

ETSI TS 125 367 V8.2.0 (2009-09)

Technical Specification

**Universal Mobile Telecommunications System (UMTS);
Mobility procedures for Home Node B (HNB);
Overall description;
Stage 2
(3GPP TS 25.367 version 8.2.0 Release 8)**



Reference

RTS/TSGR-0225367v820

Keywords

UMTS

ETSI

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Sous-Préfecture de Grasse (06) N° 7803/88

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Foreword

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1 Scope

This document provides a high level description of the mobility procedures applicable to Home NodeB support in Release 8. Where appropriate, the reasons behind the agreements are provided. Throughout this document, unless otherwise stated, the UE is assumed to be a Release 8 UE that supports the Closed Subscriber Group (CSG) feature, whether it is actually a member of a CSG or not. A Release 8 UE that does not support the CSG feature is not required to support any of the procedures stated in this document.

2 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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications"

[2] 3GPP TS 25.304: 'UE procedures in idle mode and procedures for cell reselection in connected mode'

[3] 3GPP TS 25.331: 'Radio Resource Control (RRC) protocol specification'

[4] 3GPP TS 23.011: "Service accessibility"

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

Acceptable Cell: A cell that satisfies certain conditions as specified [2]. A UE can always attempt emergency calls on an acceptable cell.

Allowed CSG Cell: A CSG cell on which a UE may normally camp if its Allowed CSG List contains the cell's CSG Identity.

Allowed CSG List: A list stored in the USIM containing all the CSG Identities of the CSGs to which the subscriber belongs.

Available PLMN: A PLMN for which the UE has found at least one cell and read its PLMN identity.

Barred Cell: A cell a UE is not allowed to camp on.

Camped on a cell: UE has completed the cell selection/reselection process and has chosen a cell. The UE monitors system information and (in most cases) paging information.

Camped on any cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell irrespective of PLMN identity.

Closed Subscriber Group (CSG): A Closed Subscriber Group identifies subscribers of an operator who are permitted to access one or more cells of the PLMN but which have restricted access (CSG cells).

CSG Cell: A CSG cell, part of the PLMN, broadcasting a CSG Indicator that is set to TRUE and a specific CSG identity. A CSG cell is accessible by the members of the closed subscriber group for that CSG identity. All the CSG cells sharing the same CSG identity use the same radio access technology.

CSG Identity (CSG ID): An identifier broadcast by a CSG cell or cells and used by the UE to facilitate access for authorised members of the associated Closed Subscriber Group.

DRX cycle: Individual time interval between monitoring Paging Occasion for a specific UE.

Equivalent PLMN list: List of PLMNs considered as equivalent by the UE for cell selection, cell reselection, MBSFN Cluster selection, MBSFN Cluster reselection and handover according to the information provided by the NAS.

Home NodeB (HNB): A HNB is a customer-premises equipment that connects a 3GPP UE over UTRAN wireless air interface to a mobile operator's network using broadband IP backhaul.

HNB Name: The Home NodeB Name is a broadcast string in free text format that provides a human readable name for the Home NodeB CSG identity.

Home PLMN: A PLMN where the Mobile Country Code (MCC) and Mobile Network Code (MNC) of the PLMN identity are the same as the MCC and MNC of the IMSI.

Non-CSG Cell: A cell that is not a CSG cell, e.g. a macro cell.

Process: A local action in the UE invoked by a RRC procedure or an Idle Mode procedure.

Radio Access Mode: Radio access mode of the cell, FDD or TDD.

Radio Access Technology: Type of technology used for radio access, for instance UTRA or GSM.

Registered PLMN: This is the PLMN on which certain Location Registration outcomes have occurred.

Registration Area: (NAS) registration area is an area in which the UE may roam without a need to perform location registration, which is a NAS procedure.

Reserved Cell: A cell on which camping is not allowed, except for particular UEs, if so indicated in the system information.

Restricted Cell: A cell on which camping is allowed, but access attempts are disallowed for UEs whose access classes are indicated as barred.

Selected PLMN: This is the PLMN that has been selected by the NAS, either manually or automatically.

Serving cell: The cell on which the UE is camped.

Strongest cell: The cell on a particular carrier that is considered strongest according to the layer 1 cell search procedure [14] [15]. As the details of the layer 1 cell search are implementation dependent, the precise definition of 'strongest cell' is also implementation dependent.

Suitable Cell: This is a cell on which an UE may camp.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

AS	Access Stratum
BCCH	Broadcast Control Channel
CM	Connection Management
CN	Core Network
CSG	Closed Subscriber Group
DRX	Discontinuous Reception
E-UTRA	Evolved UMTS Terrestrial Radio Access
FDD	Frequency Division Duplex
GPRS	General Packet Radio Service

GSM	Global System for Mobile Communications
HCS	Hierarchical Cell Structure
HNB	Home NodeB
IMSI	International Mobile Subscriber Identity
MCC	Mobile Country Code
MM	Mobility Management
MNC	Mobile Network Code
NAS	Non-Access Stratum
PCH	Paging Channel
PI	Page Indicator
PICH	Page Indication Channel
PLMN	Public Land Mobile Network
RAT	Radio Access Technology
RRC	Radio Resource Control
SAP	Service Access Point
TDD	Time Division Duplex
TMGI	Temporary Mobile Group Identity
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
UTRA	UMTS Terrestrial Radio Access
UTRAN	UMTS Terrestrial Radio Access Network

4 Overview

In Release 8, a Home NodeB may provide restricted access to only UEs belonging to a Closed Subscriber Group (CSG). One or more of such cells, known as CSG cells, are identified by a unique numeric identifier called CSG Identity. To facilitate access control, a UE with CSG subscription would have an Allowed CSG List, which contains one or more CSG Identities associated with the CSG cells on which the UE is allowed access. The UE uses the Allowed CSG List along with the CSG Identity broadcast by the CSG Cells in CSG cell selection and reselection.

In addition, manual selection of CSG Identity is introduced, which enables the human user to manually select a CSG Identity for the UE to camp on.

This document provides high level descriptions and procedures of the mobility features to support CSG deployment in Release 8. The following areas will be covered in the subsequent chapters:

- Identifiers associated with the CSG framework
- Manual selection of CSG Identity
- Measurement rules for CSG Cells
- Cell reselection to a CSG cell, from a CSG cell, and between CSG cells
- Handover to a CSG cell, from a CSG cell, and between allowed CSG cells, where applicable.

5 CSG Identification

One or more Closed Subscriber Group (CSG) cells are identified by a unique numeric identifier called CSG Identity or CSG ID. A UE belonging to a CSG has the corresponding CSG ID in its Allowed CSG List. The Allowed CSG List is maintained and provided by NAS. The CSG ID is broadcast in system information by the CSG cell, and used by the UE for cell (re)selection purposes.

A cell may optionally broadcast the CSG Indicator, whose presence and value of TRUE indicates the cell is a CSG cell.

A CSG cell may broadcast the HNB Name, a textual identifier, in system information. The HNB Name can be used to aid the human user in manual selection of a CSG ID.

At the physical layer, a CSG cell is identified by its carrier frequency (UARFCN) and Primary Scrambling Code (PSC). A set of PSC could be reserved for CSG deployment and this reserved PSC range may be signalled in system information. The PSC of a CSG cell belongs to the reserved PSC range if broadcasted.

On the mixed carrier frequency shared by both non-CSG cells (UMTS macro cells) and CSG cells, CSG cells broadcast in system information the PSC range reserved by the network for CSG cells. The non-CSG cells may also broadcast the reserved PSC range. The reserved PSC range is only applicable to the UARFCN within the PLMN where the UE received this information. The UE considers the last received reserved PSC range to be valid within the entire PLMN for the duration of 24 hours. The UE may use the reserved PSC information for CSG cell search and (re)selection purposes, according to UE's implementation.

Macro cells and CSG cells may broadcast indications of one or more carrier frequencies used for dedicated CSG deployment. This information may be used by a UE to avoid unnecessary measurements on that frequency even when cell measurement rules would require measurements of this carrier frequency. Indications of which carrier frequencies are dedicated to CSG-only deployment may be signalled in system information and are applicable only in the cell where this information is broadcasted.

6 CSG Selection

6.1 Manual CSG ID Selection

Manual CSG ID selection enables a human user to select a CSG ID. In manual CSG ID selection the UE may scan all frequencies in the supported frequency bands and display a list of found CSG IDs or the corresponding HNB Names if broadcast by the CSG cells, and indications as to whether the found CSG IDs are contained in the UE's Allowed CSG List. When the user selects an entry in the list, the UE selects any CSG cell among the ones with same CSG ID. The UE may normally camp on the chosen cell if it is an allowed CSG cell.

During manual CSG ID selection a UE is allowed to perform Location Registration procedure on a CSG cell which CSG ID is not in the Allowed CSG List.

Based on the outcome of a Location Registration procedure initiated on a CSG cell the UE's Allowed CSG List is updated.

The UE is allowed to *not* support manual CSG selection in connected mode.

7 CSG Cell Reselection

7.1 Measurement Rules for CSG Cells

To measure allowed CSG cell(s), a UE applies an autonomous search function, per UE implementation, regardless of which RAT the UE is camping on. The autonomous search function determines when and where to search for the allowed CSG cells.

On a mixed carrier, a UE may avoid measurements of any CSG cells that are known by the UE to be not allowed.

A UE may avoid measurements of any CSG cells that are known by the UE to be not allowed on the carrier frequency dedicated to CSG deployment.

7.2 Reselection to CSG Cell

The cell reselection criteria described in this section is applicable when the UE is in the following call states: Idle Mode, Cell_PCH and URA_PCH states, but not Cell_FACH, unless otherwise stated.

7.2.1 Criteria for Intra-frequency Cell Reselection

For intra-frequency reselection from a non-CSG cell to an allowed CSG cell, the UE follows the same cell ranking rules as those defined for the UTRA case in [2]. The UE may ignore not allowed CSG cells in the ranking. The UE applies reselection parameters broadcast by the serving cell. A UE may normally camp on an allowed CSG cell.

7.2.2 Criteria for Inter-frequency Cell Reselection

For inter-frequency cell reselection, the UE considers the frequency where its allowed CSG cell is on to have the highest priority value, irrespective of network configured frequency priorities, as long as the CSG cell remains allowed and best ranked on that frequency.

7.2.3 Criteria for Inter-RAT Cell Reselection

Inter-RAT reselection to an allowed CSG cell is supported when the UE is camped on another RAT. The UE requirements are defined in the specifications of the concerned RAT.

7.3 Reselection from CSG Cell

7.3.1 Criteria for Intra-frequency Cell Reselection

For intra-frequency reselection from an allowed CSG cell to a non-CSG cell, the UE follows the same cell ranking rules as those defined for the UTRA case defined in [2].

7.3.2 Criteria for Inter-frequency Cell Reselection

For inter-frequency reselection from an allowed CSG cell to a non-CSG cell, the UE follows the same cell ranking rules as those defined for the UTRA case defined in [2].

7.3.3 Criteria for Inter-RAT Cell Reselection

For reselection from a CSG cell to a GSM or E-UTRA cell, the UE follows the respective procedures defined in [2].

7.4 Reselection from CSG Cell to CSG Cell

For reselection between allowed CSG cells, the UE follows the same cell ranking rules as those defined for the UTRA case in [2].

7.5 Parameters for CSG Cell Reselection

No new parameters are defined for CSG cell ranking. The same cell reselection parameters defined for the UTRA case in [2] are used for CSG cell ranking purposes, if configured. The operator may configure the cell reselection parameters, such as Q_{offset} and Q_{hyst} , to bias the reselection of CSG cells.

8 CSG Cell Handover

8.1 Handover to CSG Cell

In Cell_DCH state, handover from a non-CSG cell to an allowed CSG cell is not within the scope of Release 8.

8.2 Handover from CSG Cell

In Cell_DCH state, the handover procedure from an allowed CSG cell to a non-CSG cell is expected to be the same as the procedure specified in [3].

8.3 Handover from CSG Cell to CSG Cell

In Cell_DCH state, handover between allowed CSG cells with the same CSG ID is expected to be the same as the procedure specified in [3].

In Cell_DCH state, handover between allowed CSG cells with different CSG IDs is expected to be the same as the procedure specified in [3].

Annex A (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Re v	Subject/Comment	Old	New
2008-11-17	RAN2#64				Proposal for 25.367 TS structure and Text Proposals	-	0.0.0
2008-11-20	RAN2#64				Revision based on discussion for email agreement.	-	0.0.1
2008-11-21	RAN2#64				Final text proposals for email agreement.	-	0.0.2
2008-11-25	RAN2#64				Revision based on email agreement.	-	1.0.0
2008-12	RP-42	RP-080873	-	-	v1.0.0 was approved at RAN #42 as v8.0.0 and put under CR control	1.0.0	8.0.0
2009-03	RP-43	RP-090135	0001	1	Corrections to manual CSG search	8.0.0	8.1.0
	RP-43	RP-090135	0002	1	Alignement to latest stage 3 agreements	8.0.0	8.1.0
2009-09	RP-45	RP-090911	0007	-	Correction to manual CSG ID selection_25.367CR(R8)	8.1.0	8.2.0

History

Document history		
V8.0.0	January 2009	Publication
V8.1.0	April 2009	Publication
V8.2.0	September 2009	Publication