

# ETSI TS 125 412 V15.0.0 (2018-07)



**Universal Mobile Telecommunications System (UMTS);  
UTRAN Iu interface signalling transport  
(3GPP TS 25.412 version 15.0.0 Release 15)**



---

Reference

RTS/TSGR-0325412vf00

---

Keywords

UMTS

**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 - NAF 742 C  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° 7803/88

---

**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 only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

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/CommiteeSupportStaff.aspx>

---

**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 2018.

All rights reserved.

**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 protected for the benefit of its Members.

**GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is 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 IPR Policy, no investigation, 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.

---

# Foreword

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, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 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
Foreword.....	2
Modal verbs terminology.....	2
1 Scope .....	5
2 References .....	5
3 Abbreviations .....	6
4 Data Link Layer .....	7
4.1 ATM Transport Option .....	7
4.2 IP Transport Option.....	7
5 RANAP Signalling Bearer .....	7
5.1 Introduction .....	7
5.2 Signalling Bearer for Circuit Switched Domain.....	7
5.2.1 Protocol Stack for the CS Domain.....	7
5.2.2 ATM Transport Option.....	8
5.2.3 IP Transport Option .....	8
5.3 Signalling Bearer for Packet Switched Domain .....	9
5.3.1 Protocol Stack for the PS Domain .....	9
5.3.2 ATM Transport Option 1 .....	9
5.3.3 ATM Transport Option 2.....	9
5.3.4 IP Transport Option .....	10
5.4 Services Provided by the Signalling Bearer .....	10
<b>Annex A (informative): Change History .....</b>	<b>11</b>
History .....	12

---

# Foreword

This Technical Specification (TS) 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 Iu Interface. Iu Interface is a logical interface between the RNC and the UTRAN Core Network. The present document describes how the RANAP signalling messages are transported over Iu.

---

# 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] ITU-T Recommendation Q.2100 (1994-07): "B-ISDN Signalling ATM Adaptation Layer (SAAL) - overview description".
- [2] ITU-T Recommendation Q.2110 (1994-07): "B-ISDN ATM Adaptation Layer – Service Specific Connection Oriented Protocol (SSCOP)".
- [3] ITU-T Recommendation Q.2140 (1995-02): "B-ISDN ATM adaptation layer – Service Specific Co-ordination Function for signalling at the Network Node Interface (SSCF AT NNI)".
- [4] ITU-T Recommendation Q.2210 (1996-07): "Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140".
- [5] ITU-T Recommendation I.361 (1995-11): "B-ISDN ATM layer specification".
- [6] ITU-T Recommendation I.363.5 (1996-08): "B-ISDN ATM Adaptation Layer Type 5".
- [7] ITU-T Recommendation Q.711 (1996-07): "Functional description of the signalling connection control part".
- [8] ITU-T Recommendation Q.712 (1996-07): "Definition and function of Signalling connection control part messages".
- [9] ITU-T Recommendation Q.713 (1996-07): "Signalling connection control part formats and codes".
- [10] ITU-T Recommendation Q.714 (1996-07): "Signalling connection control part procedures".
- [11] ITU-T Recommendation Q.715 (1996-07): "Signalling connection control part user guide".
- [12] ITU-T Recommendation Q.716 (1993-03): "Signalling Connection Control Part (SCCP) performance".
- [13] IETF RFC 791 (1981-09): "Internet Protocol".
- [14] IETF RFC 2684 (1999-09): "Multiprotocol Encapsulation over ATM Adaptation Layer 5".
- [15] IETF RFC 2225 (1998-04): "Classical IP and ARP over ATM".
- [16] IETF RFC 2960 (2000-10): "Stream Control Transmission Protocol".
- [17] IETF RFC 3332(2002-09): "Signalling System 7 (SS7) Message Transfer Part 3 (MTP3) – User Adaptation Layer (M3UA)"
- [18] 3GPP TS 25.410: "UTRAN Iu Interface: General Aspects and Principles".

- [19] IETF RFC 1661 (1994-07): "The Point-To-Point Protocol (PPP)".
- [20] IETF RFC 1662 (1994-07): "PPP in HDLC-like Framing".
- [21] IETF RFC 2507 (1999-02): "IP header compression".
- [22] IETF RFC 1990 (1996-08): "The PPP Multilink Protocol (MP)".
- [23] IETF RFC 2686 (1999-09): "The Multi-Class Extension to Multi-Link PPP".
- [24] IETF RFC 2509 (1999-02): "IP Header Compression over PPP".
- [25] IETF RFC 2460 (1996-12): "Internet Protocol, Version 6 (Ipv6) Specification".
- [26] IETF RFC 2474 (1998-12): "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers".
- [27] Void.
- [28] IETF RFC 3031 (2001-01): "MPLS".
- [29] IETF RFC 3153 (2001-08): "PPPMultiplexing".
- [30] IETF RFC 3309 (2002-09): "SCTP Checksum Change".
- [31] ANSI T1.111-2001: "Signalling System Number 7 (SS7) - Message Transfer Part (MTP)".
- [32] ANSI T1.112-2001: "Signalling System Number 7 (SS7) -- Signalling Connection Control Part (SCCP)".
- [33] ANSI T1.645-1995 (R2003), "B-ISDN Signaling ATM Adaptation Layer - Service Specific Coordination Function for Support of Signaling at the Network Node Interface (SSCF at the NNI)".

---

### 3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AAL	ATM Adaptation Layer
AAL2	ATM Adaptation Layer 2
AAL5	ATM Adaptation Layer 5
ATM	Asynchronous Transfer Mode
CS	Circuit Switched
DiffServ	Differentiated Services
HDLC	High Level Data Link Control
IP	Internet Protocol
M3UA	SS7 MTP3 User Adaptation Layer
ML/MC-PPP	Muti-Link/Multi-Class PPP
MPLS	Multiprotocol Label Switching
MSC	Mobile services Switching Center
MTP3-B	Message Transfer Part
PPP	Point-to-Point protocol
PPPMux	PPP Multiplexing
PS	Packet Switched
RANAP	Radio Access Network Application Part
RNC	Radio Network Controller
SAAL-NNI	Signalling ATM Adaptation Layer – Network Node Interface
SCCP	Signalling Connection Control Part
SCTP	Stream Control Transmission Protocol
SGSN	Serving GPRS Support Node
SSCF	Service Specific Co-ordination Function
SSCOP	Service Specific Connection Oriented Protocol

---

## 4 Data Link Layer

### 4.1 ATM Transport Option

ATM shall be used in the radio network control plane according to (ITU-T Rec. I.361 [5]). The structure of the cell header used in the UTRAN Iu interface is the cell header format and encoding at NNI (see Figure 3/I.361).

### 4.2 IP Transport Option

An RNC/CN using IP transport option shall support the PPP protocol with HDLC framing (IETF RFC 1661 [19], IETF RFC 1662 [20]).

Note: This does not preclude the single implementation and use of any other data link layer protocol (e.g. PPPMux (IETF RFC 3153 [29])/AAL5/ATM, PPP/AAL2/ATM, Ethernet, MPLS (IETF RFC 3031 [28])/ATM, etc.) fulfilling the UTRAN requirements toward the upper Layers.

An RNC/CN using IP transport option having interfaces connected via low bandwidth PPP links like E1/T1/J1 shall also support IP Header Compression (IETF RFC 2507 [21]) and the PPP extensions ML/MC-PPP (IETF RFC 1990 [22], IETF RFC 2686 [23]). In this case, the negotiation of header compression (IETF RFC 2507 [21]) over PPP shall be performed via IETF RFC 2509 [24].

---

## 5 RANAP Signalling Bearer

### 5.1 Introduction

This subclause specifies the Signalling Bearer protocol stack that supports the RANAP signalling protocol.

The following requirements on the Signalling Bearer can be stated:

- provide reliable transfer of control plane signalling messages in both connectionless mode and connection-oriented mode;
- provide separate independent connections for distinguishing transactions with individual UE's;
- supervise the 'UE connections' and provide connection status information to the Upper Layers for individual UE's;
- provide networking and routing functions;
- provide redundancy in the signalling network;
- provide load sharing.

### 5.2 Signalling Bearer for Circuit Switched Domain

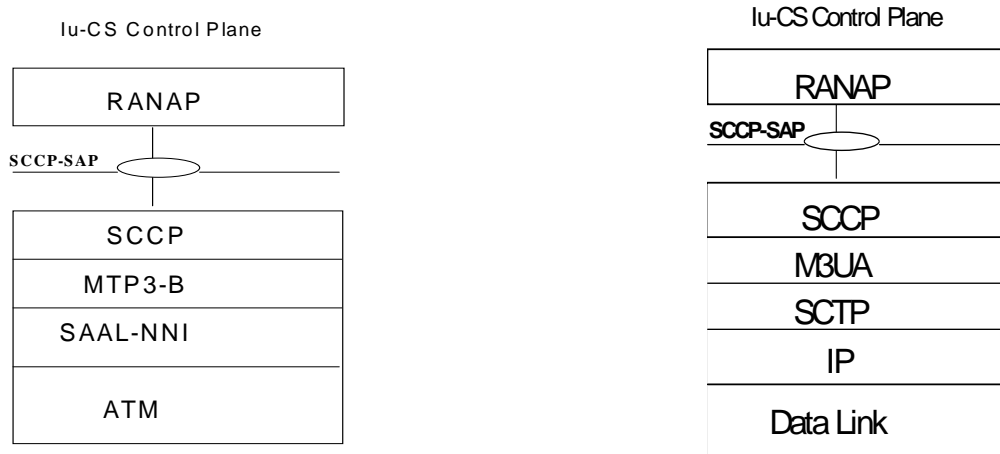
#### 5.2.1 Protocol Stack for the CS Domain

The protocol stacks for the CS Domain are shown in figure 1. The standard allows operators to choose one out of two standardised protocol suites for transport of SCCP messages.

Figure 1 shows, for the Iu IP CS domain, the point at which the service primitives are invoked. A single SAP is defined independently of the signalling bearer. The SAP provides the SCCP primitives. The figure is not intended to constrain the architecture.

The following figure 1 also illustrates the protocol model having Broadband Signalling System No.7 as the signalling bearer for RANAP over the Iu interface that fulfils the requirements. Figure 1 shows, for the CS domain, the point at which the service primitives are invoked. The SAP provides the SCCP primitives.





Protocol stack for ATM transport option

Protocol stack for IP transport option

Figure 1: SAP between RANAP and its transport for Iu - CS Domain

## 5.2.2 ATM Transport Option

1. **SCCP** (ITU-T Rec. Q.711 [7] or ANSI T1.112-2001 [32]) provides connectionless service, class 0, connection oriented service, class 2, separation of the connections mobile by mobile basis on the connection oriented link and establishment of a connection oriented link mobile by mobile basis. SCCP shall be used as specified in TS 25.410 [18].
2. **MTP3-B** (ITU-T Rec. Q.2210 [4] or ANSI T1.111-2001 [31]) provides message routing, discrimination and distribution (for point-to-point link only), signalling link management load sharing and changeover/back between link within one link-set. The need for multiple link-sets is precluded. MTP3-B shall comply with ITU-T Rec. Q.2210 [4] or ANSI T1.111-2001 [31].
3. **SAAL-NNI** (ITU-T Rec. Q.2100 [1]) consists of the following sub-layers: - **SSCF** (ITU-T Rec. Q.2140 [3] or ANSI T1.645-1995 (R2003) [33]), - **SSCOP** (ITU-T Rec. Q.2110 [2]) and - **AAL5** (ITU-T Rec. I.363.5 [6]). The SSCF maps the requirements of the layer above to the requirements of SSCOP. Also SAAL connection management, link status and remote processor status mechanisms are provided. SSCOP provides mechanisms for the establishment and release of connections and the reliable exchange of signalling information between signalling entities. Adapts the upper layer protocol to the requirements of the Lower ATM cells. It shall be possible to use SAAL-NNI connections pre-configured as PVCs for signalling transport on the Iu-Interface.
4. **ATM** (ITU-T Rec. I.361 [5]).

## 5.2.3 IP Transport Option

1. **SCCP**, see subclause 5.2.2.
2. **M3UA** refers to the SCCP adaptation layer "SS7 MTP3 – User Adaptation Layer " (IETF RFC 3332 [17]) also developed by the Sigtran working group of the IETF. An RNC equipped with the M3UA stack option shall have client functionality. This enables the RNC to report to the MSC when it is a newly introduced entity in the network.
3. **SCTP** refers to the Stream Control Transmission Protocol (IETF RFC 2960 [16]) developed by the Sigtran working group of the IETF for the purpose of transporting various signalling protocols over IP networks. The checksum method specified in IETF RFC 3309 [30] shall be used instead of the method specified in IETF RFC 2960 [16]. Multi-homing is a way to achieve redundancy with SCTP between two endpoints, of which one or both is assigned with multiple IP addresses. SCTP endpoints shall support a multi-homed remote SCTP endpoint.
4. **IP**. IPv6 shall be supported according to IETF RFC 2460 [25]. IPv4 support (IETF RFC 791 [13]) is optional.

Note: This does not preclude the single implementation and use of Ipv4.

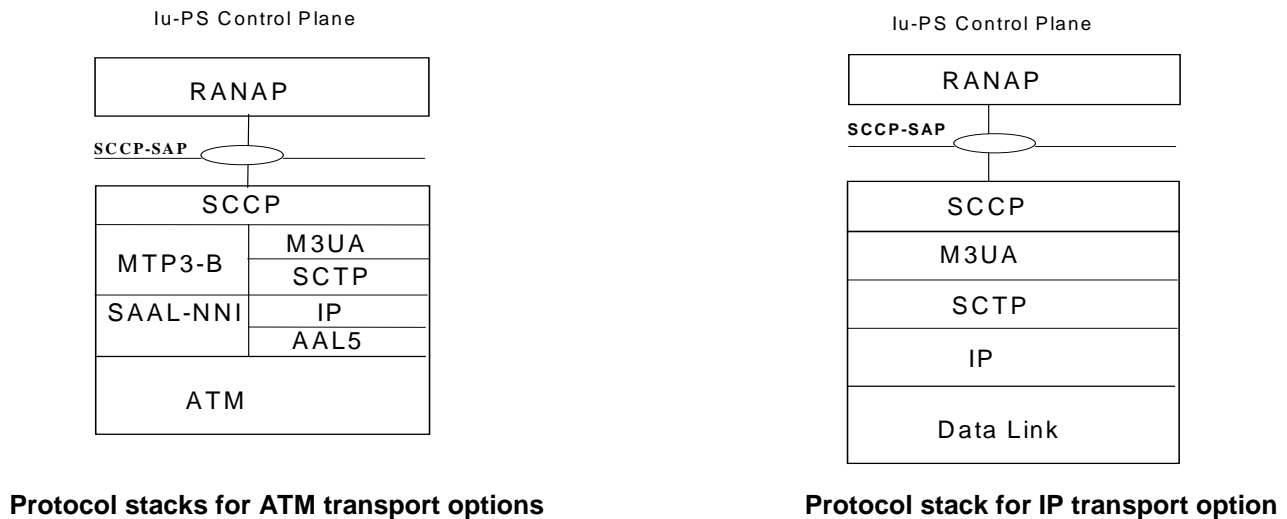
Due to the possible transition from IPv4 to IPv6 the IP dual stack support is recommended.

An RNC/CN using IP transport option shall support Diffserv code point marking IETF RFC 2474 [26]. The Diffserv code point may be determined from the application parameters.

## 5.3 Signalling Bearer for Packet Switched Domain

### 5.3.1 Protocol Stack for the PS Domain

The protocol stacks for the PS Domain is shown in figure 2. The standard allows operators to choose one out of three standardised protocol suites for transport of SCCP messages.



**Figure 2: SAP between RANAP and its transport for the Iu-IP domain**

Figure 2 shows, for the Iu IP domain, the point at which the service primitives are invoked. A single SAP is defined independently of the signalling bearer. The SAP provides the SCCP primitives. The figure is not intended to constrain the architecture.

### 5.3.2 ATM Transport Option 1

1. **SCCP** (ITU-T Rec. Q.711 [7] /ITU-T Rec. Q.712 [8] /ITU-T Rec. Q.713 [9] /ITU-T Rec. Q.714 [10] /ITU-T Rec. Q.715 [11] /ITU-T Rec. Q.716 [12] or ANSI T1.112-2001 [32]) provides connectionless service, class 0, connection oriented service, class 2, separation of the connections mobile by mobile basis on the connection oriented link and establishment of a connection oriented link mobile by mobile basis. The SCCP shall be used as specified in TS 25.410 [18].
2. **MTP3-B** (ITU-T Rec. Q.2210 [4] or ANSI T1.111-2001 [31]) provides message routing, discrimination and distribution (for point-to-point link only), signalling link management load sharing and changeover/back between link within one link-set. The need for multiple link-sets is precluded. MTB3-B shall comply with ITU-T Rec. Q.2210 [4] or ANSI T1.111-2001 [31].
3. **SAAL-NNI** (ITU-T Rec. Q.2100 [1]) consists of the following sub-layers: - **SSCF-NNI** (ITU-T Rec. Q.2140 [3] or ANSI T1.645-1995 (R2003) [33]), - **SSCOP** (ITU-T Rec. Q.2110 [2]) and - **AAL5** (ITU-T Rec. I.363.5 [6]). The SSCF maps the requirements of the layer above to the requirements of SSCOP. Also SAAL connection management, link status and remote processor status mechanisms are provided. SSCOP provides mechanisms for the establishment and release of connections and the reliable exchange of signalling information between signalling entities. Adapts the upper layer protocol to the requirements of the Lower ATM cells. It shall be possible to use SAAL-NNI connections pre-configured as PVCs for signalling transport on the Iu-interface.
4. **ATM** (ITU-T Rec. I.361 [5]).

### 5.3.3 ATM Transport Option 2

1. **SCCP**, see subclause 5.3.2.

2. **M3UA** refers to the SCCP adaptation layer "SS7 MTP3 – User Adaptation Layer " (IETF RFC 3332 [17]) also developed by the Sigtran working group of the IETF. An RNC equipped with the M3UA stack option shall have client functionality. This enables the RNC to report to the SGSN when it is a newly introduced entity in the network.
3. **SCTP** refers to the Stream Control Transmission Protocol (IETF RFC 2960 [16]) developed by the Sigtran working group of the IETF for the purpose of transporting various signalling protocols over IP networks. The multi-homing services of SCTP shall be required at both ends of an SCTP-association to enable transport redundancy and reliability. **M3UA**. An implementation of SCTP to this document shall utilise the new checksum method specified in IETF RFC 3309 [30] instead of the method specified in IETF RFC 2960 [16].
4. **IP** (IETF RFC 791 [13]) over ATM is defined in IETF RFC 2684 [14] and IETF RFC 2225 [15].
5. **AAL5** refers to ITU-T Rec. I.363.5 [6]. It shall be possible to use AAL5 connections pre-configured as PVCs for signalling transport on the Iu-interface.

### 5.3.4 IP Transport Option

1. **SCCP** , see subclause 5.3.2.
2. **M3UA**, refers to the SCCP adaptation layer "SS7 MTP3 – User Adaptation Layer " (IETF RFC 3332 [17]) also developed by the Sigtran working group of the IETF. An RNC equipped with the M3UA stack option shall have client functionality. This enables the RNC to report to the SGSN when it is a newly introduced entity in the network.
3. **SCTP**, refers to the Stream Control Transmission Protocol (IETF RFC 2960 [16]) developed by the Sigtran working group of the IETF for the purpose of transporting various signalling protocols over IP networks. An implementation of SCTP to this document shall utilise the new checksum method specified in IETF RFC 3309 [30] instead of the method specified in IETF RFC 2960 [16]. Multi-homing is a way to achieve redundancy with SCTP between two endpoints, of which one or both is assigned with multiple IP addresses. SCTP endpoints shall support a multi-homed remote SCTP endpoint.
4. **IP**. IPv6 shall be supported according to IETF RFC 2460 [25]. IPv4 support (IETF RFC 791 [13]) is optional.

Note: This does not preclude the single implementation and use of IPv4.

Due to the possible transition from IPv4 to IPv6, the IP dual stack support is recommended.

An RNC/CN using IP transport option shall support Diffserv code point marking (IETF RFC 2474 [26]). The Diffserv code point may be determined from the application parameters.

## 5.4 Services Provided by the Signalling Bearer

When considering the requirements that the upper layers, i.e. RANAP, have on the Signalling Bearer, there are a number of services it has to provide and a number of functions to perform. These numbers of services that the signalling bearer shall provide, to the upper layers, are stated in references ITU-T Rec. Q.711 [7] /ITU-T Rec. Q.712 [8] /ITU-T Rec. Q.713 [9] /ITU-T Rec. Q.714 [10] /ITU-T Rec. Q.715 [11] / ITU-T Rec. Q.716 [12] or ANSI T1.112-2001 [32].

## Annex A (informative): Change History

Date / TSG	TSG Doc.	CR	Rev	Subject/Comment	New
12/2008	-	-	-	Creation of Rel-8 version based on v7.1.0	8.0.0
12/2009	-	-	-	Creation of Rel-9 version based on v8.0.0	9.0.0
03/2011	SP-100629			Clarification on the use of References (TS 21.801 CR#0030)	9.0.1
03/2011				Creation of Rel-10 version based on v9.0.1	10.0.0
06/2011	RP-110685	0026		Correction to the References in 25.412	10.1.0
09/2012				Update to Rel-11 version (MCC)	11.0.0
09/2014				Update to Rel-12 version (MCC)	12.0.0
12/2015				Update to Rel-13 version (MCC)	13.0.0

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-03	SA#75					Promotion to Release 14 without technical change	14.0.0
2018-06	SA#80	-	-	-	-	Promotion to Release 15 without technical change	15.0.0

---

# History

<b>Document history</b>		
V15.0.0	July 2018	Publication