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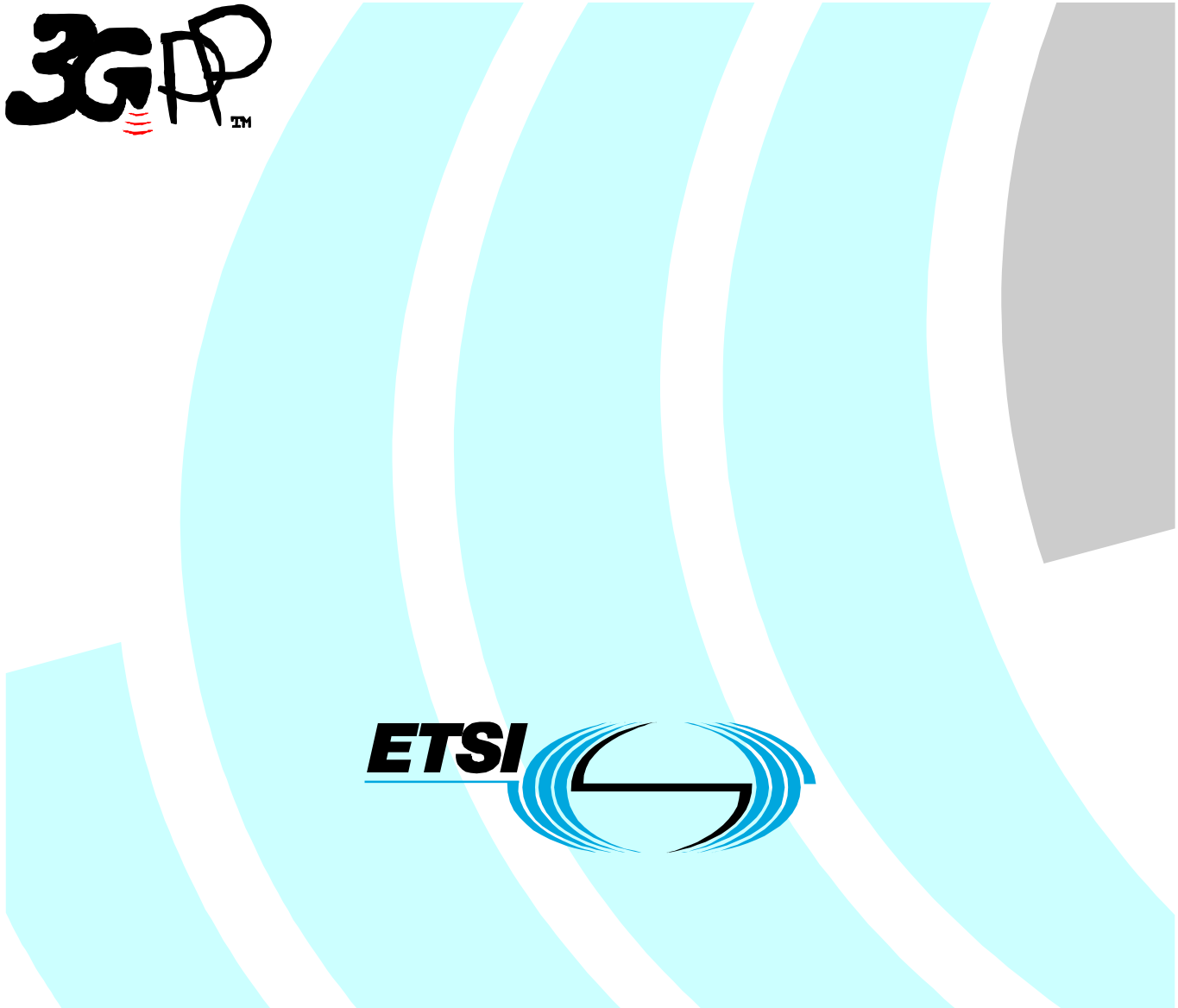
Technical Specification

Universal Mobile Telecommunications System (UMTS);
UTRAN Iu interface signalling transport
(3GPP TS 25.412 version 6.3.0 Release 6)



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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
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Foreword

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The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp .

Contents

Foreword

This Technical Specification (TS) 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.

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 (07/1994): "B-ISDN Signalling ATM Adaptation Layer (SAAL) - overview description".

[2] ITU-T Recommendation Q.2110 (07/1994): "B-ISDN ATM Adaptation Layer – Service Specific Connection Oriented Protocol (SSCOP)".

[3] ITU-T Recommendation Q.2140 (02/1995): "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 (07/1996): "Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140".

[5] ITU-T Recommendation I.361 (11/1995): "B-ISDN ATM layer specification".

[6] ITU-T Recommendation I.363.5 (08/1996): "B-ISDN ATM Adaptation Layer Type 5".

[7] ITU-T Recommendation Q.711 (07/1996): "Functional description of the signalling connection control part".

[8] ITU-T Recommendation Q.712 (07/1996): "Definition and function of Signalling connection control part messages".

[9] ITU-T Recommendation Q.713 (07/1996): "Signalling connection control part formats and codes".

[10] ITU-T Recommendation Q.714 (07/1996): "Signalling connection control part procedures".

[11] ITU-T Recommendation Q.715 (07/1996): "Signalling connection control part user guide".

[12] ITU-T Recommendation Q.716 (03/1993): "Signalling Connection Control Part (SCCP) performance".

[13] IETF RFC 791 (09/1981): "Internet Protocol".

[14] IETF RFC 2684 (09/1999): "Multiprotocol Encapsulation over ATM Adaptation Layer 5".

[15] IETF RFC 2225 (04/1998): "Classical IP and ARP over ATM".

[16] IETF RFC 2960 (10/2000): "Stream Control Transmission Protocol".

[17] IETF RFC 3332(09/2002): "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 STD 51, RFC 1661 (07/1994): "The Point-To-Point Protocol (PPP)".

[20] IETF STD 51, RFC 1662 (07/1994): "PPP in HDLC-like Framing".

[21] IETF RFC 2507 (02/1999): "IP header compression".

[22] IETF RFC 1990: "The PPP Multilink Protocol (MP)".

[23] IETF RFC 2686 (09/1999): "The Multi-Class Extension to Multi-Link PPP".

[24] IETF RFC 2509 (02/1999): "IP Header Compression over PPP".

[25] IETF RFC 2460: "Internet Protocol, Version 6 (Ipv6) Specification".

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

[27] IETF RFC 768 (09/1980): "User Datagram Protocol".

[28] IETF RFC 3031 (01/2001): "MPLS".

[29] IETF RFC 3153 (08/2001): "PPPmultiplexing".

[30] RFC 3309: "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
IntServ	Integrated Services
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
QoS	Quality of Service
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
UDP	User Datagram Protocol

4 Data Link Layer

4.1 ATM Transport Option

ATM shall be used in the radio network control plane according to 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 [19], [20].

Note: This does not preclude the single implementation and use of any other data link layer protocol (e.g. PPPMux [29]/AAL5/ATM, PPP/AAL2/ATM, Ethernet, MPLS [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 [21] and the PPP extensions ML/MC-PPP [22], [23]. In this case, the negotiation of header compression [21] over PPP shall be performed via [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.

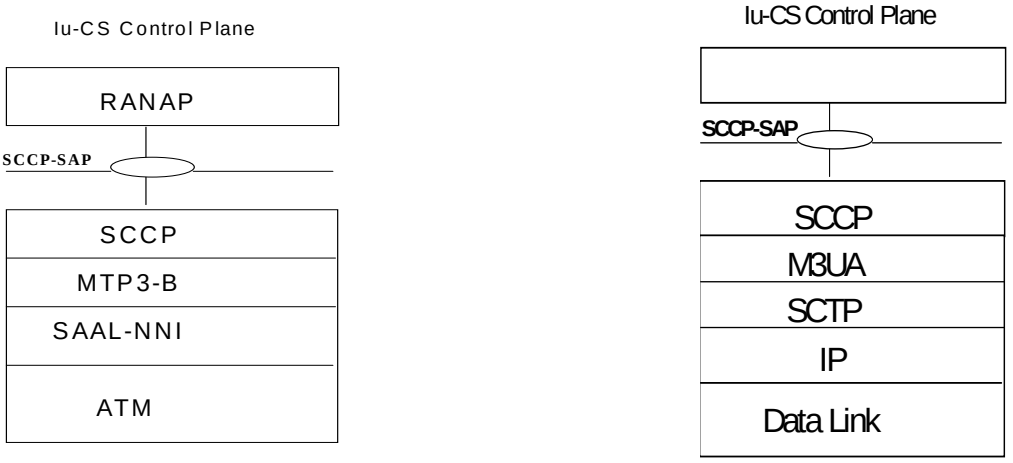
5.2 Signalling Bearer for Circuit Switched Domain

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** [7] or [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 [18].

2. **MTP3-B** [4] or [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 [4] or [31].

3. **SAAL-NNI** [1] consists of the following sub-layers: - **SSCF** [3] or [33], - **SSCOP** [2] and – **AAL5** [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** [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 " [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 [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 RFC 3309 [30] shall be used instead of the method specified in RFC 2960 [16].

4. **IP**. IPv6 shall be supported according to [25]. IPv4 support [13] is optional.

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

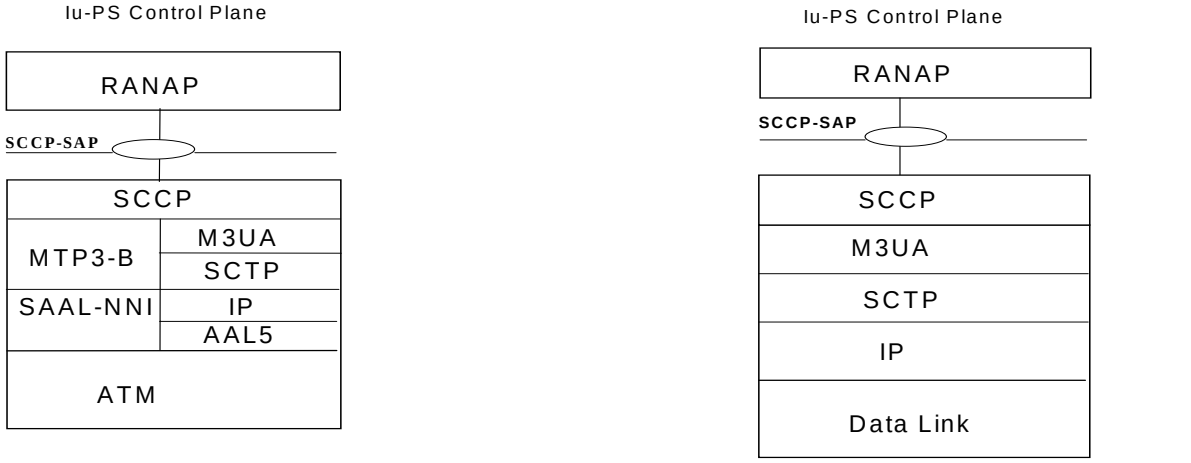
   Due to the possible transition from IPv4 to IPv6 the IP dual stack support is recommended.

An RNC/CN using IP transport option shall support Diffserv code point marking [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.



Protocol stacks for ATM transport options **Protocol stack for IP transport option**

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** [7] or [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 [18].

2. **MTP3-B** [4] or [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 [4] or [31].

3. **SAAL-NNI** [1] consists of the following sub-layers: - **SSCF-NNI** [3] or [33], - **SSCOP** [2] and – **AAL5** [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** [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 " [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 [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 RFC 3309 [30] instead of the method specified in RFC 2960 [16].

4. **IP** [13] over ATM is defined in [14] and [15].

5. **AAL5** refers to [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 " [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 [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 RFC 3309 [30] instead of the method specified in RFC 2960 [16].

4. **IP**. IPv6 shall be supported according to [25]. IPv4 support [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 [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 [7] to [12] or [32].

Annex A (informative): Change History

Change history					
TSG RAN#	Version	CR	Tdoc RAN	New Version	Subject/Comment
RAN_04	-	-	-	3.0.0	Approved at TSG RAN #4 by correspondence and placed under Change Control
RAN_05	3.0.0	-	-	3.1.0	Approved at TSG RAN #5
RAN_06	3.1.0	001	RP-99744	3.2.0	Approved at TSG RAN #6
RAN_07	3.2.0	-	RP-000077	3.3.0	Approved at TSG RAN #7 (2 approved CRs)
RAN_07	3.3.0	-	RP-000233	3.4.0	Approved at TSG RAN #8
RAN_09	3.4.0	005	RP-000372	3.5.0	Approved at TSG RAN #9
RAN_10	3.5.0	006 007 008	RP-000611	3.6.0	Approved at TSG RAN #10

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
March 01	11	-	-		Approved at TSG RAN #11 and placed under Change Control	3.6.0	4.0.0
03/2002	15	RP-020189	010	3	Introduction of IP Transport option in UTRAN	4.0.0	5.0.0
09/2002	17	RP-020611	011	1	Addition of new reference on SCTP checksum	5.0.0	5.1.0
12/2003	22	-	-	-	Introduction of Release 6 specification	5.1.0	6.0.0
12/2004	26	RP-040432	017	1	IP transport option correction	6.0.0	6.1.0
06/2005	28	RP-050234	019	-	Correction of M3UA references	6.1.0	6.2.0
12/2005	30	RP-050690	020		M3UA Client in IP Transport Option	6.2.0	6.3.0
12/2005	30	RP-050691	021	1	Addition of ANSI protocol options	6.2.0	6.3.0

History

Document history		
V6.0.0	December 2003	Publication
V6.1.0	December 2004	Publication
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