

ETSI TS 138 300 V17.0.0 (2022-05)



iTeh STANDARD

5G;

PREVIEW

NR;

NR and NG-RAN Overall description;

(standards.iteh.ai)

Stage-2

(3GPP TS 38.300 version 17.0.0 Release 17)

[ETSI TS 138 300 V17.0.0 \(2022-05\)](https://standards.iteh.ai/catalog/standards/sist/be7d5812-d3f9-436f-b239-567effe7ce2d/etsi-ts-138-300-v17-0-0-2022-05)

<https://standards.iteh.ai/catalog/standards/sist/be7d5812-d3f9-436f-b239-567effe7ce2d/etsi-ts-138-300-v17-0-0-2022-05>



ReferenceRTS/TSGR-0238300vh00

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://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

(standards.iteh.ai)

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.....	11
1 Scope	12
2 References	12
3 Abbreviations and Definitions.....	14
3.1 Abbreviations	14
3.2 Definitions	17
4 Overall Architecture and Functional Split.....	19
4.1 Overall Architecture	19
4.2 Functional Split	20
4.3 Network Interfaces	22
4.3.1 NG Interface	22
4.3.1.1 NG User Plane	22
4.3.1.2 NG Control Plane.....	23
4.3.2 Xn Interface	23
4.3.2.1 Xn User Plane	23
4.3.2.2 Xn Control Plane.....	24
4.4 Radio Protocol Architecture.....	25
4.4.1 User Plane.....	25
4.4.2 Control Plane	25
4.5 Multi-Radio Dual Connectivity	25
4.6 Radio Access Network Sharing.....	26
4.7 Integrated Access and Backhaul.....	26
4.7.1 Architecture	26
4.7.2 Protocol Stacks	27
4.7.3 User-plane Aspects	28
4.7.3.1 Backhaul transport	28
4.7.3.2 Flow and Congestion Control	29
4.7.3.3 Uplink Scheduling Latency	29
4.7.4 Signalling procedures	29
4.7.4.1 IAB-node Integration	29
4.7.4.2 IAB-node Migration.....	30
4.7.4.3 Topological Redundancy	30
4.7.4.4 Backhaul RLF Recovery	30
4.7.4.5 OTA timing synchronization.....	30
4.7.4.6 Inter node discovery.....	31
4.8 Non-Public Networks	31
5 Physical Layer	31
5.1 Waveform, numerology and frame structure.....	31
5.2 Downlink.....	32
5.2.1 Downlink transmission scheme	32
5.2.2 Physical-layer processing for physical downlink shared channel	32
5.2.3 Physical downlink control channels.....	33
5.2.4 Synchronization signal and PBCH block.....	34
5.2.5 Physical layer procedures	35
5.2.5.1 Link adaptation	35
5.2.5.2 Power Control	35
5.2.5.3 Cell search.....	35
5.2.5.4 HARQ	35
5.2.5.5 Reception of SIB1	35
5.2.6 Downlink Reference Signals and Measurements for Positioning	35

5.3	Uplink.....	36
5.3.1	Uplink transmission scheme	36
5.3.2	Physical-layer processing for physical uplink shared channel.....	36
5.3.3	Physical uplink control channel.....	37
5.3.4	Random access.....	38
5.3.5	Physical layer procedures	38
5.3.5.1	Link adaptation	38
5.3.5.2	Uplink Power control	39
5.3.5.3	Uplink timing control	39
5.3.5.4	HARQ	39
5.3.5.5	Prioritization of overlapping transmissions.....	39
5.3.6	Uplink Reference Signals and Measurements for Positioning.....	39
5.4	Carrier aggregation.....	40
5.4.1	Carrier aggregation	40
5.4.2	Supplementary Uplink	40
5.4.3	Uplink Tx switching	40
5.5	Transport Channels.....	40
5.6	Access to Shared Spectrum	41
5.6.1	Overview	41
5.6.2	Channel Access Priority Classes.....	42
5.7	Sidelink	42
5.7.1	General.....	42
5.7.2	Sidelink resource allocation modes	43
5.7.3	Physical sidelink channels and signals.....	43
5.7.4	Physical layer procedures for sidelink.....	43
5.7.4.1	HARQ feedback.....	43
5.7.4.2	Power Control	43
5.7.4.3	CSI report.....	43
5.7.5	Physical layer measurement definition	43
6	Layer 2.....	44
6.1	Overview	44
6.2	MAC Sublayer.....	47
6.2.1	Services and Functions	47
6.2.2	Logical Channels.....	48
6.2.3	Mapping to Transport Channels.....	48
6.2.4	HARQ.....	48
6.3	RLC Sublayer.....	48
6.3.1	Transmission Modes	48
6.3.2	Services and Functions	49
6.3.3	ARQ.....	49
6.4	PDCCP Sublayer.....	49
6.4.1	Services and Functions	49
6.5	SDAP Sublayer	50
6.6	L2 Data Flow.....	50
6.7	Carrier Aggregation.....	50
6.8	Dual Connectivity.....	52
6.9	Supplementary Uplink.....	52
6.10	Bandwidth Adaptation.....	52
6.11	Backhaul Adaptation Protocol Sublayer.....	53
6.11.1	Services and Functions	53
6.11.2	Traffic Mapping from Upper Layers to Layer-2.....	53
6.11.3	Routing, BAP Header Rewriting and BH-RLC-channel Mapping on BAP sublayer	54
6.12	Multiple Transmit/Receive Point Operation.....	56
7	RRC.....	56
7.1	Services and Functions	56
7.2	Protocol States	57
7.3	System Information Handling	58
7.3.1	Overview	58
7.3.2	Scheduling	59
7.3.3	SI Modification.....	60

7.4	Access Control	60
7.5	UE Capability Retrieval framework	60
7.6	Transport of NAS Messages	61
7.7	Carrier Aggregation	61
7.8	Bandwidth Adaptation	61
7.9	UE Assistance Information	61
7.10	Segmentation of RRC messages	62
8	NG Identities	62
8.1	UE Identities	62
8.2	Network Identities	63
8.3	User Data Transport on the CN-RAN Interface	64
8.4	NR sidelink communication and V2X sidelink communication related identities	64
9	Mobility and State Transitions	64
9.1	Overview	64
9.2	Intra-NR	65
9.2.1	Mobility in RRC_IDLE	65
9.2.1.1	Cell Selection	65
9.2.1.2	Cell Reselection	66
9.2.1.3	State Transitions	67
9.2.2	Mobility in RRC_INACTIVE	68
9.2.2.1	Overview	68
9.2.2.2	Cell Reselection	69
9.2.2.3	RAN-Based Notification Area	69
9.2.2.4	State Transitions	70
9.2.2.4.1	UE triggered transition from RRC_INACTIVE to RRC_CONNECTED	70
9.2.2.4.2	Network triggered transition from RRC_INACTIVE to RRC_CONNECTED	72
9.2.2.5	RNA update	72
9.2.2.6	Resume request responded with Release with Redirect, with UE context relocation	74
9.2.3	Mobility in RRC_CONNECTED	75
9.2.3.1	Overview	75
9.2.3.2	Handover	77
9.2.3.2.1	C-Plane Handling	77
9.2.3.2.2	U-Plane Handling	81
9.2.3.2.3	Data Forwarding	83
9.2.3.3	Re-establishment procedure	84
9.2.3.4	Conditional Handover	85
9.2.3.4.1	General	85
9.2.3.4.2	C-plane handling	86
9.2.3.4.3	U-plane handling	88
9.2.3.4.4	Data Forwarding	88
9.2.4	Measurements	88
9.2.5	Paging	91
9.2.6	Random Access Procedure	94
9.2.7	Radio Link Failure	96
9.2.8	Beam failure detection and recovery	97
9.2.9	Timing Advance	98
9.2.10	Extended DRX for RRC_IDLE and RRC_INACTIVE	98
9.3	Inter RAT	99
9.3.1	NR-E-UTRA mobility: Intra 5GC	99
9.3.1.1	Cell Reselection	99
9.3.1.2	Handover	99
9.3.1.3	Measurements	99
9.3.2	NR-E-UTRA mobility: From 5GC to EPC	99
9.3.2.1	Cell Reselection	99
9.3.2.2	Handover and redirection	100
9.3.2.3	Measurements	100
9.3.2.4	Data Forwarding for the Control Plane	100
9.3.2.5	Data Forwarding for the User Plane	101
9.3.3	NR-E-UTRA mobility: From EPC to 5GC	101
9.3.3.1	Data Forwarding for the Control Plane	101

9.3.3.2	Data Forwarding for the User Plane.....	102
9.3.4	NR-UTRA mobility	102
9.3.4.1	Handover with SRVCC operation.....	102
9.3.4.2	Measurements	103
9.4	Roaming and Access Restrictions	103
10	Scheduling.....	103
10.1	Basic Scheduler Operation	103
10.2	Downlink Scheduling	104
10.3	Uplink Scheduling.....	104
10.4	Measurements to Support Scheduler Operation	105
10.5	Rate Control	106
10.5.1	Downlink	106
10.5.2	Uplink	106
10.6	Activation/Deactivation Mechanism	106
10.7	E-UTRA-NR Cell Resource Coordination	107
10.8	Cross Carrier Scheduling.....	107
10.9	IAB Resource Configuration.....	108
11	UE Power Saving	108
12	QoS.....	110
12.1	Overview	110
12.2	Explicit Congestion Notification.....	113
13	Security.....	113
13.1	Overview and Principles	113
13.2	Security Termination Points.....	115
13.3	State Transitions and Mobility	115
14	UE Capabilities	115
15	Self-Configuration and Self-Optimisation	117
15.1	Definitions	117
15.2	Void.....	117
15.3	Self-configuration.....	117
15.3.1	Dynamic configuration of the NG-C interface	117
15.3.1.1	Prerequisites	117
15.3.1.2	SCTP initialization.....	117
15.3.1.3	Application layer initialization.....	117
15.3.2	Dynamic Configuration of the Xn interface	118
15.3.2.1	Prerequisites	118
15.3.2.2	SCTP initialization.....	118
15.3.2.3	Application layer initialization.....	118
15.3.3	Automatic Neighbour Cell Relation Function	118
15.3.3.1	General	118
15.3.3.2	Intra-system Automatic Neighbour Cell Relation Function.....	119
15.3.3.3	Void.....	120
15.3.3.4	Void.....	120
15.3.3.5	Inter-system Automatic Neighbour Cell Relation Function.....	120
15.3.4	Xn-C TNL address discovery	121
15.4	Support for Energy Saving	122
15.4.1	General.....	122
15.4.2	Solution description	122
15.4.2.1	Intra-system energy saving	122
15.4.2.2	Inter-system energy saving	122
15.4.3	O&M requirements.....	122
15.5	Self-optimisation	123
15.5.1	Support for Mobility Load Balancing.....	123
15.5.1.1	General	123
15.5.1.2	Load reporting for intra-RAT and intra-system inter-RAT load balancing.....	123
15.5.1.4	Adapting handover and/or reselection configuration	124
15.5.1.5	Load reporting for inter-system load balancing	124
15.5.2	Support for Mobility Robustness Optimization	124

15.5.2.1	General	124
15.5.2.2	Connection failure	125
15.5.2.2.1	General	125
15.5.2.2.2	Connection failure due to intra-system mobility	125
15.5.2.2.3	Connection failure due to inter-system mobility	126
15.5.2.3	Inter-system Unnecessary HO	127
15.5.2.4	Inter-system Ping-pong	127
15.5.2.5	O&M Requirements	128
15.5.2.6	PSCell change failure	128
15.5.3	Support for RACH Optimization	128
15.5.4	UE History Information from the UE	128
15.5.5	Support for Coverage and Capacity Optimisation	129
15.5.5.1	General	129
15.5.5.2	OAM requirements.....	129
15.5.5.3	Dynamic coverage configuration changes	129
15.5.6	Support for PCI Optimisation	129
15.5.6.1	Centralized PCI Assignment	129
15.5.6.2	Distributed PCI Assignment	129
16	Verticals Support.....	130
16.1	URLLC.....	130
16.1.1	Overview	130
16.1.2	LCP Restrictions.....	130
16.1.3	Packet Duplication.....	130
16.1.4	CQI and MCS	131
16.1.5	DCI formats	131
16.1.6	Higher layer multi-connectivity.....	131
16.1.6.1	Redundant user plane paths based on dual connectivity	131
16.1.6.2	Redundant data transmission via single UPF and single RAN node.....	131
16.1.7	URLLC in Unlicensed Controlled Environment.....	132
16.1.8	PUCCH cell switching for TDD cells.....	132
16.2	IMS Voice	132
16.2.0	Support for IMS voice	132
16.2.1	Support for MMTEL IMS voice and video enhancements	132
16.2.1.1	RAN-assisted codec adaptation.....	132
16.2.1.2	MMTEL voice quality/coverage enhancements.....	133
16.3	Network Slicing.....	133
16.3.1	General Principles and Requirements	133
16.3.2	AMF and NW Slice Selection.....	135
16.3.2.1	CN-RAN interaction and internal RAN aspects.....	135
16.3.2.2	Radio Interface Aspects	135
16.3.3	Resource Isolation and Management	135
16.3.3.1	General	135
16.3.3.2	Handling of Slice Resources	136
16.3.3a	Slice aware cell reselection.....	136
16.3.4	Signalling Aspects	136
16.3.4.1	General	136
16.3.4.2	AMF and NW Slice Selection.....	136
16.3.4.3	UE Context Handling.....	137
16.3.4.4	PDU Session Setup Handling.....	137
16.3.4.5	Mobility.....	138
16.4	Public Warning System.....	139
16.5	Emergency Services	139
16.5.1	Overview	139
16.5.2	IMS Emergency call	140
16.5.3	eCall over IMS.....	140
16.5.4	Fallback	140
16.6	Stand-Alone NPN.....	140
16.6.1	General.....	140
16.6.2	Mobility	140
16.6.2.1	General	140
16.6.2.2	Inactive Mode	141

16.6.2.3	Connected Mode	141
16.7	Public Network Integrated NPN	142
16.7.1	General	142
16.7.2	Mobility	142
16.7.2.1	General	142
16.7.2.2	Inactive Mode	142
16.7.2.3	Connected Mode	142
16.7.3	Self-Configuration for PNI-NPN	143
16.7.4	Access Control	143
16.7.5	Paging	143
16.8	Support for Time Sensitive Communications	143
16.9	Sidelink	145
16.9.1	General	145
16.9.2	Radio Protocol Architecture for NR sidelink communication	146
16.9.2.1	Overview	146
16.9.2.2	MAC	147
16.9.2.3	RLC	148
16.9.2.4	PDCCP	148
16.9.2.5	SDAP	148
16.9.2.6	RRC	148
16.9.3	Radio Resource Allocation	148
16.9.3.1	General	148
16.9.3.2	Scheduled Resource Allocation	149
16.9.3.3	UE Autonomous Resource Selection	149
16.9.4	Uu Control	150
16.9.4.1	General	150
16.9.4.2	Control of connected UEs	150
16.9.4.3	Control of idle/inactive UEs	150
16.9.5	Sidelink Discovery	151
16.9.6	SL DRX	151
16.9.6.1	General	151
16.9.6.2	Unicast	151
16.9.6.3	Groupcast/Broadcast	152
16.9.6.4	Alignment between Uu DRX and SL DRX	152
16.9.7	Power Savings Resource Allocation	152
16.9.8	Inter-UE Coordination (IUC)	153
16.10	Multicast and Broadcast Services	153
16.10.1	General	153
16.10.2	Network Architecture	153
16.10.2.1	QoS Model	153
16.10.3	Protocol Architecture	154
16.10.4	Group Scheduling	156
16.10.5	Multicast Handling	156
16.10.5.1	Session Management	156
16.10.5.2	Configuration	157
16.10.5.3	Service Continuity	158
16.10.5.3.1	General	158
16.10.5.3.2	Handover between Multicast supporting cells	158
16.10.5.3.3	Handover between Multicast supporting cell and Multicast non-supporting cell	158
16.10.5.3.4	MRB reconfiguration	159
16.10.5.4	Reception of MBS Multicast data	159
16.10.5.5	Support of CA	159
16.10.5.6	DRX	159
16.10.6	Broadcast Handling	159
16.10.6.1	Session Management	159
16.10.6.2	Configuration	159
16.10.6.3	Support of CA	160
16.10.6.4	DRX	160
16.10.6.5	Service Continuity	160
16.10.6.5.1	Service Continuity in RRC_IDLE or RRC_INACTIVE	160
16.10.6.5.2	Service Continuity in RRC_CONNECTED	160
16.11	Minimization of Service Interruption	161

16.12	Sidelink Relay	161
16.12.1	General.....	161
16.12.2	Protocol Architecture.....	161
16.12.2.1	L2 UE-to-Network Relay.....	161
16.12.3	Relay Discovery.....	163
16.12.4	Relay Selection/Reselection.....	164
16.12.5	Control plane procedures for L2 U2N Relay	165
16.12.5.1	RRC Connection Management.....	165
16.12.5.2	Radio Link Failure	166
16.12.5.3	RRC Connection Re-establishment.....	166
16.12.5.4	RRC Connection Resume	166
16.12.5.5	System Information	166
16.12.5.6	Paging	167
16.12.5.7	Access Control	167
16.12.5.8	Mobility Registration Update and RAN Area Update.....	167
16.12.6	Service Continuity for L2 U2N relay.....	168
16.12.6.1	Switching from indirect to direct path.....	168
16.12.6.2	Switching from direct to indirect path.....	169
16.13	Support of Reduced Capability (RedCap) NR devices.....	170
16.13.1	Introduction.....	170
16.13.2	Capabilities	170
16.13.3	Identification, access and camping restrictions.....	170
16.13.4	RRM measurement relaxations.....	170
16.13.5	BWP operation.....	170
16.14	Non-Terrestrial Networks.....	171
16.14.1	Overview	171
16.14.2	User Plane aspects	172
16.14.3	Mobility and State transition.....	174
16.14.3.1	Mobility in RRC_IDLE and RRC_INACTIVE	174
16.14.3.2	Mobility in RRC_CONNECTED.....	175
16.14.3.2.1	Handover	175
16.14.3.2.2	Conditional Handover	175
16.14.3.3	Measurements	175
16.14.4	Switch over	176
16.14.4.1	Definitions	176
16.14.4.2	Assumptions	176
16.14.4.3	Procedures.....	176
16.14.5	NG-RAN signalling	176
16.14.6	AMF (Re-)Selection by gNB.....	177
16.14.7	O&M Requirements.....	177
16.14.8	UE location aspects.....	177
17	Interference Management.....	178
17.1	Remote Interference Management	178
17.2	Cross-Link Interference Management	178
18	Small Data Transmission.....	179
18.0	General	179
18.1	Support of SDT procedure over RACH	180
18.2	SDT with UE context relocation	180
18.3	SDT without UE context relocation	181
19	Support for NR coverage enhancements	182
20	Support for Multi-USIM devices	183
20.1	General	183
20.2	Paging Collision Avoidance	183
20.3	UE notification on Network Switching	183
21	Application Layer Measurement Collection	184
21.1	Overview	184
21.2	QoE Measurement Configuration.....	184
21.2.1	QoE Measurement Collection Activation and Reporting	184
21.2.2	QoE Measurement Collection Deactivation	185

21.2.3	Handling of QMC during RAN Overload.....	185
21.2.4	QoE Measurement Handling in RRC_IDLE and RRC_INACTIVE States.....	185
21.2.5	Per-slice QoE Measurement	185
21.3	QoE Measurement Continuity for Mobility	185
21.4	RAN Visible QoE Measurements	186
21.5	Alignment of MDT and QoE Measurements.....	186
Annex A (informative): QoS Handling in RAN		187
A.1	PDU Session Establishment	187
A.2	New QoS Flow with RQoS	187
A.3	New QoS Flow with Explicit RRC Signalling.....	188
A.4	New QoS Flow with Explicit NAS Signalling.....	189
A.5	Release of QoS Flow with Explicit Signalling.....	190
A.6	UE Initiated UL QoS Flow.....	190
Annex B (informative): Deployment Scenarios		192
B.1	Supplementary Uplink.....	192
B.2	Multiple SSBs in a carrier	192
B.3	NR Operation with Shared Spectrum.....	193
B.4	Example implementation of Non-Terrestrial Networks	193
Annex C (informative): I-RNTI Reference Profiles		196
Annex D (informative): SPID ranges and mapping of SPID values to cell reselection and inter-RAT/inter-frequency handover priorities.....		197
Annex E (informative): NG-RAN Architecture for Radio Access Network Sharing with multiple cell ID broadcast		198
Annex F (normative): Use and structure of the I-RNTI		199
Annex G (informative): Change history		200
History		206

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.

**iTeh STANDARD
PREVIEW
(standards.iteh.ai)**

ETSI TS 138 300 V17.0.0 (2022-05)
<https://standards.iteh.ai/catalog/standards/sist/be7d5812-d3f9-436f-b239-567effe7ce2d/etsi-ts-138-300-v17-0-0-2022-05>

1 Scope

The present document provides an overview and overall description of the NG-RAN and focuses on the radio interface protocol architecture of NR connected to 5GC (E-UTRA connected to 5GC is covered in the 36 series). Details of the radio interface protocols are specified in companion specifications of the 38 series.

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 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".
- [3] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".
- [4] 3GPP TS 38.401: "NG-RAN; Architecture description".
- [5] 3GPP TS 33.501: "Security Architecture and Procedures for 5G System".
- [6] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".
- [7] 3GPP TS 38.322: "NR; Radio Link Control (RLC) protocol specification".
- [8] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) specification".
- [9] 3GPP TS 37.324: "E-UTRA and NR; Service Data Protocol (SDAP) specification".
- [10] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in Idle mode and RRC Inactive state".
- [11] 3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities".
- [12] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".
- [13] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".
- [14] 3GPP TS 22.168: "Earthquake and Tsunami Warning System (ETWS) requirements; Stage 1".
- [15] 3GPP TS 22.268: "Public Warning System (PWS) Requirements".
- [16] 3GPP TS 38.410: "NG-RAN; NG general aspects and principles".
- [17] 3GPP TS 38.420: "NG-RAN; Xn general aspects and principles".
- [18] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".
- [19] 3GPP TS 22.261: "Service requirements for next generation new services and markets".
- [20] 3GPP TS 38.202: "NR; Physical layer services provided by the physical layer".
- [21] 3GPP TS 37.340: "NR; Multi-connectivity; Overall description; Stage-2".

- [22] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".
- [23] IETF RFC 4960 (2007-09): "Stream Control Transmission Protocol".
- [24] 3GPP TS 26.114: "Technical Specification Group Services and System Aspects; IP Multimedia Subsystem (IMS); Multimedia Telephony; Media handling and interaction".
- [25] Void.
- [26] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".
- [27] IETF RFC 3168 (09/2001): "The Addition of Explicit Congestion Notification (ECN) to IP".
- [28] 3GPP TS 24.501: "NR; Non-Access-Stratum (NAS) protocol for 5G System (5GS)".
- [29] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".
- [30] 3GPP TS 38.415: "NG-RAN; PDU Session User Plane Protocol".
- [31] 3GPP TS 38.340: "NR; Backhaul Adaptation Protocol (BAP) specification".
- [32] 3GPP TS 38.470: "NG-RAN; F1 application protocol (F1AP) ".
- [33] 3GPP TS 38.425: "NG-RAN; NR user plane protocol".
- [34] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC); Stage 2".
- [35] 3GPP TS 38.101-2: "User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".
- [36] 3GPP TS 38.101-3: "User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".
- [37] 3GPP TS 37.213: "Physical layer procedures for shared spectrum channel access".
- [38] 3GPP TS 38.213: "NR; Physical layer procedures for control".
- [39] 3GPP TS 22.104: "Service requirements for cyber-physical control applications in vertical domains".
- [40] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services".
- [41] 3GPP TS 23.285: "Technical Specification Group Services and System Aspects; Architecture enhancements for V2X services".
- [42] 3GPP TS 38.305: "NG Radio Access Network (NG-RAN); Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN".
- [43] 3GPP TS 37.355: "LTE Positioning Protocol (LPP)".
- [44] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".
- [45] 3GPP TS 23.247: "Architectural enhancements for 5G multicast-broadcast services; Stage 2".
- [46] 3GPP TS 23.346 "Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs".
- [47] 3GPP TS 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode".
- [48] 3GPP TS 23.304: "Proximity based Services (ProSe) in the 5G System (5GS)".
- [49] 3GPP TS 28.541: "5G Network Resource Model (NRM)".
- [50] 3GPP TS 38.423: "NG-RAN; Xn Application Protocol (XnAP)".

- [51] NIMA TR 8350.2, Third Edition, Amendment 1, 3 January 2000: "DEPARTMENT OF DEFENSE WORLD GEODETIC SYSTEM 1984", <https://gis-lab.info/docs/nima-tr8350.2-wgs84fin.pdf>.

3 Abbreviations and Definitions

3.1 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1], in TS 36.300 [2] 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] and TS 36.300 [2].

5GC	5G Core Network
5GS	5G System
5QI	5G QoS Identifier
A-CSI	Aperiodic CSI
AKA	Authentication and Key Agreement
AMBR	Aggregate Maximum Bit Rate
AMC	Adaptive Modulation and Coding
AMF	Access and Mobility Management Function
ARP	Allocation and Retention Priority
BA	Bandwidth Adaptation
BCCH	Broadcast Control Channel
BCH	Broadcast Channel
BFD	Beam Failure Detection
BH	Backhaul
BL	Bandwidth reduced low complexity
BPSK	Binary Phase Shift Keying
C-RNTI	Cell RNTI
CAG	Closed Access Group
CAPC	Channel Access Priority Class
CBRA	Contention Based Random Access
CCE	Control Channel Element
CD-SSB	Cell Defining SSB
CFRA	Contention Free Random Access
CG	Configured Grant
CHO	Conditional Handover
CIoT	Cellular Internet of Things
CLI	Cross Link interference
CMAS	Commercial Mobile Alert Service
CORESET	Control Resource Set
CP	Cyclic Prefix
CPC	Conditional PSCell Change
DAG	Directed Acyclic Graph
DAPS	Dual Active Protocol Stack
DFT	Discrete Fourier Transform
DCI	Downlink Control Information
DCP	DCI with CRC scrambled by PS-RNTI
DL-AoD	Downlink Angle-of-Departure
DL-SCH	Downlink Shared Channel
DL-TDOA	Downlink Time Difference Of Arrival
DMRS	Demodulation Reference Signal
DRX	Discontinuous Reception
E-CID	Enhanced Cell-ID (positioning method)
EHC	Ethernet Header Compression
ETWS	Earthquake and Tsunami Warning System
FS	Feature Set
FSA ID	Frequency Selection Area Identity
G-CS-RNTI	Group Configured Scheduling RNTI