

ETSI TS 124 501 V17.7.1 (2022-07)



**5G;
Non-Access-Stratum (NAS) protocol for 5G System (5GS);
Stage 3
(3GPP TS 24.501 version 17.7.1 Release 17)**

[ETSI TS 124 501 V17.7.1 \(2022-07\)](https://standards.iteh.ai/catalog/standards/sist/03c1248b-47d1-435e-ba25-529251f05712/etsi-ts-124-501-v17-7-1-2022-07)

<https://standards.iteh.ai/catalog/standards/sist/03c1248b-47d1-435e-ba25-529251f05712/etsi-ts-124-501-v17-7-1-2022-07>



ReferenceRTS/TSGC-0124501vh71

Keywords5G

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 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

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 prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

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://standards-portal.etsi.org/People/CommitteeSupportStaff.aspx>

If you find a security vulnerability in the present document, please report it through our

Coordinated Vulnerability Disclosure Program:

<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

Notice of disclaimer & limitation of liability

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

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.

© ETSI 2022.

All rights reserved.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are 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 Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, 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.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

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

Legal Notice

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. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 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
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	24
1 Scope	25
2 References	25
3 Definitions and abbreviations.....	29
3.1 Definitions	29
3.2 Abbreviations	40
4 General	43
4.1 Overview	43
4.2 Coordination between the protocols for 5GS mobility management and 5GS session management	43
4.3 UE domain selection	44
4.3.1 UE's usage setting	44
4.3.2 Domain selection for UE originating sessions / calls.....	44
4.3.3 Change of UE's usage setting.....	46
4.3.4 Change or determination of IMS voice availability	46
4.4 NAS security	47
4.4.1 General.....	47
4.4.2 Handling of 5G NAS security contexts.....	47
4.4.2.1 General	47
4.4.2.2 Establishment of a mapped 5G NAS security context during inter-system change from S1 mode to N1 mode in 5GMM-CONNECTED mode.....	50
4.4.2.3 Establishment of a 5G NAS security context during N1 mode to N1 mode handover	51
4.4.2.4 Establishment of an EPS security context during inter-system change from N1 mode to S1 mode in 5GMM-CONNECTED mode	52
4.4.2.5 Establishment of secure exchange of NAS messages	52
4.4.2.6 Change of security keys	54
4.4.3 Handling of NAS COUNT and NAS sequence number	55
4.4.3.1 General	55
4.4.3.2 Replay protection	56
4.4.3.3 Integrity protection and verification.....	56
4.4.3.4 Ciphering and deciphering	56
4.4.3.5 NAS COUNT wrap around	57
4.4.4 Integrity protection of NAS signalling messages.....	57
4.4.4.1 General	57
4.4.4.2 Integrity checking of NAS signalling messages in the UE	58
4.4.4.3 Integrity checking of NAS signalling messages in the AMF	58
4.4.5 Ciphering of NAS signalling messages	60
4.4.6 Protection of initial NAS signalling messages.....	60
4.4.7 Protection of NAS IEs	62
4.5 Unified access control	63
4.5.1 General.....	63
4.5.2 Determination of the access identities and access category associated with a request for access for UEs not operating in SNPN access mode	65
4.5.2A Determination of the access identities and access category associated with a request for access for UEs operating in SNPN access mode	70
4.5.3 Operator-defined access categories.....	75
4.5.4 Access control and checking.....	77
4.5.4.1 Access control and checking in 5GMM-IDLE mode and in 5GMM-IDLE mode with suspend indication.....	77
4.5.4.2 Access control and checking in 5GMM-CONNECTED mode and in 5GMM-CONNECTED mode with RRC inactive indication	79
4.5.5 Exception handling and avoiding double barring	81

4.5.6	Mapping between access categories/access identities and RRC establishment cause	85
4.6	Network slicing	86
4.6.1	General.....	86
4.6.2	Mobility management aspects.....	88
4.6.2.1	General	88
4.6.2.2	NSSAI storage.....	89
4.6.2.3	Provision of NSSAI to lower layers in 5GMM-IDLE mode.....	94
4.6.2.4	Network slice-specific authentication and authorization.....	96
4.6.2.5	Mobility management based network slice admission control.....	97
4.6.2.6	Provision of NSAG information to lower layers.....	98
4.6.3	Session management aspects	99
4.6.3.0	General	99
4.6.3.1	Session management based network slice admission control	99
4.6.3.2	Support of network slice admission control and interworking with EPC	100
4.6.3.3	Session management based network slice data rate limitation control.....	100
4.7	NAS over non-3GPP access	100
4.7.1	General.....	100
4.7.2	5GS mobility management aspects	100
4.7.2.1	General	100
4.7.2.2	Establishment cause for non-3GPP access.....	101
4.7.3	5GS session management aspects.....	102
4.7.4	Limited service state over non-3GPP access	103
4.7.5	NAS signalling using trusted WLAN access network	103
4.8	Interworking with E-UTRAN connected to EPC	104
4.8.1	General.....	104
4.8.2	Single-registration mode.....	104
4.8.2.1	General	104
4.8.2.2	Single-registration mode with N26 interface	104
4.8.2.3	Single-registration mode without N26 interface	104
4.8.2.3.1	Interworking between NG-RAN and E-UTRAN	104
4.8.3	Dual-registration mode	107
4.8.4	Core Network selection for UEs not using CIoT 5GS optimizations	108
4.8.4A	Core Network selection and redirection for UEs using CIoT optimizations.....	108
4.8.4A.1	Core network selection.....	108
4.8.4A.2	Redirection of the UE by the core network.....	109
4.9	Disabling and re-enabling of UE's N1 mode capability	109
4.9.1	General.....	109
4.9.2	Disabling and re-enabling of UE's N1 mode capability for 3GPP access.....	109
4.9.3	Disabling and re-enabling of UE's N1 mode capability for non-3GPP access.....	112
4.10	Interworking with ePDG connected to EPC.....	112
4.11	UE configuration parameter updates	113
4.12	Access traffic steering, switching and splitting (ATSSS).....	113
4.13	Support of NAS signalling using wireline access network.....	113
4.14	Non-public network.....	114
4.14.1	General.....	114
4.14.2	Stand-alone non-public network	114
4.14.3	Public network integrated non-public network (PNI-NPN).....	116
4.15	Time synchronization and time sensitive communication.....	117
4.15.1	General.....	117
4.15.2	Void.....	117
4.15.2.1	Void.....	117
4.15.2.2	Void.....	117
4.15.2.3	Void.....	117
4.15.3	Time synchronization	117
4.15.4	User plane node management	118
4.16	UE radio capability signalling optimisation	118
4.17	5GS mobility management in NB-N1 mode	119
4.18	5GS session management in NB-N1 mode	119
4.19	5GS mobility management in WB-N1 mode for IoT	120
4.20	5GS session management in WB-N1 mode for IoT	120
4.21	Authentication and Key Management for Applications (AKMA)	121
4.22	Uncrewed aerial vehicle identification, authentication, and authorization.....	121

4.22.1	General.....	121
4.22.2	Authentication and authorization of UAV	122
4.22.3	Authorization of C2 communication	122
4.22.4	Authorization of UAV flight.....	123
4.23	NAS over Non-Terrestrial Network	123
4.23.1	General.....	123
4.23.2	List of "PLMNs not allowed to operate at the present UE location"	123
4.23.3	5GS mobility management via a satellite NG-RAN cell	124
4.23.4	5GS session management via a satellite NG-RAN cell	124
4.23.5	Handling multiple tracking area codes from the lower layers.....	124
4.24	Minimization of service interruption.....	125
4.25	Support of MUSIM features.....	126
5	Elementary procedures for 5GS mobility management	127
5.1	Overview	127
5.1.1	General.....	127
5.1.2	Types of 5GMM procedures.....	127
5.1.3	5GMM sublayer states	128
5.1.3.1	General	128
5.1.3.2	5GMM sublayer states	128
5.1.3.2.1	5GMM sublayer states in the UE.....	128
5.1.3.2.1.1	General.....	128
5.1.3.2.1.2	Main states	129
5.1.3.2.1.2.1	5GMM-NUL.....	129
5.1.3.2.1.2.2	5GMM-DEREGISTERED.....	129
5.1.3.2.1.2.3	5GMM-REGISTERED-INITIATED	129
5.1.3.2.1.2.4	5GMM-REGISTERED	129
5.1.3.2.1.2.5	5GMM-DEREGISTERED-INITIATED.....	129
5.1.3.2.1.2.6	5GMM-SERVICE-REQUEST-INITIATED.....	129
5.1.3.2.1.3	Substates of state 5GMM-DEREGISTERED	130
5.1.3.2.1.3.1	General	130
5.1.3.2.1.3.2	5GMM-DEREGISTERED.NORMAL-SERVICE	130
5.1.3.2.1.3.3	5GMM-DEREGISTERED.LIMITED-SERVICE.....	130
5.1.3.2.1.3.4	5GMM-DEREGISTERED.ATTEMPTING-REGISTRATION	130
5.1.3.2.1.3.5	5GMM-DEREGISTERED.PLMN-SEARCH	130
5.1.3.2.1.3.6	5GMM-DEREGISTERED.NO-SUPI	130
5.1.3.2.1.3.7	5GMM-DEREGISTERED.NO-CELL-AVAILABLE	130
5.1.3.2.1.3.8	5GMM-DEREGISTERED.eCALL-INACTIVE.....	130
5.1.3.2.1.3.9	5GMM-DEREGISTERED.INITIAL-REGISTRATION-NEEDED	131
5.1.3.2.1.4	Substates of state 5GMM-REGISTERED	131
5.1.3.2.1.4.1	General	131
5.1.3.2.1.4.2	5GMM-REGISTERED.NORMAL-SERVICE	131
5.1.3.2.1.4.3	5GMM-REGISTERED.NON-ALLOWED-SERVICE.....	131
5.1.3.2.1.4.4	5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE.....	131
5.1.3.2.1.4.5	5GMM-REGISTERED.LIMITED-SERVICE	132
5.1.3.2.1.4.6	5GMM-REGISTERED.PLMN-SEARCH	132
5.1.3.2.1.4.7	5GMM-REGISTERED.NO-CELL-AVAILABLE	132
5.1.3.2.1.4.8	5GMM-REGISTERED.UPDATE-NEEDED	132
5.1.3.2.2	5GS update status in the UE	132
5.1.3.2.3	5GMM sublayer states in the network side	133
5.1.3.2.3.1	General.....	133
5.1.3.2.3.2	5GMM-DEREGISTERED	134
5.1.3.2.3.3	5GMM-COMMON-PROCEDURE-INITIATED.....	134
5.1.3.2.3.4	5GMM-REGISTERED.....	134
5.1.3.2.3.5	5GMM-DEREGISTERED-INITIATED	134
5.1.4	Coordination between 5GMM and EMM.....	134
5.1.4.1	General	134
5.1.4.2	Coordination between 5GMM for 3GPP access and EMM with N26 interface	134
5.1.4.3	Coordination between 5GMM for 3GPP access and EMM without N26 interface	135
5.1.5	Coordination between 5GMM and GMM	135
5.2	Behaviour of the UE in state 5GMM-DEREGISTERED and state 5GMM-REGISTERED	135
5.2.1	General.....	135

5.2.2	UE behaviour in state 5GMM-DEREGISTERED	135
5.2.2.1	General	135
5.2.2.2	Primary substate selection	136
5.2.2.2.1	Selection of the substate after power on	136
5.2.2.3	Detailed description of UE behaviour in state 5GMM-DEREGISTERED	136
5.2.2.3.1	NORMAL-SERVICE	136
5.2.2.3.2	LIMITED-SERVICE	136
5.2.2.3.3	ATTEMPTING-REGISTRATION	137
5.2.2.3.4	PLMN-SEARCH	138
5.2.2.3.5	NO-SUPI	138
5.2.2.3.6	NO-CELL-AVAILABLE	138
5.2.2.3.7	eCALL-INACTIVE	138
5.2.2.3.8	INITIAL-REGISTRATION-NEEDED	138
5.2.2.4	Substate when back to state 5GMM-DEREGISTERED from another 5GMM state	138
5.2.3	UE behaviour in state 5GMM-REGISTERED	139
5.2.3.1	General	139
5.2.3.2	Detailed description of UE behaviour in state 5GMM-REGISTERED	139
5.2.3.2.1	NORMAL-SERVICE	139
5.2.3.2.2	NON-ALLOWED-SERVICE	139
5.2.3.2.3	ATTEMPTING-REGISTRATION-UPDATE	139
5.2.3.2.4	LIMITED-SERVICE	141
5.2.3.2.5	PLMN-SEARCH	141
5.2.3.2.6	NO-CELL-AVAILABLE	141
5.2.3.2.7	UPDATE-NEEDED	141
5.3	General on elementary 5GMM procedures	142
5.3.1	5GMM modes and N1 NAS signalling connection	142
5.3.1.1	Establishment of the N1 NAS signalling connection	142
5.3.1.2	Re-establishment of the N1 NAS signalling connection	143
5.3.1.3	Release of the N1 NAS signalling connection	144
5.3.1.4	5GMM-CONNECTED mode with RRC inactive indication	148
5.3.1.5	Suspend and resume of the N1 NAS signalling connection	151
5.3.2	Permanent identifiers	152
5.3.3	Temporary identities	155
5.3.4	Registration areas	156
5.3.5	Service area restrictions	157
5.3.5.1	General	157
5.3.5.2	3GPP access service area restrictions	157
5.3.5.3	Wireline access service area restrictions	160
5.3.6	Mobile initiated connection only mode	161
5.3.7	Handling of the periodic registration update timer and mobile reachable timer	163
5.3.8	Handling of timer T3502	165
5.3.9	Handling of NAS level mobility management congestion control	165
5.3.10	Handling of DNN based congestion control	166
5.3.11	Handling of S-NSSAI based congestion control	166
5.3.12	Handling of local emergency numbers	166
5.3.12A	Handling of local emergency numbers received via 3GPP access and non-3GPP access	167
5.3.12A.1	General	167
5.3.12A.2	Receiving a REGISTRATION ACCEPT message via non-3GPP access	168
5.3.13	Lists of 5GS forbidden tracking areas	168
5.3.13A	Forbidden PLMN lists	169
5.3.14	List of equivalent PLMNs	170
5.3.15	Transmission failure abnormal case in the UE	170
5.3.16	Extended DRX cycle for UEs in 5GMM-IDLE and 5GMM-CONNECTED mode with RRC inactive indication	170
5.3.17	Service Gap Control	171
5.3.18	Restriction on use of enhanced coverage	173
5.3.19	Handling of congestion control for transport of user data via the control plane	173
5.3.19a	Specific requirements for UE configured to use timer T3245	174
5.3.19a.1	UE not operating in SNPN access operation mode	174
5.3.19a.2	UE operating in SNPN access operation mode	174
5.3.20	Specific requirements for UE when receiving non-integrity protected reject messages	175
5.3.20.1	General	175

5.3.20.2	Requirements for UE in a PLMN.....	175
5.3.20.3	Requirements for UE in an SNPN.....	179
5.3.21	CIoT 5GS optimizations	183
5.3.22	Interaction between MICO mode with active time and extended idle mode DRX cycle	185
5.3.23	Forbidden wireline access area	185
5.3.24	WUS assistance	186
5.3.25	Paging Early Indication with Paging Subgrouping Assistance	186
5.4	5GMM common procedures.....	187
5.4.1	Primary authentication and key agreement procedure	187
5.4.1.1	General	187
5.4.1.2	EAP based primary authentication and key agreement procedure	187
5.4.1.2.1	General	187
5.4.1.2.2	EAP-AKA' related procedures.....	190
5.4.1.2.3	EAP-TLS related procedures.....	196
5.4.1.2.3A	Procedures related to EAP methods other than EAP-AKA' and EAP-TLS	201
5.4.1.2.3B	Procedures related to EAP methods used for primary authentication of an N5GC device.....	205
5.4.1.2.4	EAP message reliable transport procedure	206
5.4.1.2.4.3	EAP message reliable transport procedure accepted by the UE.....	207
5.4.1.2.5	EAP result message transport procedure	209
5.4.1.3	5G AKA based primary authentication and key agreement procedure	210
5.4.1.3.1	General	210
5.4.1.3.2	Authentication initiation by the network	211
5.4.1.3.3	Authentication response by the UE	211
5.4.1.3.4	Authentication completion by the network.....	212
5.4.1.3.5	Authentication not accepted by the network.....	213
5.4.1.3.6	Authentication not accepted by the UE	215
5.4.1.3.7	Abnormal cases	216
5.4.2	Security mode control procedure	220
5.4.2.1	General	220
5.4.2.2	NAS security mode control initiation by the network.....	220
5.4.2.3	NAS security mode command accepted by the UE.....	223
5.4.2.4	NAS security mode control completion by the network	226
5.4.2.5	NAS security mode command not accepted by the UE.....	226
5.4.2.6	Abnormal cases in the UE	226
5.4.2.7	Abnormal cases on the network side	227
5.4.3	Identification procedure	227
5.4.3.1	General	227
5.4.3.2	Identification initiation by the network.....	227
5.4.3.3	Identification response by the UE	228
5.4.3.4	Identification completion by the network	228
5.4.3.5	Abnormal cases in the UE	228
5.4.3.6	Abnormal cases on the network side	228
5.4.4	Generic UE configuration update procedure.....	229
5.4.4.1	General	229
5.4.4.2	Generic UE configuration update procedure initiated by the network	232
5.4.4.3	Generic UE configuration update accepted by the UE	237
5.4.4.4	Generic UE configuration update completion by the network	242
5.4.4.5	Abnormal cases in the UE	243
5.4.4.6	Abnormal cases on the network side	243
5.4.5	NAS transport procedure(s)	245
5.4.5.1	General	245
5.4.5.2	UE-initiated NAS transport procedure	245
5.4.5.2.1	General	245
5.4.5.2.2	UE-initiated NAS transport procedure initiation	246
5.4.5.2.3	UE-initiated NAS transport of messages accepted by the network	248
5.4.5.2.4	UE-initiated NAS transport of messages not accepted by the network	252
5.4.5.2.5	Abnormal cases on the network side	255
5.4.5.2.6	Abnormal cases in the UE	259
5.4.5.3	Network-initiated NAS transport procedure	261
5.4.5.3.1	General	261
5.4.5.3.2	Network-initiated NAS transport procedure initiation	262
5.4.5.3.3	Network-initiated NAS transport of messages	266

5.4.6	5GMM status procedure	271
5.4.6.1	General	271
5.4.6.2	5GMM status received in the UE	272
5.4.6.3	5GMM status received in the network	272
5.4.7	Network slice-specific authentication and authorization procedure	272
5.4.7.1	General	272
5.4.7.2	Network slice-specific EAP message reliable transport procedure	273
5.4.7.2.1	Network slice-specific EAP message reliable transport procedure initiation	273
5.4.7.2.2	Network slice-specific EAP message reliable transport procedure accepted by the UE	274
5.4.7.2.3	Abnormal cases on the network side	274
5.4.7.2.4	Abnormal cases in the UE	274
5.4.7.3	Network slice-specific EAP result message transport procedure	275
5.4.7.3.1	Network slice-specific EAP result message transport procedure initiation	275
5.5	5GMM specific procedures	275
5.5.1	Registration procedure	275
5.5.1.1	General	275
5.5.1.2	Registration procedure for initial registration	277
5.5.1.2.1	General	277
5.5.1.2.2	Initial registration initiation	277
5.5.1.2.3	5GMM common procedure initiation	284
5.5.1.2.4	Initial registration accepted by the network	285
5.5.1.2.5	Initial registration not accepted by the network	304
5.5.1.2.6	Initial registration for emergency services not accepted by the network	317
5.5.1.2.6A	Initial registration for initiating an emergency PDU session not accepted by the network	318
5.5.1.2.7	Abnormal cases in the UE	319
5.5.1.2.8	Abnormal cases on the network side	321
5.5.1.3	Registration procedure for mobility and periodic registration update	323
5.5.1.3.1	General	323
5.5.1.3.2	Mobility and periodic registration update initiation	323
5.5.1.3.3	5GMM common procedure initiation	335
5.5.1.3.4	Mobility and periodic registration update accepted by the network	336
5.5.1.3.5	Mobility and periodic registration update not accepted by the network	361
5.5.1.3.6	Mobility and periodic registration update for initiating an emergency PDU session not accepted by the network	375
5.5.1.3.6A	Mobility and periodic registration update for an emergency services fallback not accepted by the network	375
5.5.1.3.7	Abnormal cases in the UE	376
5.5.1.3.8	Abnormal cases on the network side	379
5.5.2	De-registration procedure	382
5.5.2.1	General	382
5.5.2.2	UE-initiated de-registration procedure	384
5.5.2.2.1	UE-initiated de-registration procedure initiation	384
5.5.2.2.2	UE-initiated de-registration procedure completion	385
5.5.2.2.3	UE-initiated de-registration procedure completion for 5GS services over 3GPP access	385
5.5.2.2.4	UE-initiated de-registration procedure completion for 5GS services over non-3GPP access	386
5.5.2.2.5	UE-initiated de-registration procedure completion for 5GS services over both 3GPP access and non-3GPP access	386
5.5.2.2.6	Abnormal cases in the UE	386
5.5.2.2.7	Abnormal cases in the network side	388
5.5.2.3	Network-initiated de-registration procedure	389
5.5.2.3.1	Network-initiated de-registration procedure initiation	389
5.5.2.3.2	Network-initiated de-registration procedure completion by the UE	390
5.5.2.3.3	Network-initiated de-registration procedure completion by the network	400
5.5.2.3.4	Abnormal cases in the UE	401
5.5.2.3.5	Abnormal cases in the network side	401
5.5.3	eCall inactivity procedure	402
5.5.4	Authentication and key agreement procedure for 5G ProSe UE-to-network relay	403
5.5.4.1	General	403
5.5.4.2	ProSe relay transaction identity (PRTI)	404
5.5.4.3	UE-initiated authentication and key agreement procedure initiation	404
5.5.4.4	UE-initiated authentication and key agreement procedure accepted by the network	405
5.5.4.5	UE-initiated authentication and key agreement procedure not accepted by the network	406

5.5.4.6	Abnormal cases in the UE	406
5.5.4.7	Abnormal cases on the network side	406
5.6	5GMM connection management procedures	407
5.6.1	Service request procedure	407
5.6.1.1	General	407
5.6.1.2	Service request procedure initiation	411
5.6.1.2.1	UE is not using 5GS services with control plane CIoT 5GS optimization	411
5.6.1.2.2	UE is using 5GS services with control plane CIoT 5GS optimization	413
5.6.1.3	Common procedure initiation	416
5.6.1.4	Service request procedure accepted by the network	416
5.6.1.4.1	UE is not using 5GS services with control plane CIoT 5GS optimization	416
5.6.1.4.2	UE is using 5GS services with control plane CIoT 5GS optimization	420
5.6.1.5	Service request procedure not accepted by the network	424
5.6.1.6	Service request procedure for initiating an emergency PDU session not accepted by the network	435
5.6.1.6A	Service request procedure for an emergency services fallback not accepted by the network	436
5.6.1.7	Abnormal cases in the UE	436
5.6.1.8	Abnormal cases on the network side	440
5.6.2	Paging procedure	442
5.6.2.1	General	442
5.6.2.2	Paging for 5GS services	442
5.6.2.2.1	General	442
5.6.2.2.2	Abnormal cases on the network side	444
5.6.2.2.3	Abnormal cases in the UE	445
5.6.3	Notification procedure	445
5.6.3.1	General	445
5.6.3.2	Notification procedure initiation	445
5.6.3.3	Notification procedure completion	447
5.6.3.4	Abnormal cases on the network side	448
5.6.3.5	Abnormal cases on the UE side	448
6	Elementary procedures for 5GS session management	448
6.1	Overview	448
6.1.1	General	448
6.1.2	Types of 5GSM procedures	449
6.1.3	5GSM sublayer states	450
6.1.3.1	General	450
6.1.3.2	5GSM sublayer states in the UE	450
6.1.3.2.1	Overview	450
6.1.3.2.2	PDU SESSION INACTIVE	450
6.1.3.2.3	PDU SESSION ACTIVE PENDING	450
6.1.3.2.4	PDU SESSION ACTIVE	450
6.1.3.2.5	PDU SESSION INACTIVE PENDING	450
6.1.3.2.6	PDU SESSION MODIFICATION PENDING	451
6.1.3.2.7	PROCEDURE TRANSACTION INACTIVE	451
6.1.3.2.8	PROCEDURE TRANSACTION PENDING	451
6.1.3.3	5GSM sublayer states in the network side	451
6.1.3.3.1	Overview	451
6.1.3.3.2	PDU SESSION INACTIVE	452
6.1.3.3.3	PDU SESSION ACTIVE	452
6.1.3.3.4	PDU SESSION INACTIVE PENDING	452
6.1.3.3.5	PDU SESSION MODIFICATION PENDING	452
6.1.3.3.6	PROCEDURE TRANSACTION INACTIVE	452
6.1.3.3.7	PROCEDURE TRANSACTION PENDING	452
6.1.4	Coordination between 5GSM and ESM	452
6.1.4.1	Coordination between 5GSM and ESM with N26 interface	452
6.1.4.2	Coordination between 5GSM and ESM without N26 interface	465
6.1.4a	Coordination between 5GSM and SM	467
6.1.5	Coordination for interworking with ePDG connected to EPC	467
6.2	General on elementary 5GSM procedures	468
6.2.1	Principles of PTI handling for 5GSM procedures	468
6.2.2	PDU session types	470
6.2.3	PDU session management	470

6.2.4	IP address allocation	470
6.2.4.1	General	470
6.2.4.2	IP address allocation via NAS signalling	471
6.2.4.3	Additional RG related requirements for IP address allocation	472
6.2.4.4	Additional requirements of the UE acting as 5G ProSe layer-3 UE-to-network relay UE for IP address allocation	472
6.2.5	Quality of service	473
6.2.5.1	General	473
6.2.5.1.1	QoS rules	473
6.2.5.1.1.1	General	473
6.2.5.1.1.2	Signalled QoS rules	473
6.2.5.1.1.3	Derived QoS rules	474
6.2.5.1.1.4	QoS flow descriptions	475
6.2.5.1.2	Session-AMBR	475
6.2.5.1.2A	Void	475
6.2.5.1.3	UL user data packet matching	475
6.2.5.1.4	Reflective QoS	476
6.2.5.1.4.1	General	476
6.2.5.1.4.2	Derivation of packet filter for UL direction from DL user data packet	476
6.2.5.1.4.3	Creating a derived QoS rule by reflective QoS in the UE	478
6.2.5.1.4.4	Updating a derived QoS rule by reflective QoS in the UE	478
6.2.5.1.4.5	Deleting a derived QoS rule in the UE	479
6.2.5.1.4.6	Ignoring RQI in the UE	479
6.2.5.2	QoS in MA PDU session	479
6.2.6	Local area data network (LADN)	479
6.2.7	Handling of DNN based congestion control	480
6.2.8	Handling of S-NSSAI based congestion control	481
6.2.9	Interaction with upper layers	483
6.2.9.1	General	483
6.2.9.2	URSP	483
6.2.9.3	ProSeP	484
6.2.10	Handling of 3GPP PS data off	484
6.2.11	Multi-homed IPv6 PDU session	486
6.2.12	Handling of network rejection not due to congestion control	486
6.2.13	Handling of Small data rate control	488
6.2.14	Handling of Serving PLMN rate control	489
6.2.15	Handling of Reliable Data Service	489
6.2.16	Handling of header compression for control plane CIoT optimizations	489
6.2.17	Handling of edge computing enhancements	490
6.2.18	Support of redundant PDU sessions	491
6.3	Network-requested 5GSM procedures	491
6.3.1	PDU session authentication and authorization procedure	491
6.3.1.1	General	491
6.3.1.2	PDU EAP message reliable transport procedure	493
6.3.1.2.1	PDU EAP message reliable transport procedure initiation	493
6.3.1.2.2	PDU EAP message reliable transport procedure accepted by the UE	494
6.3.1.2.3	Abnormal cases on the network side	495
6.3.1.2.4	Abnormal cases in the UE	495
6.3.1.3	PDU EAP result message transport procedure	495
6.3.1.3.1	PDU EAP result message transport procedure initiation	495
6.3.1.3.2	Abnormal cases in the UE	496
6.3.1A	Service-level authentication and authorization procedure	496
6.3.1A.1	General	496
6.3.1A.2	Service-level authentication and authorization procedure initiation	497
6.3.1A.3	Service-level authentication and authorization procedure accepted by the UE	498
6.3.1A.4	Abnormal cases on the network side	498
6.3.1A.5	Abnormal cases in the UE	498
6.3.2	Network-requested PDU session modification procedure	499
6.3.2.1	General	499
6.3.2.2	Network-requested PDU session modification procedure initiation	499
6.3.2.3	Network-requested PDU session modification procedure accepted by the UE	504
6.3.2.4	Network-requested PDU session modification procedure not accepted by the UE	512

6.3.2.5	Abnormal cases on the network side	517
6.3.2.6	Abnormal cases in the UE	518
6.3.3	Network-requested PDU session release procedure	518
6.3.3.1	General	518
6.3.3.2	Network-requested PDU session release procedure initiation	518
6.3.3.3	Network-requested PDU session release procedure accepted by the UE	521
6.3.3.4	N1 SM delivery skipped	530
6.3.3.5	Abnormal cases on the network side	530
6.3.3.6	Abnormal cases in the UE	530
6.4	UE-requested 5GSM procedures	531
6.4.1	UE-requested PDU session establishment procedure	531
6.4.1.1	General	531
6.4.1.2	UE-requested PDU session establishment procedure initiation	531
6.4.1.3	UE-requested PDU session establishment procedure accepted by the network	541
6.4.1.4	UE-requested PDU session establishment procedure not accepted by the network	554
6.4.1.4.1	General	554
6.4.1.4.2	Handling of network rejection due to congestion control	558
6.4.1.4.3	Handling of network rejection not due to congestion control	564
6.4.1.5	Handling the maximum number of established PDU sessions	571
6.4.1.5A	Handling the maximum number of allowed active user-plane resources for PDU sessions of UEs in NB-N1 mode	573
6.4.1.6	Abnormal cases in the UE	573
6.4.1.7	Abnormal cases on the network side	575
6.4.2	UE-requested PDU session modification procedure	576
6.4.2.1	General	576
6.4.2.2	UE-requested PDU session modification procedure initiation	577
6.4.2.3	UE-requested PDU session modification procedure accepted by the network	582
6.4.2.4	UE-requested PDU session modification procedure not accepted by the network	582
6.4.2.4.1	General	582
6.4.2.4.2	Handling of network rejection due to congestion control	583
6.4.2.4.3	Handling of network rejection not due to congestion control	590
6.4.2.5	Abnormal cases in the UE	593
6.4.2.6	Abnormal cases on the network side	594
6.4.3	UE-requested PDU session release procedure	595
6.4.3.1	General	595
6.4.3.2	UE-requested PDU session release procedure initiation	595
6.4.3.3	UE-requested PDU session release procedure accepted by the network	596
6.4.3.4	UE-requested PDU session release procedure not accepted by the network	596
6.4.3.5	Abnormal cases in the UE	596
6.4.3.6	Abnormal cases on the network side	598
6.5	5GSM status procedure	598
6.5.1	General	598
6.5.2	5GSM status received in the UE	598
6.5.3	5GSM status received in the SMF	599
6.6	Miscellaneous procedures	599
6.6.1	Exchange of extended protocol configuration options	599
6.6.2	Remote UE report procedure	599
6.6.2.1	General	599
6.6.2.2	Remote UE report procedure initiation	599
6.6.2.3	Remote UE report procedure accepted by the network	600
6.6.2.4	Abnormal cases in the UE	600
6.6.2.5	Abnormal cases on the network side	601
7	Handling of unknown, unforeseen, and erroneous protocol data	601
7.1	General	601
7.2	Message too short or too long	602
7.2.1	Message too short	602
7.2.2	Message too long	602
7.3	Unknown or unforeseen procedure transaction identity or PDU Session identity	602
7.3.1	Procedure transaction identity	602
7.3.2	PDU Session identity	603
7.4	Unknown or unforeseen message type	604

7.5	Non-semantic mandatory information element errors	604
7.5.1	Common procedures	604
7.5.2	5GS mobility management	604
7.5.3	5GS session management	605
7.6	Unknown and unforeseen IEs in the non-imperative message part	605
7.6.1	IEs unknown in the message	605
7.6.2	Out of sequence IEs	605
7.6.3	Repeated IEs	605
7.7	Non-imperative message part errors	605
7.7.1	Syntactically incorrect optional IEs	606
7.7.2	Conditional IE errors	606
7.8	Messages with semantically incorrect contents	606
8	Message functional definitions and contents	606
8.1	Overview	606
8.2	5GS mobility management messages	606
8.2.1	Authentication request	606
8.2.1.1	Message definition	606
8.2.1.2	Authentication parameter RAND	607
8.2.1.3	Authentication parameter AUTN	607
8.2.1.4	Void	607
8.2.1.5	EAP message	607
8.2.2	Authentication response	607
8.2.2.1	Message definition	607
8.2.2.2	Authentication response parameter	608
8.2.2.3	EAP message	608
8.2.3	Authentication result	608
8.2.3.1	Message definition	608
8.2.3.2	ABBA	608
8.2.4	Authentication failure	609
8.2.4.1	Message definition	609
8.2.4.2	Authentication failure parameter	609
8.2.5	Authentication reject	609
8.2.5.1	Message definition	609
8.2.5.2	EAP message	610
8.2.6	Registration request	610
8.2.6.1	Message definition	610
8.2.6.2	Non-current native NAS key set identifier	613
8.2.6.3	5GMM capability	613
8.2.6.4	UE security capability	613
8.2.6.5	Requested NSSAI	613
8.2.6.6	Last visited registered TAI	613
8.2.6.7	S1 UE network capability	613
8.2.6.8	Uplink data status	614
8.2.6.9	PDU session status	614
8.2.6.10	MICO indication	614
8.2.6.11	UE status	614
8.2.6.12	Additional GUTI	614
8.2.6.13	Allowed PDU session status	614
8.2.6.14	UE's usage setting	614
8.2.6.15	Requested DRX parameters	614
8.2.6.16	EPS NAS message container	614
8.2.6.17	LADN indication	615
8.2.6.17A	Payload container type	615
8.2.6.18	Payload container	615
8.2.6.19	Network slicing indication	615
8.2.6.20	5GS update type	615
8.2.6.21	NAS message container	615
8.2.6.22	Requested extended DRX parameters	615
8.2.6.23	EPS bearer context status	615
8.2.6.24	T3324 value	615
8.2.6.25	Mobile station classmark 2	616

8.2.6.26	Supported codecs	616
8.2.6.27	UE radio capability ID	616
8.2.6.28	Requested mapped NSSAI	616
8.2.6.29	Additional information requested	616
8.2.6.30	Requested WUS assistance information	616
8.2.6.31	Void	616
8.2.6.32	N5GC indication	616
8.2.6.33	Requested NB-N1 mode DRX parameters	616
8.2.6.34	UE request type	616
8.2.6.35	Paging restriction	616
8.2.6.35	Service-level-AA container	616
8.2.6.36	NID	617
8.2.6.37	MS determined PLMN with disaster condition	617
8.2.6.38	Requested PEIPS assistance information	617
8.2.7	Registration accept	617
8.2.7.1	Message definition	617
8.2.7.2	5G-GUTI	620
8.2.7.3	Equivalent PLMNs	620
8.2.7.4	TAI list	621
8.2.7.5	Allowed NSSAI	621
8.2.7.6	Rejected NSSAI	621
8.2.7.7	Configured NSSAI	621
8.2.7.8	5GS network feature support	621
8.2.7.9	PDU session status	621
8.2.7.10	PDU session reactivation result	621
8.2.7.11	PDU session reactivation result error cause	622
8.2.7.12	LADN information	622
8.2.7.13	MICO indication	622
8.2.7.14	Network slicing indication	622
8.2.7.15	Service area list	622
8.2.7.16	T3512 value	622
8.2.7.17	Non-3GPP de-registration timer value	622
8.2.7.18	T3502 value	622
8.2.7.19	Emergency number list	622
8.2.7.20	Extended emergency number list	622
8.2.7.21	SOR transparent container	622
8.2.7.22	EAP message	623
8.2.7.23	NSSAI inclusion mode	623
8.2.7.24	Operator-defined access category definitions	623
8.2.7.25	Negotiated DRX parameters	623
8.2.7.26	Non-3GPP NW policies	623
8.2.7.27	Negotiated extended DRX parameters	623
8.2.7.28	T3447 value	623
8.2.7.29	T3448 value	623
8.2.7.30	T3324 value	623
8.2.7.31	EPS bearer context status	623
8.2.7.32	UE radio capability ID	624
8.2.7.33	UE radio capability ID deletion indication	624
8.2.7.34	Pending NSSAI	624
8.2.7.35	Ciphering key data	624
8.2.7.36	CAG information list	624
8.2.7.37	Truncated 5G-S-TMSI configuration	624
8.2.7.38	Negotiated NB-N1 mode DRX parameters	624
8.2.7.39	Negotiated WUS assistance information	624
8.2.7.40	Extended rejected NSSAI	624
8.2.7.41	Service-level-AA container	625
8.2.7.42	Negotiated PEIPS assistance information	625
8.2.7.43	5GS additional request result	625
8.2.7.44	NSSRG information	625
8.2.7.45	Disaster roaming wait range	625
8.2.7.46	Disaster return wait range	625
8.2.7.47	List of PLMNs to be used in disaster condition	625

8.2.7.48	Forbidden TAI(s) for the list of "5GS forbidden tracking areas for roaming"	625
8.2.7.49	Forbidden TAI(s) for the list of "5GS forbidden tracking areas for regional provision of service"	625
8.2.7.50	Extended CAG information list.....	625
8.2.7.51	NSAG information	625
8.2.8	Registration complete	626
8.2.8.1	Message definition	626
8.2.8.2	SOR transparent container	626
8.2.9	Registration reject.....	626
8.2.9.1	Message definition	626
8.2.9.2	T3346 value.....	627
8.2.9.3	T3502 value.....	627
8.2.9.4	EAP message.....	627
8.2.9.5	Rejected NSSAI	627
8.2.9.6	CAG information list.....	627
8.2.9.7	Extended rejected NSSAI	628
8.2.9.8	Disaster return wait range	628
8.2.9.9	Extended CAG information list.....	628
8.2.9.10	Lower bound timer value	628
8.2.9.11	Forbidden TAI(s) for the list of "5GS forbidden tracking areas for roaming"	628
8.2.9.12	Forbidden TAI(s) for the list of "5GS forbidden tracking areas for regional provision of service"	628
8.2.10	UL NAS transport.....	628
8.2.10.1	Message definition	628
8.2.10.2	PDU session ID	629
8.2.10.3	Old PDU session ID	629
8.2.10.4	Request type	629
8.2.10.5	S-NSSAI	629
8.2.10.6	DNN.....	629
8.2.10.7	Additional information.....	630
8.2.10.8	MA PDU session information.....	630
8.2.10.9	Release assistance indication	630
8.2.11	DL NAS transport.....	630
8.2.11.1	Message definition	630
8.2.11.2	PDU session ID	631
8.2.11.3	Additional information.....	631
8.2.11.4	5GMM cause.....	631
8.2.11.5	Back-off timer value	631
8.2.11.6	Lower bound timer value	631
8.2.12	De-registration request (UE originating de-registration)	631
8.2.12.1	Message definition	631
8.2.13	De-registration accept (UE originating de-registration).....	632
8.2.13.1	Message definition	632
8.2.14	De-registration request (UE terminated de-registration).....	632
8.2.14.1	Message definition	632
8.2.14.2	5GMM cause.....	633
8.2.14.3	T3346 value.....	633
8.2.14.4	Rejected NSSAI	633
8.2.14.5	CAG information list.....	633
8.2.14.6	Extended rejected NSSAI	633
8.2.14.7	Disaster return wait range	634
8.2.14.8	Lower bound timer value	634
8.2.14.9	Forbidden TAI(s) for the list of "5GS forbidden tracking areas for roaming"	634
8.2.14.10	Forbidden TAI(s) for the list of "5GS forbidden tracking areas for regional provision of service"	634
8.2.15	De-registration accept (UE terminated de-registration).....	634
8.2.15.1	Message definition	634
8.2.16	Service request.....	634
8.2.16.1	Message definition	634
8.2.16.2	Uplink data status.....	635
8.2.16.3	PDU session status	635
8.2.16.4	Allowed PDU session status	635
8.2.16.5	NAS message container	635
8.2.16.6	UE request type	635
8.2.16.7	Paging restriction	635