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Contents

Foreword

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

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- 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 F1 interface. The F1 interface provides means for interconnecting a gNB-CU and a gNB-DU of a gNB within an NG-RAN, or for interconnecting a gNB-CU and a gNB-DU of an en-gNB within an E-UTRAN. The present document describes how the F1AP signalling messages are transported over F1.

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 8200 (2017-07): "Internet Protocol, Version 6 (IPv6) Specification".

[3] IETF RFC 791 (1981-09): "Internet Protocol".

[4] IETF RFC 2474 (1998-12): "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers".

[5] IETF RFC 4960 (2007-09): "Stream Control Transmission Protocol".

[6] 3GPP TS 38.300: "NR; Overall description; Stage-2".

[7] 3GPP TS 38.401: "NG-RAN; Architecture description".

[8] 3GPP TS 37.340: "NR; Multi-connectivity; Overall description; Stage-2".

[9] IETF RFC 6083 (2011-01): "Datagram Transport Layer Security (DTLS) for Stream Control Transmission Protocol (SCTP)".

[10] IETF RFC 6335 (2011-08): " Internet Assigned Numbers Authority (IANA) Procedures for the Management of the Service Name and Transport Protocol Port Number Registry".

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].

en-gNB: as defined in TS 37.340 [8]

F1: interface between a gNB-CU and a gNB-DU, providing an interconnection point between the gNB-CU and the gNB-DU.

F1-C: Reference point for the control plane protocol between gNB-CU and gNB-DU.

gNB-CU: as defined in TS 38.401 [7]

gNB-DU: as defined in TS 38.401 [7]

gNB: as defined in TS 38.300 [6]

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

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

3.3 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 F1-C signalling bearer

4.1 Function and protocol stack

The F1-C signalling bearer provides the following functions:

- Provision of reliable transfer of F1AP messages over the F1-C interface.
- Provision of networking and routeing function.
- Provision of redundancy in the signalling network.
- Support for flow control and congestion control.

The protocol stack for F1-C Signalling Bearer is shown in figure 4.1-1 and details on each protocol are described in the following clauses.

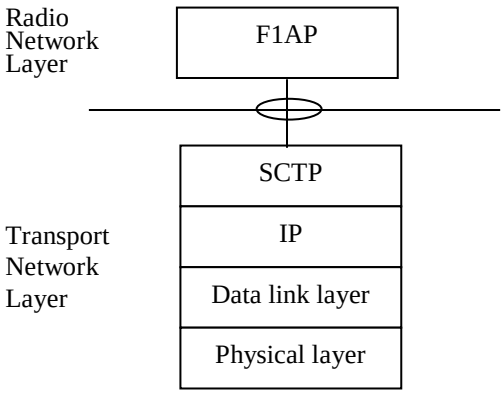

Figure 4.1-1: F1-C signalling bearer protocol stack

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 gNB-CU and gNB-DU shall support IPv6 (IETF RFC 8200 [2]) and/or IPv4 (IETF RFC 791 [3]).

The IP layer of F1-C only supports point-to-point transmission for delivering F1AP message.

The gNB-CU and gNB-DU shall support the Diffserv Code Point marking as described in IETF RFC 2474 [4].

7 Transport layer

SCTP (IETF RFC 4960 [5]) shall be supported as the transport layer of F1-C signalling bearer. The Payload Protocol Identifier (ppid) assigned by IANA to be used by SCTP for the application layer protocol F1AP is 62, and 68 for DTLS over SCTP (IETF RFC 6083 [9]). 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-DU and gNB-CU shall support a configuration with a single SCTP association per gNB-DU/gNB-CU pair. Configurations with multiple SCTP endpoints per gNB-DU/gNB-CU pair should be supported. When configurations with multiple SCTP associations are supported, the gNB-CU/gNB-DU may request to dynamically add/remove SCTP associations between the gNB-DU/gNB-CU pair.

The gNB-DU shall establish the SCTP association. The SCTP Destination Port number value assigned by IANA to be used for F1AP is 38472. When the gNB-CU requests to dynamically add additional SCTP associations between the gNB-DU/gNB-CU pair, the SCTP Destination Port number value may be 38472, or any dynamic port value (IETF RFC 6335 [10]).

Within the set of SCTP associations established between one gNB-CU and gNB-DU pair, a single SCTP association shall be employed for F1AP elementary procedures that utilize non-UE-associated signalling with the possibility of fail-over to a new association to enable robustness. Selection of the SCTP association by the gNB-DU and the gNB-CU is specified in TS 38.401 [7].

When the configuration with multiple SCTP endpoints per gNB-DU is supported and gNB-DU wants to add additional SCTP endpoints, the gNB-DU Configuration Update procedure shall be the first F1AP procedure triggered on an additional TNLA of an already setup F1-C interface instance after the TNL association has become operational, and the gNB-CU shall associate the TNLA to the F1-C interface instance using the included gNB-DU ID.

Between one gNB-CU and gNB-DU pair:

- A single pair of stream identifiers shall be reserved over an SCTP association for the sole use of F1AP 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 F1AP 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-DU 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 or gNB-DU, at any time for an already established SCTP association, which shall be handled as defined in IETF RFC 4960 [5] 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**
2017-06	R3 NR#2	R3-172121	-	-	-	First version	0.1.0
2017-07	R3 NR#2	R3-172644	-	-	-	Incorporated agreed TPs from R3 NR#2 Adhoc	0.2.0
2017-08	R3#97	R3-172715				Incorporated Rapporteur's cleanup	0.2.1
2017-08	R3#97	R3-173446	-	-	-	Incorporated agreed TPs from R3#97	0.3.0
2017-10	R3#97b	R3-174246	-	-	-	Incorporated agreed TPs from R3#97b	0.4.0
2017-12	R3#98	R3-175062	-	-	-	Incorporated agreed TPs from R3#98	0.5.0
2017-12	RAN#78	RP-172261				Submitted for approval to RAN	1.0.0
2017-12	RAN#78					TR approved by RAN plenary	15.0.0
2018-06	RAN#80	RP-181238	0002	1	F	Clarifications on multiple TNL associations	15.1.0
2018-09	RAN#81	RP-181922	0006	5	F	NR Corrections (38.472 Baseline CR covering RAN3-101 agreements)	15.2.0
2019-03	RAN#83	RP-190555	0009	4	F	Multiple TNLA over F1 transport	15.3.0
2019-07	RAN#84	RP-191395	0013	1	F	Removal of Multiple TNLA(s)	15.4.0
2019-09	RAN#85	RP-192166	0014	1	F	Addition of PPID for DTLS over SCTP for 38.472	15.5.0
2019-09	RAN#85	RP-192167	0016	1	F	Use of SCTP ports for multiple TNLA	15.5.0
2019-12	RAN#86	RP-192915	0017	-	F	Ambiguity with multiple SCTP associations in 38.472	15.6.0
2020-03	RAN#87-e	RP-200425	0018	-	F	Rapporteur’s Update for 38.472	16.0.0
2020-09	RAN#89-e	RP-201956	0020	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
2022-09	RAN#97-e	RP-222188	0022	-	F	Corrections for MBS-associated signalling	17.1.0
2023-06	RAN#100	RP-231075	0027	2	A	Corrections on TNL association addition, update and removal (F1)	17.2.0
2024-03	SA#103-	-	-	-	-	Update to Rel-18 version (MCC)	18.0.0

History

Document history		
V18.0.0	May 2024	Publication