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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 digital cellular telecommunications system. This ETS corresponds to GSM 02.11 Phase 2 version 4.9.0.

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.

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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 European Telecommunication Standard (ETS) is to describe the service access procedures as presented to the user.

Definitions and procedures are provided in this ETS for international roaming, national roaming and regionally provided service. These are mandatory in relation to the technical realization of the Mobile Station (MS).

1.1 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 350): "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2] GSM 02.07 (ETS 300 906): "Digital cellular telecommunications system (Phase 2+); Mobile Stations (MS) features".

[3] GSM 03.02: "Digital cellular telecommunications system (Phase 2+); Network architecture".

[4] GSM 03.12: "Digital cellular telecommunications system; Location registration procedures".

[5] GSM 03.22 (ETS 300 930): "Digital cellular telecommunications system; Functions related to Mobile Station (MS) in idle mode and group receive mode".

[6] GSM 04.08 (ETS 300 940): "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification".

[7] GSM 05.08 (ETS 300 911): "Digital cellular telecommunications system (Phase 2+); Radio subsystem link control".

[8] GSM 11.11 (ETS 300 977): "Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module-Mobile Equipment (SIM - ME) interface".

[9] CCITT Recommendation Q.1001: "General aspects of Public Land Mobile Networks".

1.2 Definitions and abbreviations

In addition to those below, abbreviations used in this ETS are listed in GSM 01.04 [1].

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. A GSM PLMN may provide service in one, or combinations, of the frequency bands in 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 MS.

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 minimized in adjacent countries unless otherwise agreed.

NOTE 1: CCITT Recommendation Q.1001 [9] 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 MSs.

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 2: The System Area according to [9] 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 [9]. 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 certain geographical part(s) of a PLMN, as controlled by the network operator.

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 clause 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 MSs 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.

- MSs to access the system irrespective of the location of the MS.

- MSs 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 GSM 03.02 [3]. The technical realization of location registration is defined in GSM 03.12 [4].

GSM 03.12 [4] 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 (modes). The MS shall select the last mode used, as the default mode, at every switch-on.

NOTE: By defaulting to the last mode used, e.g. manual network selection, the undesired automatic selection of an adjacent PLMN instead of the desired HPLMN in border areas, can be avoided at switch-on.

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 [2], 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 ETS, 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.

If the registration is unsuccessful due to the lack to service entitlement, specific behaviour by the MS may be required, see subclause 3.2.2.4.

To avoid unnecessary registration attempts, lists of forbidden PLMNs and LAs are maintained in the MS, see subclause 3.2.2.4 and GSM 03.22 [5].

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 (GSM 03.22 [5] and GSM 05.08 [7] refers).

3.2.2.2 At switch-on or recovery from lack of coverage

If the MS is within coverage (at switch-on) or returns to coverage of the PLMN on which it is already registered (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 network selection mode, automatic or manual:

A) Automatic network selection mode

The MS shall select and attempt registration on other PLMNs, if available and allowable and the location area is not in the list of "forbidden LSs for roaming" (see GSM 03.22 [5]), in the following order:

i) HPLMN;
ii) each PLMN in the "PLMN Selector" data field in the SIM (in priority order);
iii) other PLMNs with sufficient received signal level (see GSM 03.22 [5]) in random order;
iv) all other PLMNs in order of decreasing signal strength.

An allowable PLMN is one which is not in the "Forbidden PLMN" data field in the SIM (see subclause 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 minimize the access time while maintaining battery life, e.g. by prioritizing 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 with sufficient received signal level (see GSM 03.22 [5]) in random order;
iv) all other PLMNs in order of decreasing signal strength.

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. The MS shall not attempt to register on a PLMN which has not been selected by the user.

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 minimize the time to find a new valid BCCH carrier and maintain battery life, e.g. by prioritizing 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 shall select the PLMNs in the "PLMN Selector" list in order of priority and, if necessary, other available and allowable PLMNs according to the procedure defined in GSM 03.22 [5].

B) Manual Network Selection Mode

The procedure of 3.2.2.2 B) is followed.

3.2.2.4 Mobile Station reactions to indications of service restriction from the network

Different types of MS behaviour is required to support, for example, national roaming, regionally provided service and temporary international roaming restrictions. The behaviour to be followed by the MS is indicated by the network.

3.2.2.4.1 "Permanent" PLMN restriction

When a registration attempt by the MS is rejected by a network with an indication of "permanent" PLMN restriction, the PLMN identity 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 [8].

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.

3.2.2.4.2 "Partial" and "temporary" PLMN restrictions

When a registration attempt by the MS is rejected by a network due to a "partial" or a "temporary" PLMN restriction, the MS shall perform one of the following procedures determined by the indication in the location update reject cause sent by the network (see GSM 03.22 [5]):

i) The MS shall store the location area identity in the list of "forbidden LAs for regional provision of service" and shall enter the limited service state and remain in that state until it moves to a cell in a location area where service is allowed.

ii) The MS shall store the location area identity in the list of "forbidden LAs for roaming" and shall use one of the following procedures according to the PLMN selection Mode:

A) Automatic network selection mode:

The procedure of 3.2.2.2. A).

B) Manual network selection mode:

The procedure of 3.2.2.2.B).

3.2.2.5 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.

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 and visited PLMNs of home 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 [6] refers). Otherwise, Emergency Calls are allowed.

History

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