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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 E1 signalling bearer.....	6
4.1 Function and protocol stack.....	6
5 Data link layer	7
6 IP layer	7
7 Transport layer	7
Annex A (informative): Change history	9
History	10

Foreword

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

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Version x.y.z

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- 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 the E1 interface. The E1 interface provides means for the interconnection of gNB-CU-CP and gNB-CU-UP within the NG-RAN architecture (TS 38.401 [2]), or for the interconnection of ng-eNB-CU-CP and ng-eNB-CU-UP within the NG-RAN architecture (TS 38.401 [2]), or for the interconnection of eNB-CP and eNB-UP within the E-UTRAN architecture (TS 36.401 [13]).

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 38.401: "NG-RAN; Architecture description".
- [3] IETF RFC 8200 (2017-07): "Internet Protocol, Version 6 (IPv6) Specification".
- [4] IETF RFC 791 (1981-09): "Internet Protocol".
- [5] IETF RFC 2474 (1998-12): "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers".
- [6] IETF RFC 4960 (2007-09): "Stream Control Transmission Protocol".
- [7] 3GPP TS 37.480: "E1 general aspects and principles".
- [8] 3GPP TS 37.481: "E1 layer 1".
- [9] 3GPP TS 37.483: "E1 Application Protocol (E1AP)".
- [10] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description; Stage-2".
- [11] IETF RFC 6083 (2011-01): "Datagram Transport Layer Security (DTLS) for Stream Control Transmission Protocol (SCTP)".
- [12] IETF RFC 6335 (2011-08): "Internet Assigned Numbers Authority (IANA) Procedures for the Management of the Service Name and Transport Protocol Port Number Registry".
- [13] 3GPP TS 36.401: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Architecture description".
- [14] 3GPP TS 37.470: "W1 interface; General aspects and principles".

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].

E1: interface between a gNB-CU-CP and a gNB-CU-UP, providing an interconnection point between the gNB-CU-CP and the gNB-CU-UP, as defined in TS 38.300 [10]. This interface also applies to between the ng-eNB-CU-CP and the ng-eNB-CU-UP or between the eNB-CP and the eNB-UP.

eNB-CP: as defined in TS 36.401 [13].

eNB-UP: as defined in TS 36.401 [13].

gNB-CU: as defined in TS 38.401 [2].

gNB-CU-CP: as defined in TS 38.401 [2].

gNB-CU-UP: as defined in TS 38.401 [2].

ng-eNB-CU: as defined in TS 37.470 [14].

ng-eNB-CU-CP: as defined in TS 38.401 [2].

ng-eNB-CU-UP: as defined in TS 38.401 [2].

ng-eNB-DU: as defined in TS 37.470 [14].

SCTP endpoint: as defined in IETF RFC 4960 (2007-09) [6].

SCTP association: as defined in IETF RFC 4960 (2007-09) [6].

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].

DiffServ	Differentiated Service
IANA	Internet Assigned Number Authority
IP	Internet Protocol
PPP	Point to Point Protocol
SCTP	Stream Control Transmission Protocol

4 E1 signalling bearer

4.1 Function and protocol stack

E1 signalling bearer provides the following functions:

- Provision of reliable transfer of E1AP message over E1 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 E1 Signalling Bearer is shown in figure 4.1-1 and details on each protocol are described in the following sections.

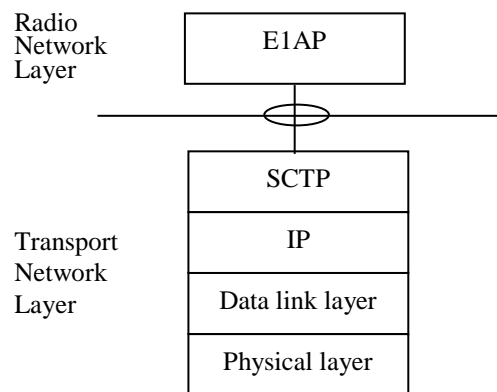


Figure 4.1-1: E1 signalling bearer protocol stack

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 gNB-CU-CP, gNB-CU-UP, ng-eNB-CU-CP, ng-eNB-CU-UP, eNB-CP and eNB-UP shall support IPv6 (IETF RFC 8200 [3]) and/or IPv4 (IETF RFC 791 [4]).

The IP layer of E1 only supports point-to-point transmission for delivering E1AP message.

The gNB-CU-CP, gNB-CU-UP, ng-eNB-CU-CP, ng-eNB-CU-UP, eNB-CP and eNB-UP shall support the Diffserv Code Point marking as described in IETF RFC 2474 [5].

7 Transport layer

NOTE: The transport layer structure and mechanism specified in this section are also used between ng-eNB-CU-CP and ng-eNB-CU-UP or between eNB-CP and eNB-UP, unless stated otherwise. With this understanding, in this section each instance of gNB-CU-CP could be treated as eNB-CP or ng-eNB-CU-CP, and each gNB-CU-UP could be treated as eNB-UP or ng-eNB-CU-UP, for eNB or ng-eNB CP/UP separation respectively.

SCTP (IETF RFC 4960 [6]) shall be supported as the transport layer of E1 signalling bearer. The Payload Protocol Identifier assigned by IANA to be used by SCTP for the application layer protocol E1AP is 64 and 67 for DTLS over SCTP (IETF RFC 6083 [11]). 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.

The gNB-CU-CP and gNB-CU-UP shall support a configuration with a single SCTP association per gNB-CU-CP/gNB-CU-UP pair. Configurations with multiple SCTP endpoints per gNB-CU-CP/gNB-CU-UP pair should be supported. When configurations with multiple SCTP associations are supported, the gNB-CU-CP or the gNB-CU-UP may request to dynamically add/remove SCTP associations between the gNB-CU-CP/gNB-CU-UP pair. Within the set of SCTP associations established between one gNB-CU-CP and gNB-CU-UP pair, a single SCTP association shall be employed for E1AP elementary procedures that utilize non-UE-associated signalling with the possibility of fail-over to a new association to enable robustness.

When the configuration with multiple SCTP endpoints per gNB-CU-UP is supported and gNB-CU-UP wants to add additional SCTP endpoints, the gNB-CU-UP Configuration Update procedure shall be the first E1AP procedure triggered on an additional TNLA of an already setup E1 interface instance after the TNL association has become operational, and the gNB-CU-CP shall associate the TNLA to the E1 interface instance using the included gNB-CU-UP ID.

Either the gNB-CU-CP or gNB-CU-UP shall establish the first SCTP association. The additional SCTP associations are established by the gNB-CU-UP. The SCTP Destination Port number value to be used for E1AP is 38462 which is assigned by IANA. When the gNB-CU-CP requests to dynamically add additional SCTP associations between the gNB-CU-CP and gNB-CU-UP pair, the gNB-CU-CP port is selected and signalled by the gNB-CU-CP to the gNB-CU-UP, and it can be port number value 38462 or any dynamic port value as defined by IETF RFC 6335 [12].

Between one gNB-CU-CP and gNB-CU-UP pair:

- A single pair of stream identifiers shall be reserved over an SCTP association for the sole use of E1AP 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 E1AP elementary procedures that utilize UE-associated signalling. However, a few pairs (i.e. more than one) should be reserved.
- For a single UE-associated signalling the gNB-CU-CP and the gNB-CU-UP 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.

Transport network redundancy may 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 INIT may be sent from a gNB-CU-CP or a gNB-CU-UP, at any time for an already established SCTP association, which shall be handled as defined in IETF RFC 4960 [6] in sub clause 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.

For MBS-associated signalling, principles specified above for UE-associated signalling shall apply.

Annex A (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2022-01	R3#114bis-e	R3-220919				Text transferred from TS 38.462 v16.1.0 and references updated to 37.48x series	0.1.0
2022-01	R3#114bis-e	R3-221120				Update the release number and fix typos	0.2.0
2022-02	R3#115-e	R3-221644				Submission to RAN3 #115-e	0.3.0
2022-02	R3#115-e	R3-222577				Change history updated, merge the changes of R3-222519	0.3.1
2022-02	R3#115-e	R3-222974				RAN3 #115-e post meeting review.	0.4.0
2022-03	RAN#95-e	RP-220797				Version submitted for approval in RAN#95-e	1.0.0
2022-03	RAN#95-e	RP-220850				Agreed Rel-17 CR from other WI is merged. Including REL-17 38.462 changes of R3-222520 of RP-220236	1.1.0
2022-03	SA#95-e					Promotion to Release 17 without technical change	17.0.0
2022-06	RAN#96	RP-221145	0001	2	D	Rapporteur clean-ups to 37.482	17.1.0
2022-09	RAN#97-e	RP-222188	0002	-	F	Corrections for MBS-associated signalling	17.2.0
2023-06	RAN#100	RP-231075	0003	1	A	Corrections on TNL association addition, update and removal (E1)	17.3.0

History

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