ETSI TS 136 413 V13.4.0 (2016-10)

LTE;
Evolved Universal Terrestrial
Radio Access Network (E-UTRAN);
S1 Application Protocol (S1AP)
(3GPP TS 36.413 version 13.4.0 Release 13)

Reference
RTS/TSGR-0336413vd40

Keywords
LTE

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 2016.
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.
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 13
1 Scope 14
2 References 14
3 Definitions and abbreviations 16
3.1 Definitions 16
3.2 Abbreviations 17
4 General 18
4.1 Procedure Specification Principles 18
4.2 Forwards and Backwards Compatibility 19
4.3 Specification Notations 19
5 S1AP Services 20
6 Services Expected from Signalling Transport 21
7 Functions of S1AP 22
8 S1AP Procedures 24
8.1 List of S1AP Elementary procedures 24
8.2 E-RAB Management procedures 26
8.2.1 E-RAB Setup 26
8.2.1.1 General 26
8.2.1.2 Successful Operation 26
8.2.1.3 Unsuccessful Operation 27
8.2.1.4 Abnormal Conditions 28
8.2.2 E-RAB Modify 28
8.2.2.1 General 28
8.2.2.2 Successful Operation 28
8.2.2.3 Unsuccessful Operation 29
8.2.2.4 Abnormal Conditions 29
8.2.3 E-RAB Release 30
8.2.3.1 General 30
8.2.3.2 Successful Operation 30
8.2.3.2.1 E-RAB Release – MME initiated 30
8.2.3.2.2 E-RAB Release Indication – eNB initiated 31
8.2.3.3 Abnormal Conditions 31
8.2.4 E-RAB Modification Indication 31
8.2.4.1 General 31
8.2.4.2 Successful Operation 32
8.2.4.3 Unsuccessful Operation 32
8.2.4.4 Abnormal Conditions 33
8.3 Context Management procedures 33
8.3.1 Initial Context Setup 33
8.3.1.1 General 33
8.3.1.2 Successful Operation 33
8.3.1.3 Unsuccessful Operation 36
8.3.1.4 Abnormal Conditions 37
8.3.2 UE Context Release Request (eNB initiated) 37
8.3.2.1 General 37
8.3.2.2 Successful Operation 37
8.3.3 UE Context Release (MME initiated) 38

8.3.3.1 General 38
8.3.3.2 Successful Operation 38
8.3.3.3 Abnormal Conditions 39
8.3.4 UE Context Modification 39
8.3.4.1 General 39
8.3.4.2 Successful Operation 39
8.3.4.3 Unsuccessful Operation 41
8.3.4.4 Abnormal Conditions 41
8.3.5 UE Radio Capability Match 41
8.3.5.1 General 41
8.3.5.2 Successful Operation 41
8.3.5.3 Unsuccessful Operation 42
8.3.5.4 Abnormal Conditions 42
8.3.6 UE Context Modification Indication 42
8.3.6.1 General 42
8.3.6.2 Successful Operation 42
8.3.6.3 Unsuccessful Operation 42
8.3.6.4 Abnormal Conditions 42
8.3.7 UE Context Suspend 43
8.3.7.1 General 43
8.3.7.2 Successful Operation 43
8.3.8 UE Context Resume 43
8.3.8.1 General 43
8.3.8.2 Successful Operation 43
8.3.8.3 Unsuccessful Operation 44
8.3.9 Connection Establishment Indication 44
8.3.9.1 General 44
8.3.9.2 Successful Operation 44
8.3.9.3 Unsuccessful Operation 45
8.3.9.4 Abnormal Conditions 45
8.4 Handover Signalling 45
8.4.1 Handover Preparation 45
8.4.1.1 General 45
8.4.1.2 Successful Operation 45
8.4.1.3 Unsuccessful Operation 48
8.4.1.4 Abnormal Conditions 49
8.4.2 Handover Resource Allocation 49
8.4.2.1 General 49
8.4.2.2 Successful Operation 49
8.4.2.3 Unsuccessful Operation 52
8.4.2.4 Abnormal Conditions 52
8.4.3 Handover Notification 53
8.4.3.1 General 53
8.4.3.2 Successful Operation 53
8.4.3.3 Abnormal Conditions 53
8.4.4 Path Switch Request 53
8.4.4.1 General 53
8.4.4.2 Successful Operation 54
8.4.4.3 Unsuccessful Operation 55
8.4.4.4 Abnormal Conditions 55
8.4.5 Handover Cancellation 56
8.4.5.1 General 56
8.4.5.2 Successful Operation 56
8.4.5.3 Unsuccessful Operation 56
8.4.5.4 Abnormal Conditions 56
8.4.6 eNB Status Transfer 56
8.4.6.1 General 56
8.4.6.2 Successful Operation 57
8.4.6.3 Unsuccessful Operation 57
8.4.6.4 Abnormal Conditions 57
8.4.7 MME Status Transfer 57
8.4.7.1 General 57

8.4.7.2 Successful Operation....58
8.4.7.3 Unsuccessful Operation....58
8.4.7.4 Abnormal Conditions....58
8.5 Paging....58
8.5.1 General....58
8.5.2 Successful Operation....59
8.5.3 Unsuccessful Operation....60
8.5.4 Abnormal Conditions....60
8.6 NAS transport....60
8.6.1 General....60
8.6.2 Successful Operations....60
8.6.2.1 Initial UE Message....60
8.6.2.2 DOWNLINK NAS TRANSPORT....61
8.6.2.3 UPLINK NAS TRANSPORT....62
8.6.2.4 NAS NON DELIVERY INDICATION....63
8.6.2.5 Reroute NAS Request....63
8.6.3 Unsuccessful Operation....63
8.6.4 Abnormal Conditions....63
8.7 Management procedures....64
8.7.1 Reset....64
8.7.1.1 General....64
8.7.1.2 Successful Operation....64
8.7.1.2.1 Reset Procedure Initiated from the MME....64
8.7.1.2.2 Reset Procedure Initiated from the E-UTRAN....65
8.7.1.3 Abnormal Conditions....66
8.7.1.3.1 Abnormal Condition at the EPC....66
8.7.1.3.2 Abnormal Condition at the E-UTRAN....66
8.7.1.3.3 Crossing of Reset Messages....66
8.7.2 Error Indication....66
8.7.2.1 General....66
8.7.2.2 Successful Operation....66
8.7.2.3 Abnormal Conditions....67
8.7.3 S1 Setup....67
8.7.3.1 General....67
8.7.3.2 Successful Operation....67
8.7.3.3 Unsuccessful Operation....68
8.7.3.4 Abnormal Conditions....68
8.7.4 eNB Configuration Update....68
8.7.4.1 General....68
8.7.4.2 Successful Operation....68
8.7.4.3 Unsuccessful Operation....69
8.7.4.4 Abnormal Conditions....69
8.7.5 MME Configuration Update....69
8.7.5.1 General....69
8.7.5.2 Successful Operation....70
8.7.5.3 Unsuccessful Operation....70
8.7.5.4 Abnormal Conditions....70
8.7.6 Overload Start....71
8.7.6.1 General....71
8.7.6.2 Successful Operation....71
8.7.6.3 Unsuccessful Operation....72
8.7.7 Overload Stop....72
8.7.7.1 General....72
8.7.7.2 Successful Operation....72
8.7.7.3 Unsuccessful Operation....72
8.8 S1 CDMA2000 Tunnelling Procedures....72
8.8.1 General....72
8.8.2 Successful Operations....73
8.8.2.1 Downlink S1 CDMA2000 Tunnelling....73
8.8.2.2 Uplink S1 CDMA2000 Tunnelling....73
8.8.3 Unsuccessful Operation....74
8.8.4 Abnormal Conditions....74

8.9 UE Capability Info Indication 74
8.9.1 General 74
8.9.2 Successful Operation 74
8.10 Trace Procedures 75
8.10.1 Trace Start 75
8.10.1.1 General 75
8.10.1.2 Successful Operation 75
8.10.2 Trace Failure Indication 76
8.10.2.1 General 76
8.10.2.2 Successful Operation 76
8.10.3 Deactivate Trace 76
8.10.3.1 General 76
8.10.3.2 Successful Operation 76
8.10.4 Cell Traffic Trace 77
8.10.4.1 General 77
8.10.4.2 Successful Operation 77
8.11 Location Reporting Procedures 77
8.11.1 Location Reporting Control 77
8.11.1.1 General 77
8.11.1.2 Successful Operation 77
8.11.1.3 Abnormal Conditions 78
8.11.2 Location Report Failure Indication 78
8.11.2.1 General 78
8.11.2.2 Successful Operation 78
8.11.3 Location Report 78
8.11.3.1 General 78
8.11.3.2 Successful Operation 78
8.11.3.3 Abnormal Conditions 79
8.12 Warning Message Transmission Procedures 79
8.12.1 Write-Replace Warning 79
8.12.1.1 General 79
8.12.1.2 Successful Operation 79
8.12.1.3 Abnormal Conditions 80
8.12.2 Kill 80
8.12.2.1 General 80
8.12.2.2 Successful Operation 80
8.12.3 PWS Restart Indication 81
8.12.3.1 General 81
8.12.3.2 Successful Operation 81
8.12.4 PWS Failure Indication 81
8.12.4.1 General 81
8.12.4.2 Successful Operation 82
8.13 eNB Direct Information Transfer 82
8.13.1 General 82
8.13.2 Successful Operation 82
8.13.2.1 eNB Direct Information Transfer 82
8.13.3 Abnormal Conditions 82
8.14 MME Direct Information Transfer 83
8.14.1 General 83
8.14.2 Successful Operation 83
8.14.2.1 MME Direct Information Transfer 83
8.14.3 Abnormal Conditions 83
8.15 eNB Configuration Transfer 83
8.15.1 General 83
8.15.2 Successful Operation 84
8.15.2.1 eNB Configuration Transfer 84
8.15.3 Abnormal Conditions 84
8.16 MME Configuration Transfer 84
8.16.1 General 84
8.16.2 Successful Operation 84
8.16.2.1 MME Configuration Transfer 84
8.16.3 Abnormal Conditions 85

8.17 LPPa transport 85
8.17.1 General 85
8.17.2 Successful Operations 86
8.17.2.1 DOWNLINK UE ASSOCIATED LPPA TRANSPORT 86
8.17.2.2 UPLINK UE ASSOCIATED LPPA TRANSPORT 86
8.17.2.3 DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT 86
8.17.2.4 UPLINK NON UE ASSOCIATED LPPA TRANSPORT 87
8.17.3 Unsuccessful Operation 87
8.17.4 Abnormal Conditions 87

9 Elements for S1AP Communication 88
9.1 Message Functional Definition and Content 88
9.1.1 General 88
9.1.2 Message Contents 88
9.1.2.1 Presence 88
9.1.2.2 Criticality 88
9.1.2.3 Range 88
9.1.2.4 Assigned Criticality 88
9.1.3 E-RAB Management Messages 89
9.1.3.1 E-RAB SETUP REQUEST 89
9.1.3.2 E-RAB SETUP RESPONSE 90
9.1.3.3 E-RAB MODIFY REQUEST 91
9.1.3.4 E-RAB MODIFY RESPONSE 91
9.1.3.5 E-RAB RELEASE COMMAND 92
9.1.3.6 E-RAB RELEASE RESPONSE 92
9.1.3.7 E-RAB RELEASE INDICATION 93
9.1.3.8 E-RAB MODIFICATION INDICATION 94
9.1.3.9 E-RAB MODIFICATION CONFIRM 95
9.1.4 Context Management Messages 95
9.1.4.1 INITIAL CONTEXT SETUP REQUEST 95
9.1.4.2 Void 96
9.1.4.3 INITIAL CONTEXT SETUP RESPONSE 96
9.1.4.4 INITIAL CONTEXT SETUP FAILURE 97
9.1.4.5 UE CONTEXT RELEASE REQUEST 97
9.1.4.6 UE CONTEXT RELEASE COMMAND 98
9.1.4.7 UE CONTEXT RELEASE COMPLETE 98
9.1.4.8 UE CONTEXT MODIFICATION REQUEST 98
9.1.4.9 UE CONTEXT MODIFICATION RESPONSE 99
9.1.4.10 UE CONTEXT MODIFICATION FAILURE 99
9.1.4.11 UE RADIO CAPABILITY MATCH REQUEST 100
9.1.4.12 UE RADIO CAPABILITY MATCH RESPONSE 100
9.1.4.13 UE CONTEXT MODIFICATION INDICATION 100
9.1.4.14 UE CONTEXT MODIFICATION CONFIRM 100
9.1.4.15 UE CONTEXT SUSPEND REQUEST 101
9.1.4.16 UE CONTEXT SUSPEND RESPONSE 101
9.1.4.17 UE CONTEXT RESUME REQUEST 101
9.1.4.18 UE CONTEXT RESUME RESPONSE 102
9.1.4.19 UE CONTEXT RESUME FAILURE 102
9.1.4.20 Connection Establishment Indication 102
9.1.5 Handover Signalling Messages 103
9.1.5.1 HANDOVER REQUIRED 103
9.1.5.2 HANDOVER COMMAND 104
9.1.5.3 HANDOVER PREPARATION FAILURE 105
9.1.5.4 HANDOVER REQUEST 106
9.1.5.5 HANDOVER REQUEST ACKNOWLEDGE 107
9.1.5.6 HANDOVER FAILURE 108
9.1.5.7 HANDOVER NOTIFY 108
9.1.5.8 PATH SWITCH REQUEST 109
9.1.5.9 PATH SWITCH REQUEST ACKNOWLEDGE 110
9.1.5.10 PATH SWITCH REQUEST FAILURE 110
9.1.5.11 HANDOVER CANCEL 111
9.1.5.12 HANDOVER CANCEL ACKNOWLEDGE 111

9.1.5.13 eNB STATUS TRANSFER 111
9.1.5.14 MME STATUS TRANSFER 111
9.1.6 PAGING 111
9.1.7 NAS Transport Messages 113
9.1.7.1 INITIAL UE MESSAGE 113
9.1.7.2 DOWNLINK NAS TRANSPORT 114
9.1.7.3 UPLINK NAS TRANSPORT 114
9.1.7.4 NAS NON DELIVERY INDICATION 114
9.1.7.5 REROUTE NAS REQUEST 115
9.1.8 Management messages 115
9.1.8.1 RESET 115
9.1.8.2 RESET ACKNOWLEDGE 115
9.1.8.3 ERROR INDICATION 116
9.1.8.4 S1 SETUP REQUEST 116
9.1.8.5 S1 SETUP RESPONSE 117
9.1.8.6 S1 SETUP FAILURE 118
9.1.8.7 ENB CONFIGURATION UPDATE 118
9.1.8.8 ENB CONFIGURATION UPDATE ACKNOWLEDGE 119
9.1.8.9 ENB CONFIGURATION UPDATE FAILURE 119
9.1.8.10 MME CONFIGURATION UPDATE 119
9.1.8.11 MME CONFIGURATION UPDATE ACKNOWLEDGE 120
9.1.8.12 MME CONFIGURATION UPDATE FAILURE 120
9.1.8.13 OVERLOAD START 120
9.1.8.14 OVERLOAD STOP 121
9.1.9 S1 CDMA2000 Tunnelling Messages 122
9.1.9.1 DOWNLINK S1 CDMA2000 TUNNELLING 122
9.1.9.2 UPLINK S1 CDMA2000 TUNNELLING 122
9.1.10 UE CAPABILITY INFO INDICATION 122
9.1.11 Trace Messages 123
9.1.11.1 TRACE START 123
9.1.11.2 TRACE FAILURE INDICATION 123
9.1.11.3 DEACTIVATE TRACE 123
9.1.12 Location Reporting Messages 124
9.1.12.1 LOCATION REPORTING CONTROL 124
9.1.12.2 LOCATION REPORT FAILURE INDICATION 124
9.1.12.3 LOCATION REPORT 124
9.1.13 Warning Message Transmission Messages 124
9.1.13.1 WRITE-REPLACE WARNING REQUEST 124
9.1.13.2 WRITE-REPLACE WARNING RESPONSE 125
9.1.13.3 KILL REQUEST 125
9.1.13.4 KILL RESPONSE 125
9.1.13.5 PWS RESTART INDICATION 126
9.1.13.6 PWS FAILURE INDICATION 126
9.1.14 eNB DIRECT INFORMATION TRANSFER 127
9.1.15 MME DIRECT INFORMATION TRANSFER 127
9.1.16 eNB CONFIGURATION TRANSFER 127
9.1.17 MME CONFIGURATION TRANSFER 127
9.1.18 CELL TRAFFIC TRACE 127
9.1.19 LPPa Transport Messages 128
9.1.19.1 DOWNLINK UE ASSOCIATED LPPA TRANSPORT 128
9.1.19.2 UPLINK UE ASSOCIATED LPPA TRANSPORT 128
9.1.19.3 DOWNLINK NON UE ASSOCIATED LPPA TRANSPORT 129
9.1.19.4 UPLINK NON UE ASSOCIATED LPPA TRANSPORT 129
9.2 Information Element Definitions 129
9.2.0 General 129
9.2.1 Radio Network Layer Related IEs 129
9.2.1.1 Message Type 129
9.2.1.2 E-RAB ID 130
9.2.1.3 Cause 130
9.2.1.3a RRC Establishment Cause 134
9.2.1.4 Trace Activation 134
9.2.1.5 Source ID 135

9.2.1.6 Target ID 135
9.2.1.7 Source eNB to Target eNB Transparent Container 136
9.2.1.8 Target eNB to Source eNB Transparent Container 137
9.2.1.9 Source RNC to Target RNC Transparent Container 138
9.2.1.10 Target RNC to Source RNC Transparent Container 138
9.2.1.11 Source BSS to Target BSS Transparent Container 138
9.2.1.12 Target BSS to Source BSS Transparent Container 138
9.2.1.13 Handover Type 138
9.2.1.14 Extended RNC-ID 138
9.2.1.15 E-RAB Level QoS Parameters 138
9.2.1.16 Paging DRX 139
9.2.1.17 Paging Cause 139
9.2.1.18 GBR QoS Information 139
9.2.1.19 Bit Rate 139
9.2.1.20 UE Aggregate Maximum Bit Rate 140
9.2.1.21 Criticality Diagnostics 140
9.2.1.22 Handover Restriction List 141
9.2.1.23 CDMA2000-PDU 142
9.2.1.24 CDMA2000 RAT Type 142
9.2.1.25 CDMA2000 Sector ID 143
9.2.1.26 Security Context 143
9.2.1.27 UE Radio Capability 144
9.2.1.28 CDMA2000 HO Status 144
9.2.1.29 CDMA2000 HO Required Indication 144
9.2.1.30 1xRTT MEID 144
9.2.1.31 eNB Status Transfer Transparent Container 144
9.2.1.32 COUNT Value 146
9.2.1.33 CDMA2000 1xRTT RAND 146
9.2.1.34 Request Type 147
9.2.1.35 CDMA2000 1xRTT SRVCC Info 147
9.2.1.36 E-RAB List 147
9.2.1.37 Global eNB ID 148
9.2.1.38 E-UTRAN CGI 148
9.2.1.39 Subscriber Profile ID for RAT/Frequency priority 148
9.2.1.40 UE Security Capabilities 148
9.2.1.41 Security Key 149
9.2.1.42 UE History Information 149
9.2.1.43 Last Visited Cell Information 149
9.2.1.43a Last Visited E-UTRAN Cell Information 150
9.2.1.43b Last Visited GERAN Cell Information 150
9.2.1.44 Message Identifier 150
9.2.1.45 Serial Number 151
9.2.1.46 Warning Area List 151
9.2.1.47 Emergency Area ID 151
9.2.1.48 Repetition Period 151
9.2.1.49 Number of Broadcasts Requested 152
9.2.1.50 Warning Type 152
9.2.1.51 Warning Security Information 152
9.2.1.52 Data Coding Scheme 152
9.2.1.53 Warning Message Contents 152
9.2.1.54 Broadcast Completed Area List 153
9.2.1.55 Inter-system Information Transfer Type 153
9.2.1.56 Source To Target Transparent Container 153
9.2.1.57 Target To Source Transparent Container 154
9.2.1.58 SRVCC Operation Possible 155
9.2.1.59 SRVCC HO Indication 155
9.2.1.60 Allocation and Retention Priority 155
9.2.1.61 Time to wait 156
9.2.1.62 CSG Id 156
9.2.1.63 CSG Id List 156
9.2.1.64 MS Classmark 2 157
9.2.1.65 MS Classmark 3 157

9.2.1.66 Cell Type 157
9.2.1.67 Old BSS to New BSS Information 157
9.2.1.68 Layer 3 Information 157
9.2.1.69 E-UTRAN Round Trip Delay Estimation Info 157
9.2.1.70 Broadcast Cancelled Area List 157
9.2.1.71 Number of Broadcasts 158
9.2.1.72 Concurrent Warning Message Indicator 158
9.2.1.73 CSG Membership Status 159
9.2.1.74 Cell Access Mode 159
9.2.1.75 Extended Repetition Period 159
9.2.1.76 Data Forwarding Not Possible 159
9.2.1.77 PS Service Not Available 159
9.2.1.78 Paging Priority 159
9.2.1.79 Relay Node Indicator 160
9.2.1.80 Correlation ID 160
9.2.1.81 MDT Configuration 160
9.2.1.82 MME Relay Support Indicator 163
9.2.1.83 Management Based MDT Allowed 163
9.2.1.84 GW Context Release Indication 163
9.2.1.85 Voice Support Match Indicator 164
9.2.1.86 M3 Configuration 164
9.2.1.87 M4 Configuration 164
9.2.1.88 M5 Configuration 164
9.2.1.89 MDT PLMN List 164
9.2.1.90 COUNT Value Extended 165
9.2.1.91 Kill-all Warning Messages Indicator 165
9.2.1.92 LHN ID 165
9.2.1.93 User Location Information 165
9.2.1.94 MBSFN-ResultToLog 165
9.2.1.95 EARFCN 166
9.2.1.96 Expected UE Behaviour 166
9.2.1.97 Expected UE Activity Behaviour 167
9.2.1.98 UE Radio Capability for Paging 167
9.2.1.99 ProSe Authorized 167
9.2.1.100 COUNT Value for PDCP SN Length 18 168
9.2.1.101 M6 Configuration 168
9.2.1.102 M7 Configuration 168
9.2.1.103 Assistance Data for Paging 169
9.2.1.104 Assistance Data for Recommended Cells 169
9.2.1.105 Information on Recommended Cells and eNBs for Paging 169
9.2.1.106 Recommended Cells for Paging 169
9.2.1.107 Recommended eNBs for Paging 170
9.2.1.108 Assistance Data for CE capable UEs 170
9.2.1.109 Cell Identifier and Coverage Enhancement Level 171
9.2.1.110 Paging Attempt Information 171
9.2.1.111 Paging eDRX Information 171
9.2.1.112 UE Retention Information 171
9.2.1.113 UE User Plane CIoT Support Indicator 171
9.2.1.114 NB-IoT Default Paging DRX 172
9.2.1.115 NB-IoT Paging eDRX Information 172
9.2.1.116 Bearer Type 172
9.2.1.117 RAT Type 172
9.2.1.118 CE-mode-B Support Indicator 172
9.2.1.119 SRVCC Operation Not Possible 172
9.2.2 Transport Network Layer Related IEs 174
9.2.2.1 Transport Layer Address 174
9.2.2.2 GTP-TEID 174
9.2.2.3 Tunnel Information 174
9.2.3 NAS Related IEs 174
9.2.3.1 LAI 174
9.2.3.2 RAC 174
9.2.3.3 MME UE S1AP ID 175

9.2.3.4 eNB UE S1AP ID 175
9.2.3.5 NAS-PDU 175
9.2.3.6 S-TMSI 175
9.2.3.7 TAC 175
9.2.3.8 PLMN Identity 175
9.2.3.9 GUMMEI 176
9.2.3.10 UE Identity Index value 176
9.2.3.11 IMSI 176
9.2.3.12 MMEC 176
9.2.3.13 UE Paging Identity 177
9.2.3.14 DL Forwarding 177
9.2.3.15 Direct Forwarding Path Availability 177
9.2.3.16 TAI 177
9.2.3.17 Relative MME Capacity 178
9.2.3.18 UE S1AP ID pair 178
9.2.3.19 Overload Response 178
9.2.3.20 Overload Action 178
9.2.3.21 CS Fallback Indicator 178
9.2.3.22 CN Domain 178
9.2.3.23 RIM Transfer 179
9.2.3.24 RIM Information 179
9.2.3.25 RIM Routing Address 179
9.2.3.26 SON Configuration Transfer 180
9.2.3.27 SON Information 180
9.2.3.28 SON Information Reply 181
9.2.3.29 X2 TNL Configuration Info 181
9.2.3.30 NAS Security Parameters from E-UTRAN 181
9.2.3.31 NAS Security Parameters to E-UTRAN 182
9.2.3.32 LPPa-PDU 182
9.2.3.33 Routing ID 182
9.2.3.34 Time Synchronisation Info 182
9.2.3.35 Void 183
9.2.3.36 Traffic Load Reduction Indication 183
9.2.3.37 Additional CS Fallback Indicator 183
9.2.3.38 Masked IMEISV 183
9.2.3.41 Muting Pattern Information 184
9.2.3.42 Synchronisation Information 184
9.2.3.43 Listening Subframe Pattern 184
9.2.3.44 MME Group ID 185
9.2.3.45 Additional GUTI 185
9.2.3.46 Extended UE Identity Index Value 185
9.2.3.47 NB-IoT UE Identity Index Value 185
9.3 Message and Information Element Abstract Syntax (with ASN.1) 186
9.3.0 General 186
9.3.1 Usage of private message mechanism for non-standard use 186
9.3.2 Elementary Procedure Definitions 187
9.3.3 PDU Definitions 216
9.3.4 Information Element Definitions 344
9.3.5 Common Definitions 435
9.3.6 Constant Definitions 436
9.3.7 Container Definitions 452
9.4 Message Transfer Syntax 461
9.5 Timers 461

10 Handling of Unknown, Unforeseen and Erroneous Protocol Data 462
10.1 General 462
10.2 Transfer Syntax Error 462
10.3 Abstract Syntax Error 462
10.3.1 General 462
10.3.2 Criticality Information 463
10.3.3 Presence Information 463
10.3.4 Not comprehended IE/IE group 464

10.3.4.1 Procedure Code 464
10.3.4.1A Type of Message 464
10.3.4.2 IEs other than the Procedure Code and Type of Message 464
10.3.5 Missing IE or IE group 465
10.3.6 IEs or IE groups received in wrong order or with too many occurrences or erroneously present 466
10.4 Logical Error 467
10.5 Exceptions 467
10.6 Handling of AP ID 468

Annex A (informative): S1AP Transparent containers content 469

Annex B (normative): IEs for SON Transfer 470

B.1 Tabular definition 470
B.1.1 SON Transfer Application Identity 470
B.1.2 SON Transfer Request Container 470
B.1.3 SON Transfer Response Container 471
B.1.4 SON Transfer Cause 472
B.1.5 Cell Load Reporting Response 474
B.1.6 E-UTRAN Cell Load Reporting Response 474
B.1.7 Multi-Cell Load Reporting Request 475
B.1.8 IRAT Cell ID 475
B.1.9 Multi-Cell Load Reporting Response 475
B.1.10 Cell Load Reporting Cause 476
B.1.11 Event-Triggered Cell Load Reporting Request 477
B.1.12 Event-triggered Cell Load Reporting Response 477
B.1.13 HO Report 477
B.1.14 Cell Activation Request 478
B.1.15 Cell Activation Response 479
B.1.16 Cell State Indication 479
B.1.17 Failure Event Report 479
B.1.18 eHRPD Sector ID 480
B.1.19 eHRPD Sector Load Reporting Response 480
B.1.20 eHRPD Composite Available Capacity 480
B.1.21 eHRPD Sector Capacity Class Value 481
B.1.22 eHRPD Capacity Value 481
B.1.23 Candidate PCI 481

B.2 ASN.1 definition 481

Annex C (informative): Processing of Transparent Containers at the MME 492

Annex D (informative): Change history 493

History 499

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

The present document specifies the E-UTRAN radio network layer signalling protocol for the S1 interface. The S1 Application Protocol (S1AP) supports the functions of S1 interface by signalling procedures defined in this document. S1AP is developed in accordance to the general principles stated in TS 36.401 [2] and TS 36.410 [3].

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 36.401: "E-UTRAN Architecture Description".

[3] 3GPP TS 36.410: "S1 General Aspects and Principles".

[4] ITU-T Recommendation X.691 (07/2002): "Information technology – ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".

[5] ITU-T Recommendation X.680 (07/2002): "Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation".

[6] ITU-T Recommendation X.681 (07/2002): "Information technology – Abstract Syntax Notation One (ASN.1): Information object specification".

[7] Void

[8] 3GPP TS 23.402: "Architecture enhancements for non-3GPP accesses".

[9] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC)".

[10] 3GPP TS 32.422: "Trace control and configuration management".

[11] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for E-UTRAN access".

[12] 3GPP TS 36.414: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 data transport".

[13] 3GPP TS 23.203: "Policy and charging control architecture"

[14] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA), Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[15] 3GPP TS 33.401: "Security architecture".

[16] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRAN); Radio Resource Control (RRC) Protocol Specification".

[17] 3GPP TS 23.272: "Circuit Switched Fallback in Evolved Packet System; Stage 2".

[18] 3GPP TS 48.018: "General Packet Radio Service (GPRS); BSS GPRS Protocol (BSSGP)".

[19] 3GPP TS 25.413: "UTRAN Iu interface RANAP signalling".