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1 Scope

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

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

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.
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- [1] Void
- [2] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [3] 3GPP TS 23.122: "Non Access Stratum functions related to Mobile Station (MS) in idle mode".
- [4] ITU-T Recommendation Q.1001: "General aspects of Public Land Mobile Networks".
- [5] 3GPP TS 22.043: "Support of Localised Service Area (SoLSA). Stage 1".
- [6] 3GPP TS 22.234: "Requirements on 3GPP system to wireless local area network (WLAN) interworking".
- [7] 3GPP TS 22.101: "Service aspects; Service principles".
- [8] 3GPP TS 22.278: "Service requirements for the Evolved Packet System (EPS)".
- [9] 3GPP TS 36.304: "User Equipment (UE) procedures in idle mode"
- [10] 3GPP TS 25.304: "User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode".
- [11] 3GPP TS 25.304: "User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode".
- [12] 3GPP TS 36.304: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode".
- [13] 3GPP TS 36.331: "E-UTRA Radio Resource Control (RRC)".
- [14] 3GPP TS 22.220: "Service requirements for Home NodeBs and Home eNodeBs".
- [15] 3GPP2 C.S0004-A v6.0: "Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems – Addendum 2"
- [16] 3GPP TS 22.153: "Multimedia priority service".
- [17] 3GPP TS 36.306: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities"
- [18] 3GPP TS 43.064: "General Packet Radio Service (GPRS); Overall description of the GPRS radio interface; Stage 2"

1.2 Definitions and abbreviations

1.2.1 Definitions

In addition to those below, abbreviations used in this 3GPP TS are listed in 3GPP TR 21.905 [2].

3GPP PS Data Off

A feature which when configured by the HPLMN and activated by the user prevents transport via PDN connections in 3GPP access of all IP packets except IP packets required by 3GPP PS Data Off Exempt Services.

3GPP PS Data Off Exempt Services

A set of operator services that are allowed even if the 3GPP PS Data Off feature has been activated in the UE by the user.

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 PLMN may provide service in one, or a combination, of frequency bands.

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

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

PLMN Area

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

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

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

If there are several PLMNs in one country, their PLMN areas may overlap. In border areas, the PLMN areas 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: ITU-T Recommendation Q.1001 [4] does not contain a definition of the PLMN area.

System Area

The System Area is defined as the group of PLMN areas accessible by UEs.

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

Note 2: The System Area according to [4] Recommendation Q.1001 corresponds to the System Area.

Service Area

The Service Area is defined in the same way as the Service Area according to ITU-T Recommendation Q.1001 [4]. In contrast to the PLMN area 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.

Localised Service Area (LSA)

The localised service area concept shall give the operator a basis to offer subscribers different services (e.g. tariffs or access rights) depending on the location of the subscriber. A LSA consists of a cell or a number of cells within a PLMN. (3GPP TS 22.043 [5]).

Tracking Area:

E-UTRAN utilises Tracking Areas (TA) for UE access control, location registration, paging and mobility management. The TA is independent of Location Areas (LA) and Routing Areas (RA). A TA comprises one or more E-UTRA cells. Service requirements for E-UTRAN are specified in 3GPP TS 22.278 [8].

1.2.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [2] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [2].

ACDC	Application specific Congestion control for Data Communication
EAB	Extended Access Barring
SSAC	Service Specific Access Control

2 Roaming

2.1 General requirements

A UE 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 UE will in principle not suffer an interruption within the 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 UE leaves the 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).

Subject to roaming agreements, a visited network shall be able to prevent incoming roamers from using a particular radio access technology (e.g. when the home network has not implemented this radio access technology).

2.2 International roaming

International roaming is a service whereby an UE 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 UE 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 UE and the visited PLMN; it does not depend on subscription arrangements.

2.4 Roaming in shared networks

The following requirements are applicable to GERAN, UTRAN and E-UTRAN sharing scenarios:

- Mechanisms shall be specified to enable flexible allocation of visiting roamers among core network operators that have roaming agreements with the same roaming partners. The core network operators shall be able to pre-define their relative share of visiting roamers and distribute the visiting roamers that apply automatic network selection to different core networks connected to the radio access network accordingly.
- When network sharing exists between different operators and a user roams into the shared network it shall be possible for that user to register with a core network operator (among the network sharing partners) that the user's home operator has a roaming agreement with, even if the operator is not operating a radio access network in that area.
- The selection of a core network operator among those connected to the shared radio access network can either be manual (i.e. performed by the user after obtaining a list of available core network operators) or automatic (i.e. performed by the UE according to user and operator preferred settings). For further information see clause 3.2.

3 Provisions for providing continuity of service

3.1 Location registration

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

- Fixed subscribers to call a UE by only using the directory number of the UE irrespective of where the UE is located in the system area at the time of the call.
- UEs to access the system irrespective of the location of the UE.
- UEs to identify when a change in location area has taken place in order to initiate automatic location updating procedures.

3.2 Network selection

3.2.1 General

The UE shall support both manual and automatic network selection mechanisms (modes). The UE shall select the last mode used, as the default mode, at every switch-on.

As an optional feature of the ME, the user shall be able to set a preference in the ME for the mode that shall be used at switch on. If set then the ME shall select this preference rather than the default mode.

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 UE manufacturer.

The UE shall contain display functions by which Available PLMNs and the Selected PLMN can be indicated.

In order not to confuse the user, the same definitions of PLMN names shall be applied consistently both in registered mode and in the list presented to the user when in manual mode.

In shared networks a radio access network can be part of more than one PLMN. This shall be transparent to the user, i.e. the UE shall be able to indicate those PLMNs to the user, and the UE shall support network selection among those PLMNs, as in non-shared networks.

3.2.2 Procedures

3.2.2.1 General

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

In this TS, the term "PLMN Selection" defines a UE based procedure, whereby candidate PLMNs are chosen, one at a time, for attempted registration.

A User Controlled PLMN Selector data field exists on the USIM to allow the user to indicate a preference for network selection. It shall be possible for the user to update the User Controlled PLMN Selector data field, but it shall not be possible to update this data field over the radio interface, e.g. using SIM Application Toolkit.

It shall be possible to have an Operator Controlled PLMN Selector list and a User Controlled PLMN Selector list stored on the SIM/USIM card. Both PLMN Selector lists may contain a list of preferred PLMNs in priority order. It shall be possible to have an associated Access Technology identifier e.g., N G-RAN, E-UTRAN (WB-S1 mode), E-UTRAN(NB-S1 mode), UTRAN, GERAN or GERAN EC-GSM-IoT associated with each entry in the PLMN Selector lists.

The UE shall utilise all the information stored in the USIM related to network selection, e.g. HPLMN, Operator controlled PLMN Selector list, User Controlled PLMN Selector list, Forbidden PLMN list.

Note 1: A PLMN in a Selector list, including HPLMN, may have multiple occurrences, with different access technology identifiers.

The UE shall ignore those PLMN + access technology entries in the User Controlled PLMN selector and Operator Controlled PLMN selector lists where the associated Access Technology is not supported by the UE. In the case that there are multiple associated Access Technology identifiers in an entry the UE shall not ignore the entry if it includes any associated Access Technology that is supported by the UE.

It shall be possible to handle cases where one network operator accepts access from access networks with different network IDs. It shall also be possible to indicate to the UE that a group of PLMNs are equivalent to the registered PLMN regarding PLMN selection, cell selection/re-selection and handover.

It shall be possible for the home network operator to identify alternative Network IDs as the HPLMN. It shall be possible for the home network operator to store in the USIM an indication to the UE that a group of PLMNs are treated as the HPLMN regarding PLMN selection. Any PLMN to be declared as an equivalent to the HPLMN shall be present within the EHPLMN list and is called an EHPLMN. The EHPLMN list replaces the HPLMN derived from the IMSI. When the EHPLMN list is present, any PLMN in this list shall be treated as the HPLMN in all the network and cell selection procedures.

If registration on a PLMN is successful, the UE 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/USIM. However, if registration is unsuccessful, the UE shall ensure that there is no registered PLMN stored in the SIM/USIM.

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

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

To avoid unnecessary registration attempts, lists of forbidden PLMNs, TAs and LAs are maintained in the UE, see clause 3.2.2.4 and 3GPP TS 23.122 [3].

Registration attempts shall not be made by UEs without a SIM/USIM inserted.

An UE/ME which has not successfully registered shall nevertheless be able to make emergency call attempts on an available PLMN (which supports the emergency call teleservice), without the need for the user to select a PLMN. An available PLMN is determined by radio characteristics (3GPP TS 23.122 [3]).

3.2.2.2 At switch-on or recovery from lack of coverage

At switch on, when in coverage of the last registered PLMN as stored in the SIM/USIM, the UE will attach to that network.