ETSI TS 123 221 V14.1.0 (2017-05)

Digital cellular telecommunications system (Phase 2+) (GSM);
Universal Mobile Telecommunications System (UMTS);
LTE;
Architectural requirements
(3GPP TS 23.221 version 14.1.0 Release 14)

Reference
RTS/TSGS-0223221ve10

Keywords
GSM,LTE,UMTS

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:
http://www.etsi.org/standards-search

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status.
Information on the current status of this and other ETSI documents is available at
https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx

If you find errors in the present document, please send your comment to one of the following services:
https://portal.etsi.org/People/CommiteeSupportStaff.aspx

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.
The content of the PDF version shall not be modified without the written authorization of ETSI.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2017.
All rights reserved.

DECT™, **PLUGTESTS**™, **UMTS**™ and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.
3GPP™ and **LTE**™ are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.
oneM2M logo is protected for the benefit of its Members
GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (https://ipr.etsi.org/).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights 2
Foreword 2
Modal verbs terminology 2
Foreword 6
1 Scope 7
2 References 7
3 Definitions, symbols and abbreviations 8
3.1 Definitions 8
3.2 Symbols 9
3.3 Abbreviations 9
4 3GPP system domains and subsystems 10
4.1 Allowed network and terminal configurations 10
4.2 Circuit switched (CS) core network domain 10
4.2.1 Iu mode to Iu mode handover for circuit switched services 10
4.2.2 A mode to Iu mode handover for CS services 11
4.2.3 General principles for use of CS-MGW resources 11
4.2.4 Transcoder location 11
4.3 Packet Switched (PS) core network domain 11
4.4 IP Multimedia subsystem (IMS) 11
4.5 Cross Core Network Domain Requirements 12
4.6 UTRAN 12
4.7 GERAN 12
4.8 E-UTRAN 12
5 IP addressing 12
5.1 IP version issues 12
5.2 Interoperability between IPv4 and IPv6 networks 12
5.2.1 IPv4/IPv6 Mobile connecting to IPv4 and IPv6 networks 13
5.2.2 IPv6 only Mobile connecting to IPv4 network 13
5.2.3 IPv6 Mobile connected to an IPv6 Device via an IPv4 network 14
5.3 Address management 14
5.4 IP addressing and routing for access to IM-subsystem services 15
5.5 Simultaneous access to multiple services 16
5.6 UE support of IPv6 17
5.7 IP addressing and routing for server/application 18
6 Mobility management 18
6.1 Introduction 18
6.2 Location management and mobility management concept overview 18
6.2.1 Non-combined procedures 18
6.2.2 Use of combined procedures 20
6.3 Description of the location management and mobility management concept - area concepts 21
6.3.1 Introduction 21
6.3.2 Location areas 21
6.3.3 Tracking and Routing areas 21
6.3.3a Support of Iu and A/Gb mode of operation in GERAN Cells 21
6.3.3a.1 Overview 21
6.3.3a.2 Interface selection in GERAN Cells 22
6.3.3a.2.1 Basic principles for MS controlled Cell/Mode selection/re-selection 22
6.3.3a.2.2 Basic principles for network controlled Mode selection/re-selection 22
6.3.4 RAN internal areas 22
6.3.5 Relationship between the different areas 23
6.3.5a Restriction of subscribers' access 24
6.3.6 Hierarchical tracking concept 24

6.4 Relationship between MM and SM states for an UE....25
6.5 Requirement in case of temporarily loss of coverage of packet UE....25
6.6 MM functionality in different UE service states....25
6.7 The RRC state machine....26
6.8 Relationship between CS and PS service states and RRC state for an UE....27
6.9 Service registration and location update....28
6.9.1 Introduction....28
6.9.2 Location area update....29
6.9.3 Tracking and Routing area update....29
6.9.4 Combined updates....29
6.10 Paging initiated by CN....29
6.11 Signalling connection establishment....29
6.11a CS Domain Signalling Requirements (in particular relating to handover)....30
6.12 Relations between SRNS relocation and location registration....30
6.13 Requirements on identifiers for UMTS and GSM....31
6.14 Use of MM system information....32
6.15 Signalling procedures....32
6.15.1 Idle mode procedures....32
6.15.1.1 Location Area update....33
6.15.1.2 Routing Area Update....34
6.15.1.2A Tracking Area Update....34
6.15.1.3 Periodic registration towards both CN nodes without use of Gs or SGs....34
6.15.1.4 Periodic registration with use of Gs or SGs....34
6.15.1.5 UE initiated combined detach procedure when using Gs or SGs....34
6.15.1.6 Forbidden LA/RA....34
6.15.2 SRNS Relocation....34
6.16 RAN coordination....34

7 Call control....35
7.1 General Aspects....35
7.2 Domain selection for mobile terminated calls from the PSTN/CS domain....36
7.2.1 Introduction....36
7.2.2 Calls directed to the CS domain....36
7.2.3 Calls directed to the IMS....36
7.2a Domain selection for UE originating sessions / calls....36
7.2b Access Domain Selection for terminating sessions....39
7.2c Domain Selection for UE originating SMS....39
7.2d Domain selection decisions during ongoing sessions....40
7.2e Selection of method for UE originating USSD requests....40
7.3 Routing sessions from the IMS to the CS Domain....40

8 Support of IM CN Subsystem services....40
8.1 Context activation and registration....40
8.2 Location management....42
8.2.1 Registration concepts for a subscriber roaming into CS domain....42
8.3 IMS Emergency sessions....44
8.3.1 GPRS/EPS considerations for UE recognized IMS Emergency Sessions....44
8.3.2 Emergency Calls in absence of UICC for GPRS/EPS Access....44

9 Efficient use of radio resource....44

Annex A (informative): Guidance for CSFB and IMS enabled UE implementations in E-UTRAN....45

A.1 General....45

A.2 IMS PS Voice preferred....45
A.2.1 EPS Attach....45
A.2.2 Combined EPS/IMSI attach....46

A.3 CS Voice preferred....47

A.4 IMS PS Voice only....48

A.5 CS Voice only....48

Annex B (informative): Guidance related to IPv4 address usage 50

B.1 General 50

B.2 Interworking aspects 50

B.2.1 Interworking scenario: UE assigned private IPv4 address 50

B.2.2 Use of Device triggering 50

B.2.3 Specific APN use 51

Annex C (informative): Change history 52

History 53

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

This document covers the architectural requirements for 3GPP systems based on UTRAN, E-UTRAN and Iu mode GERAN. In particular it details the high level requirements for the Circuit Switched (CS) Domain and the stage 2 procedures that span more than one domain/subsystem. The reference model to which these procedures apply can be found within TS 23.002 [1]. In addition, A mode to Iu mode handover for CS services is addressed. Detailed architectural requirements within the subsystems are contained within the remainder of the 23 series of specifications e.g. the requirements for the Packet Switched (PS) domain are contained within TS 23.060 [2], TS 23.401 [27] and the requirements for the Bearer Independent CS Core Network are contained in TS 23.205[14].

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 TS 23.002: "Network Architecture".

[2] 3GPP TS 23.060: "General Packet Radio Service (GPRS) Service description; Stage 2".

[3] 3GPP TS 23.012: "Location management procedures".

[5] 3GPP TS 25.331: "Radio Resource Control (RRC) Protocol Specification".

[6] 3GPP TS 25.301: "Radio interface protocol architecture".

[7] 3GPP TS 25.303: "UE functions and inter-layer procedures in connected mode".

[8] 3GPP TR 21.905: "3G Vocabulary".

[9] 3GPP TS 25.413: "UTRAN Iu interface RANAP signalling".

[10] 3GPP TS 25.410: "UTRAN Iu Interface: General Aspects and Principles".

[11] 3GPP TS 23.228: "IP Multimedia Subsystem – Stage 2".

[12] 3GPP TS 43.051: "GERAN Overall Description".

[13] 3GPP TS 23.153: "Out of Band Transcoder Control - Stage 2".

[14] 3GPP TS 23.205: "Bearer Independent CS Core Network – Stage 2".

[15] 3GPP TR 25.931: "UTRAN Functions, examples on signalling procedures".

[16] RFC 2766: "Network Address Translation - Protocol Translation (NAT-PT)", G. Tsirtsis, P. Srisuresh. February 2000.

[17] RFC 2893: "Transition Mechanisms for IPv6 Hosts and Routers", R. Gilligan, E. Nordmark, August 2000.

[17a] RFC 4941: "Privacy Extensions for Stateless Address Autoconfiguration in IPv6", T. Narten, R. Daves, S. Krishnan, September 2007.

[18] 3GPP TS 25.401 "UTRAN Overall Description".