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UPDATE NOTE

Recommendation GSM 02.11

Service Accessibility

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New updated version November 1992: 3.7.0

1. Reason for Change

Changes agreed at SMG No 4bis (Paris) are included.

2. Details of changes

CR	Title	Sections modified	Ref SMG Doc
02.11-24r1	Automatic PLMN selection	3.2.2.1	570/92 r1

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0. SCOPE

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

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

The procedures described in this recommendation are mandatory for international roaming but not necessarily applicable to national roaming.

1. DEFINITIONS

1.1. 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 Recommendations.

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 subscriber relationship exists in the home GSM PLMN. If communications are handled over another GSM PLMN, this PLMN is referred to as the visited GSM PLMN.

1.2. 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 recommendations 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 and 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. It can be determined differently for hand-held stations than for other types of mobile stations.

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 coverage is minimised in adjacent countries unless otherwise agreed.

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

1.3. 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.

1.4. 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.

2. ROAMING

A MS with a valid IMSI may roam and access service in the area authorized by the entitlement of the subscription (see Rec. GSM 02.13) .

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).

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 Recommendation GSM 03.02. The technical realisation of location registration is defined in Recommendation GSM 03.12.

Recommendation 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 contain display functions by which the following can be indicated:

- Available PLMNs, possibly including "PLMN not allowed" indication (derived from the 'forbidden PLMN' list in the SIM). I.e. a "list" indicating which PLMNs are available.
- Selected PLMN, i.e. the PLMN the user has selected manually or the MS has selected automatically.

The presentation shall be in accordance with requirements in GSM 02.07.

The MS shall also support procedures which enable the user to request the MS to make a search for and display any available GSM PLMNs covering the area in which the MS is located.

The MS shall also support a GSM PLMN selection function. There shall be both an automatic and a manual mode. The automatic function is achieved by means of the MS reading a pre-programmed list of preferred PLMNs in the SIM. Pre-programming may be carried out by both the subscriber and the PLMN operator. Programming from the MS-keypad shall be provided however the method to do it is left to the discretion of manufacturers.

3.2.2. Initial Access

Upon switching on, with a valid IMSI available or after switch on when it becomes available, the MS shall select the home PLMN (HPLMN) and enter the cell selection procedure defined in GSM 05.08. When a suitable cell (as defined in GSM 05.08) has been found, then a location update may be required. The identity of the HPLMN is derived from the IMSI used by the MS (see Rec GSM 03.03).

If however the HPLMN is not available the following apply:

3.2.2.1. Selection and access to VPLMNs

The MS automatically identifies (based on the PLMN list derived during cell selection) other GSM PLMNs providing service, and the various options will be displayed to the user.

If in automatic mode, the MS shall attempt to select a suitable cell and access the PLMNs in turn, in the order of priority as stored in the SIM. This is repeated until successful registration or to the end of the list, whichever occurs first. Before attempting to select a suitable cell on the selected PLMN the MS will ensure that the subscriber has access right to this (except for emergency calls). This is achieved by means of the MS reading the forbidden PLMN data field in the SIM. (Note that this procedure allows PLMNs not on the preferred PLMN list to be selected for registration).

This datafield indicates PLMNs which the MS shall not automatically attempt to access. A PLMN is written to the datafield if a network (other than the HPLMN) rejects a location update with the cause "PLMN not allowed". If four PLMNs are stored in the datafield and the MS requests another to be stored, the oldest shall be overwritten.

If in manual mode, the user can select one of the PLMNs. The MS shall then attempt to select a suitable cell and access the selected PLMN, even if it is a 'forbidden PLMN'. If the resulting location update attempt is successful, the MS shall delete this VPLMN from the data field, i.e. replace it with a NULL value.

In case of unsuccessful Initial Access procedure (automatic or manual) the MS shall camp on a cell in accordance with the "Abnormal Cases and Emergency calls" procedure in GSM 05.08.

3.2.3. Location Area Not Allowed

If a location update is rejected with the cause "Location Area not allowed" the MS shall stay camped on a cell in accordance with GSM 05.08.

3.2.4. New registration after loss of radio coverage

If the MS loses radio coverage, i.e. is unable to find a suitable cell (according to GSM 05.08) of the network registered on and is in automatic mode, then the Initial Access process as described in 3.2.2 is 're-started'. However, in manual mode, the Access process as described in 3.2.2.1 is 're-started'. If the user takes no action, the MS continues to look for the previous registered PLMN. If this is not available the MS shall camp on a cell in accordance with the "Abnormal Cases and Emergency calls" procedure in GSM 05.08.

3.2.5. Search Procedure at the User's Request

At any time (in both automatic and manual mode) the user may request the Initial Access process outlined in 3.2.2. The MS remains on the previously registered PLMN (i.e. the selected/used PLMN when this procedure was initiated) if no new PLMN is selected or is available.

3.3. Handover

As a mobile moves around the coverage area of a GSM PLMN the communication path is automatically switched from one Base Station Transmitter/Receiver to another in order to maintain continuity of service. This process is called handover and is required for the following conditions :

- handover between channels on the same BTS
- handover between BTS's of the same MSC
- handover between BTS's of different MSC's of the same PLMN.

Handover between PLMN's is not required.

4. ACCESS CONTROL

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 area of a GSM PLMN. Such situations may arise during states of emergency, or where 1 of 2 co-located PLMNs has failed.

Overhead messages should be available on a cell by cell basis indicating the class of subscribers barred from accessing the system or responding to a page.

All mobiles are members of one out of 10 randomly allocated mobile populations referred by Access Class 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 Class 11 to 15), also held in the SIM. These are allocated to specific high priority users as follows (the following 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

As regards Emergency calls (i.e "Class" 10), see note 2.

Any number of these classes may be barred at any one time. If the MS is a member of at least 1 Access Class which corresponds

with the permitted classes as signalled over the air interface, and the Access Class is applicable in the serving network (see note 3), access attempts are allowed.

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

Note 1: it is not intended that access control be used under normal operating conditions.

Note 2: This means that MSs in class 0-9, or without a valid IMSI, are not allowed to make emergency call attempts if "emergency call class" is barred.

Note 3: The Access Classes 0-9 applies to MSs on Home and Visited PLMNs. For the classes 11-15 the following shall apply:

Classes 11 and 15 - Home PLMN only
Classes 12, 13, 14 - Home PLMN Country only

When an MS whose Access Class is 11 or 15 is not in the HPLMN, or those of Access Class 12, 13 or 14 are not in their HPLMN Country, the MS shall use class 0-9 as stored in the SIM, or by using the least significant but one digit of the IMSI.

Note 4: The Access Class(es) to be used in the HPLMN is/are stored in the SIM (see GSM 11.11) whilst the Access Class to be used when roaming outside the HPLMN is derived as stated in note 3 above.