system (Phase 2); Technical realization of Short Message Service Cell Broadcast (SMSCB)".

[21] GSM 03.45 (ETS 300 538): "European digital cellular telecommunication system (Phase 2); Technical realization of facsimile group 3 transparent".

[22] GSM 03.46 (ETS 300 539): "European digital cellular telecommunication system (Phase 2); Technical realization of facsimile group 3 non-transparent".

[23] GSM 03.50 (ETS 300 540): "European digital cellular telecommunication system (Phase 2); Transmission planning aspects of the speech service in the GSM Public Land Mobile Network (PLMN) system".

[24] GSM 03.70 (ETS 300 541): "European digital cellular telecommunication system (Phase 2); Routeing of calls to/from Public Data Networks (PDN)".

[25] GSM 03.81 (ETS 300 542): "European digital cellular telecommunication system (Phase 2); Line identification supplementary services - Stage 2".

[26] GSM 03.82 (ETS 300 543): "European digital cellular telecommunication system (Phase 2); Call Forwarding (CF) supplementary services - Stage 2".

[27] GSM 03.83 (ETS 300 544): "European digital cellular telecommunication system (Phase 2); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 2".

[28] GSM 03.84 (ETS 300 545): "European digital cellular telecommunication system (Phase 2); MultiParty (MPTY) supplementary services - Stage 2".

[29] GSM 03.85 (ETS 300 546): "European digital cellular telecommunication system (Phase 2); Closed User Group (CUG) supplementary services - Stage 2".

[30] GSM 03.86 (ETS 300 547): "European digital cellular telecommunication system (Phase 2); Advice of Charge (AoC) supplementary services - Stage 2".

[31] GSM 03.88 (ETS 300 548): "European digital cellular telecommunication system (Phase 2); Call Barring (CB) supplementary services - Stage 2".

[32] GSM 03.90 (ETS 300 549): "European digital cellular telecommunication system (Phase 2); Unstructured supplementary services operation - Stage 2".

[33] GSM 04.08 (ETS 300 557): "European digital cellular telecommunication system (Phase 2); Mobile radio interface layer 3 specification".

[34] GSM 11.11 (ETS 300 608): "European digital cellular telecommunication system (Phase 2); Specification of the Subscriber Identity Module-Mobile Equipment (SIM-ME) interface".

[35] CCITT Recommendation Q.1001: "General aspects of public land mobile networks".

0.3 Definitions and abbreviations

In addition to those below, abbreviations used in this specification are listed in GSM 01.04.

GSM PLMN

A Public Land Mobile Network (PLMN) is a network established and operated by an Administration or RPOA for the specific purpose of providing land mobile communication services to the public. It provides communication possibilities for mobile users. For communications between mobile and fixed users, interworking with a fixed network is necessary.

A GSM PLMN is a PLMN which is in accordance with the GSM Specifications.

As a rule, a GSM PLMN is limited by the borders of a country. Depending on national regulations there may be more than one GSM PLMN per country.

A relationship exists between each subscriber and his home GSM PLMN (HPLMN). If communications are handled over another GSM PLMN, this PLMN is referred to as the visited GSM PLMN (VPLMN).

GSM PLMN Area (GPA)

The GSM PLMN Area (GPA) is the geographical area in which a GSM PLMN provides communication services according to the GSM specifications to mobile users. In the GPA, the mobile user can set up calls to a user of a terminating network. The terminating network may be a fixed network, the same GSM PLMN, another GSM PLMN or other types of PLMN.

Terminating network users can also set up calls to the GSM PLMN.

The GPA is allocated to a GSM PLMN. It is determined by the service and network provider in accordance with any provisions laid down under national law. In general the GPA is restricted to one country. It can also be determined differently, depending on the different telecommunication services, or type of Mobile Station.

If there are several GSM PLMNs in one country, their GPAs may overlap. In border areas, the GPAs of GSM PLMNs of different countries may overlap. Administrations will have to take precautions to ensure that cross border coverage is minimised in adjacent countries unless otherwise agreed.

NOTE: CCITT Recommendation Q.1001 does not contain a definition of the PLMN area.

GSM System Area (GSA)

The GSM System Area is defined as the group of GSM PLMN areas accessible by GSM mobile stations.

Interworking of several GSM PLMNs and interworking between GSM PLMNs and fixed network(s) permit GSM public land mobile communication services at international level.

NOTE: The System Area according to CCITT Recommendation Q.1001 corresponds to the GSM System Area.

GSM Service Area

The GSM Service Area is defined in the same way as the Service Area according to CCITT Recommendation Q.1001. In contrast to the GPA it is not based on the coverage of a PLMN. Instead it is based on the area in which a fixed network user can call a mobile user without knowing his location. The Service Area can therefore change when the signalling system is being extended, for example.

Regionally Provided Service

Regionally Provided Service is defined as a service entitlement to only geographical part(s) of a PLMN, controlled by the network operator.

1 Not used

2 Roaming

2.1 General requirements

A MS with a valid IMSI may roam and access service in the area authorized by the entitlement of the subscription.

If a communication has been established, the MS will in principle not suffer an interruption within the GSM PLMN area (provided the entitlement of the subscription allows it). Exceptions are possible if no network resources or radio coverage are available locally.

However, if the MS leaves the GSM PLMN area, an established communication may terminate. If the user then wants to continue, another network providing service has to be selected and a new communication has to be established (see section 3).

2.2 International roaming

International roaming is a service whereby an MS of a given PLMN is able to obtain service from a PLMN of another country.

The availability of International Roaming is subject to inter-PLMN agreements.

2.3 National roaming

National Roaming is a service whereby an MS of a given PLMN is able to obtain service from another PLMN of the same country, anywhere, or on a regional basis.

The availability of National Roaming depends on the home PLMN of the requesting MS and the visited PLMN; it does not depend on subscription arrangements.

3 Provisions for providing continuity of service

3.1 Location registration

GSM PLMNs shall provide a location registration function with the main purpose of providing continuity of service to mobile stations over the whole GSM system area. The location registration function shall be such as to allow:

- Fixed subscribers to call a MS by only using the directory number of the MS irrespective of where the MS is located in the GSM system area at the time of the call.

- Mobile stations to access the system irrespective of the location of the MS.

- Mobile stations to identify when a change in location area has taken place in order to initiate automatic location updating procedures.

The system architecture enabling implementation of the above requirements is defined in Specification GSM 03.02. The technical realisation of location registration is defined in Specification GSM 03.12.

Specification GSM 03.12 also gives the conditions when a location updating has to take place.

3.2 Network selection

3.2.1 General

The MS shall support both manual and automatic network selection mechanisms. The MS manufacturer may decide which should be the default mode at initial switch-on and whether subsequently the last mode used should become the default. However, the user shall be given the opportunity to change mode at any time.

Except as defined below, the MMI shall be at the discretion of the MS manufacturer.

The MS shall contain display functions in accordance with GSM 02.07, by which Available PLMNs and the Selected PLMN can be indicated.

3.2.2 Procedures

3.2.2.1 General

In the following procedures the MS selects and attempts registration on PLMNs.

In this specification, the term 'PLMN Selection' defines an MS based procedure, whereby candidate PLMNs are chosen, one at a time, for attempted registration.

If registration on a PLMN is successful, the MS shall indicate this PLMN (the 'registered PLMN') and be capable of making and receiving calls on it. The identity of the registered PLMN shall be stored on the SIM. However, if registration is unsuccessful, the MS shall ensure that there is no registered PLMN stored in the SIM.

If a registration is unsuccessful because the IMSI is unknown in the home network, or the MS is illegal, then the MS shall not allow any further registration attempts on any network, until the MS is next powered-up or a SIM is inserted.

Registration attempts shall not be made by MSs without a SIM inserted.

An MS/ME which has not successfully registered shall nevertheless be able to make emergency call attempts on an available PLMN, without the need for the user to select a PLMN. An available PLMN is determined by radio characteristics (03.22/05.08 refers).

3.2.2.2 At switch-on or recovery from lack of coverage

If the MS is registered on a PLMN (as indicated by the registered PLMN stored in the SIM), the MS shall perform a location update to a new location area if necessary.

If there is no registered PLMN stored in the SIM, or if this PLMN is unavailable, or the attempted registration fails, the MS shall follow one of the following two procedures depending on its operating mode.

A) Automatic network selection mode

The MS shall select and attempt registration on other PLMNs, if available and allowable, in the following order:

i) HPLMN;
ii) each PLMN in the "PLMN Selector" data field in the SIM (in priority order);
iii) all other PLMNs in random order.

An allowable PLMN is one which is not in the "Forbidden PLMN" data field in the SIM (see 3.2.2.4).

If successful registration is achieved, the MS shall indicate the selected PLMN.

If registration cannot be achieved on any PLMN, the MS shall indicate "no service" to the user, wait until a new PLMN is detected, or new location areas of an allowed PLMN are found which are not in the forbidden LA list(s), and then repeat the procedure. When registration cannot be achieved, different (discontinuous) PLMN search schemes may be used in order to minimise the access time while maintaining battery life, e.g. by prioritising the search in favour of BCCH carriers which have a high probability of belonging to an available and allowable PLMN.

B) Manual network selection mode

The MS shall indicate whether there are any PLMNs, including "Forbidden PLMNs", which are available. If there are none, this shall also be indicated.

Any available PLMN's shall be presented in the following order:

i) HPLMN;
ii) PLMNs contained in the "PLMN Selector" data field in the SIM (in priority order);
iii) Other PLMNs, in random order.

The user may select his desired PLMN and the MS shall attempt registration on this PLMN. (This may take place at any time during the presentation of PLMNs).

If the registration cannot be achieved on the selected PLMN, the MS shall indicate 'No Service'. The user may then select and attempt to register on another or the same PLMN following the above procedure.

If a PLMN is selected but the MS cannot register on it because registration is rejected with the cause "PLMN not allowed", the MS shall not re-attempt to register on that network unless the same PLMN is selected again by the user.

If a PLMN is selected but the MS cannot register on it for other reasons, the MS shall, upon detection of a new LA (not in a forbidden LA list) of the selected PLMN, attempt to register on the PLMN.

If the MS is registered on a PLMN but loses coverage, different (discontinuous) carrier search schemes may be used to minimise the time to find a new valid BCCH carrier and maintain battery life, eg by prioritising the search in favour of BCCH carriers of the registered PLMN.

3.2.2.3 User reselection

At any time, the user may request the MS to initiate reselection and registration onto an alternative available PLMN, according to the following procedures, dependent upon the operating mode.

A) Automatic Network Selection Mode

The MS shall select the HPLMN. If the HPLMN is not available, the MS attempts selection of the PLMNs in the "PLMN Selector" list (in priority order). If none of these is available and allowable, the MS selects any other available and allowable PLMNs at random. The PLMN which the MS had selected prior to the start of this reselection procedure shall not be reselected, unless no other PLMNs are available and allowable, in which case it shall be reselected at the end of the procedure.

B) Manual Network Selection Mode

The procedure of 3.2.2.2 B) above is followed.

3.2.2.4 "Forbidden PLMN" list

If a registration on a VPLMN is rejected with the cause "PLMN not allowed", the PLMN shall be written to a list of "Forbidden PLMNs" stored in a data field in the SIM.

The structure of this data field is given in GSM 11.11.

If a successful registration (whilst in manual mode) is achieved on a PLMN in the "Forbidden PLMN" list, the PLMN shall be deleted from the list.

When in automatic mode, the MS may indicate any PLMNs which will not be selected due to their presence in the "Forbidden PLMN" list.

3.2.2.5 National roaming

3.2.2.5.1 Location Update Reject

If a location update request is rejected with the cause "National Roaming not allowed", the MS shall initiate the network selection procedure as in 3.2.2.2 A) or B).

3.2.2.5.2 Timer for return to HPLMN

If the MS in Automatic Mode has selected and registered on a VPLMN of its home country, it shall make periodic attempts to return to its HPLMN.

The interval between attempts shall be stored in the SIM. Only the service provider shall be able to set the timer value. The timer shall have a value between 6 minutes and 8 hours, with a step size of 6 minutes. One value shall be designated to indicate that no periodic attempts shall be made.

In the absence of a permitted value in the SIM, or the SIM is phase 1 and therefore does not contain the datafield, then a default value of 30 minutes, shall be used by the MS.

NOTE: Use of values less than 30 minutes may result in excessive ME battery drain.

3.2.2.6 Regionally provided service

If a location update is rejected with the cause "Location Area not allowed", the MS shall perform the following procedures dependent upon the operating mode.

A) Automatic Network Selection Mode

The MS shall select and attempt to register on the next PLMN as in 3.2.2.2 A).

B) Manual Network Selection Mode

The MS shall present available PLMNs as in 3.2.2.2 B).

4 Access control

4.1 Purpose

Under certain circumstances, it will be desirable to prevent MS users from making access attempts (including emergency call attempts) or responding to pages in specified areas of a GSM PLMN. Such situations may arise during states of emergency, or where 1 of 2 or more co-located PLMNs has failed.

Broadcast messages should be available on a cell by cell basis indicating the class(es) of subscribers barred from network access.

The use of this facility allows the network operator to prevent overload of the access channel under critical conditions.

It is not intended that access control be used under normal operating conditions.

4.2 Allocation

All MSs are members of one out of ten randomly allocated mobile populations, defined as Access Classes 0 to 9. The population number is stored in the SIM. In addition, mobiles may be members of one or more out of 5 special categories (Access Classes 11 to 15), also held in the SIM. These are allocated to specific high priority users as follows. (The enumeration is not meant as a priority sequence):

Class	15	-	PLMN Staff
-"-	14	-	Emergency Services
-"-	13	-	Public Utilities (e.g. water/gas suppliers)
-"-	12	-	Security Services
-"-	11	-	For PLMN Use

4.3 Operation

If the MS is a member of at least one Access Class which corresponds to the permitted classes as signalled over the air interface, and the Access Class is applicable in the serving network, access attempts are allowed. Otherwise access attempts are not allowed.

Access Classes are applicable as follows:

Classes 0 - 9	-	Home and Visited PLMNs
Classes 11 and 15	-	Home PLMN only
Classes 12, 13, 14	-	Home PLMN Country only

Any number of these classes may be barred at any one time.

4.4 Emergency Calls

An additional control bit known as "Access Class 10" is also signalled over the air interface to the MS. This indicates whether or not network access for Emergency Calls is allowed for MSs with access classes 0 to 9 or without an IMSI. For MSs with access classes 11 to 15, Emergency Calls are not allowed if both "Access class 10" and the relevant Access Class (11 to 15) are barred (GSM 04.08 refers). Otherwise, Emergency Calls are allowed.

History

Document history	
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