

# ETSI TS 138 412 V19.0.0 (2026-01)



TECHNICAL SPECIFICATION

**5G;  
NG-RAN;  
NG signalling transport  
(3GPP TS 38.412 version 19.0.0 Release 19)**



---

**Reference**

RTS/TSGR-0338412vj00

---

**Keywords**

5G

**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 the  
[ETSI Search & Browse Standards application](#).

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 on [ETSI deliver repository](#).

Users should be aware that the present document may be revised or have its status changed, this information is available in the [Milestones listing](#).

If you find errors in the present document, please send your comments to the relevant service listed under [Committee Support Staff](#).

If you find a security vulnerability in the present document, please report it through our [Coordinated Vulnerability Disclosure \(CVD\)](#) program.

---

**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 2026.  
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 IPR online database](#).

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™**, **LTE™** and **5G™** logo 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 at [3GPP to ETSI numbering cross-referencing](#).

---

## 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.....	4
1 Scope .....	5
2 References .....	5
3 Definitions and abbreviations.....	5
3.1 Definitions .....	5
3.2 Abbreviations .....	6
4 NG signalling bearer .....	6
4.1 Functions and protocol stack.....	6
5 Data link layer .....	7
6 IP layer .....	7
7 Transport layer .....	7
<b>Annex A (informative): Change history .....</b>	<b>9</b>
History .....	10

---

# Foreword

This Technical Specification has been produced by the 3<sup>rd</sup> 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 standards for signalling transport to be used across NG interface. NG interface is a logical interface between the NG-RAN and the 5GC. The present document describes how the NGAP signalling messages are transported over NG.

---

# 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] IETF RFC 4960: "Stream Control Transmission Protocol".
- [3] 3GPP TS 23.501: "System Architecture for the 5G System".
- [4] 3GPP TS 23.502: "Procedures for the 5G System".
- [5] IETF RFC 8200 (2017-07): "Internet Protocol, Version 6 (IPv6) Specification".
- [6] IETF RFC 791 (1981-09): "Internet Protocol".
- [7] IETF RFC 2474 (1998-12): "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers".
- [8] IETF RFC 6083 (2011-01): "Datagram Transport Layer Security (DTLS) for Stream Control Transmission Protocol (SCTP)".
- [9] IETF RFC 6335 (2011-08): "Internet Assigned Numbers Authority (IANA) Procedures for the Management of the Service Name and Transport Protocol Port Number Registry".
- [10] [IANA: "Stream Control Transmission Protocol \(SCTP\) Parameters"](https://www.iana.org/assignments/sctp-parameters/sctp-parameters.xhtml#sctp-parameters-25),  
[\[https://www.iana.org/assignments/sctp-parameters/sctp-parameters.xhtml#sctp-parameters-25\]](https://www.iana.org/assignments/sctp-parameters/sctp-parameters.xhtml#sctp-parameters-25). [11] IANA: "Service Name and Transport Protocol Port Number Registry",  
[\[https://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xhtml\]](https://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xhtml).
- [11] 3GPP TS 23.369: "Architecture support for Ambient power-enabled Internet of Things; Stage 2".

---

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**NG:** interface between a NG-RAN node and a 5GC, providing an interconnection point between the NG-RAN and the 5GC.

**NG-C:** Reference point for the control plane protocol between NG-RAN and AMF or between NG-RAN and AIOTF.

**SCTP endpoint:** as defined in IETF RFC 4960 (2007-09) [5]

**SCTP association:** as defined in IETF RFC 4960 (2007-09) [5]

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

5GC	5G Core Network
A-IoT	Ambient IoT
AIOTF	Ambient IoT Function
IP	Internet Protocol
SCTP	Stream Control Transmission Protocol
DiffServ	Differentiated Service
PPP	Point to Point Protocol
IANA	Internet Assigned Number Authority
AMF	Access and Mobility management Function

---

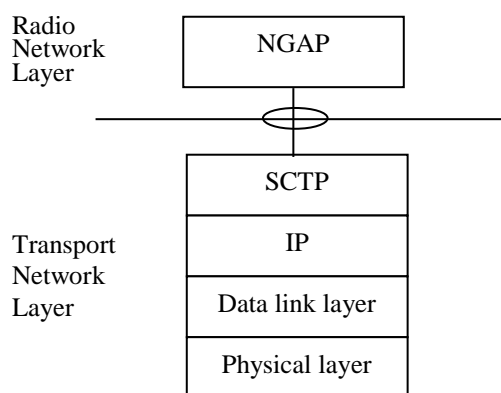
## 4 NG signalling bearer

### 4.1 Functions and protocol stack

NG-C signalling bearer provides the following functions:

- Provision of reliable transfer of NGAP message over NG-C interface.
- Provision of networking and routing function.
- Provision of redundancy in the signalling network.
- Support for flow control and congestion control.

The protocol stack for NG-C Signalling Bearer is shown in figure 4.1-1 and details on each protocol are described in the following clauses.



**Figure 4.1-1: NG-C signalling bearer protocol stack**

The Transport Network Layer is based on IP transport, comprising SCTP on top of IP.

---

## 5 Data link layer

The support of any suitable Data Link Layer protocol, e.g. PPP, Ethernet, etc., shall not be prevented.

---

## 6 IP layer

The 5GC and NG-RAN shall support IPv6 (IETF RFC 8200 [5]) and/or IPv4 (IETF RFC 791 [6]).

The IP layer of NG-C only supports point-to-point transmission for delivering NG AP message.

The 5GC and NG-RAN shall support the Diffserv Code Point marking as described in IETF RFC 2474 [7].

---

## 7 Transport layer

SCTP (IETF RFC 4960 [2]) shall be supported as the transport layer of NG-C signalling bearer. The Payload Protocol Identifier (ppid) to be used by SCTP for the application layer protocol NGAP and for DTLS over SCTP (IETF RFC 6083 [8]) is assigned by IANA in [10]. The byte order of the ppid shall be big-endian.

SCTP refers to the Stream Control Transmission Protocol developed by the Sigtran working group of the IETF for the purpose of transporting various signalling protocols over IP network.

NG-RAN node and AMF shall support a configuration with a single SCTP association per NG-RAN node/AMF pair. Configurations with multiple SCTP endpoints per NG-RAN node/AMF pair should be supported. When configurations with multiple SCTP associations are supported, the AMF may request to dynamically add/remove SCTP associations between the NG-RAN node/AMF pair. Within the set of SCTP associations established between one AMF and NG-RAN node pair, the AMF may request the NG-RAN node to restrict the usage of SCTP association for certain types of NG-C signalling. If no restriction information is provided for an SCTP association, any type of NG-C signalling is allowed via the SCTP association. Selection of the SCTP association by the NG-RAN node and the AMF is specified in TS 23.501 [3] and TS 23.502 [4]. The NG-RAN node shall establish the SCTP association. The SCTP Destination Port number value to be used by NGAP is assigned by IANA in [11]. When the AMF requests to dynamically add additional SCTP associations between the NG-RAN node/AMF pair, the SCTP Destination Port number value may be the one assigned by IANA in [11], or any dynamic port value (IETF RFC 6335 [9]). When the configuration with multiple SCTP endpoints per NG-RAN node is supported and the NG-RAN node wants to add additional SCTP endpoints, the RAN configuration update procedure shall be the first NGAP procedure triggered on an additional TNLA of an already setup NG-C interface instance after the TNL association has become operational, and the AMF shall associate the TNLA to the NG-C interface instance using the included Global RAN node ID.

Between one AMF and NG-RAN node pair:

- A single pair of stream identifiers shall be reserved over at least one SCTP association for the sole use of NGAP elementary procedures that utilize non UE-associated signalling.
- At least one pair of stream identifiers over one or several SCTP associations shall be reserved for the sole use of NGAP elementary procedures that utilize UE-associated signalings. However, a few pairs (i.e. more than one) should be reserved.
- For a single UE-associated signalling, the NG-RAN node shall use one SCTP association and one SCTP stream, and the SCTP association/stream should not be changed during the communication of the UE-associated signalling until after current SCTP association is failed or removed, or TNL binding update is performed as described in TS 23.502 [3].

Transport network redundancy can be achieved by SCTP multi-homing between two end-points, of which one or both is assigned with multiple IP addresses. SCTP end-points shall support a multi-homed remote SCTP end-point. For SCTP endpoint redundancy, an SCTP endpoint (in the NG-RAN node or AMF) may send an INIT, at any time for an already established SCTP association, which the other SCTP endpoint shall handle as defined in IETF RFC 4960 [2] in subclause 5.2.

The SCTP congestion control may, using an implementation specific mechanism, initiate higher layer protocols to reduce the signalling traffic at the source and prioritise certain messages.

All principles and requirements specified for non UE-associated signalling across the NG interface apply for A-IoT related signalling between one AMF and NG-RAN node pair.

If NG-C is established between an A-IoT enabled NG-RAN node and an AIOTF, as specified in TS 23.369 [11], all principles and requirements specified for the AMF for support of non UE-associated signalling apply for the AIOTF.

## Annex A (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2018-01	RAN3-AH-1801	R3-180541				Reflected agreed TP in RAN3-AH-1801 in 2018-01 (Sophia Antipolis)	0.2.0
2018-03	RAN3#99	R3-181587				Reflected agreed TP in RAN3#99 in 2018-03 (Athens)	0.3.0
2018-05	RAN3#100	R3-183591				Reflected agreed TP in RAN3#100 in 2018-05 (Busan) and made some editorial corrections	0.4.0
2018-06	RAN#80	RP-180681				Submitted to RAN plenary for Approval	1.0.0
2018-06	RAN#80	-	-	-	-	Specification approved at TSG-RAN and placed under change control	15.0.0
2018-09	RAN#81	RP-181920	0001		F	Updated reference to IPv6	15.1.0
2018-09	RAN#81	RP-181922	0003		F	NR Corrections (38.412 Baseline CR covering RAN3#101 agreements)	15.1.0
2019-07	RAN#84	RP-191395	0008	1	F	Clarify the support for multiple TNL Endpoints in the NG-RAN node	15.2.0
2019-09	RAN#85	RP-192166	0010	1	F	CR on PPID value for DTLS over SCTP	15.3.0
2019-09	RAN#85	RP-192167	0011	1	F	Use of SCTP ports for multiple TNLA	15.3.0
2019-12	RAN#86	RP-192915	0012	-	F	Ambiguity with multiple SCTP associations in 38.412	15.4.0
2020-03	RAN#87-e	RP-200425	0013	-	F	Rapporteur's Update for 38.412	16.0.0
2020-09	RAN#89-e	RP-201954	0015	2	A	SCTP association change when current SCTP association is failed	16.1.0
2022-03	SA#95-e					Promotion to Release 17 without technical change	17.0.0
2023-06	RAN#100	RP-231075	0021	2	A	Corrections on TNL association addition, update and removal	17.1.0
2024-03	SA#103-	-	-	-	-	Update to Rel-18 version (MCC)	18.0.0
2024-06	RAN#104	RP-241113	0022	2	D	Correction on NGAP PPID and Destination Port Number over SCTP	18.1.0
2025-09	RAN#109	RP-252676	0025	4	B	Introduction of Ambient IoT	19.0.0

---

# History

<b>Document history</b>		
V19.0.0	January 2026	Publication