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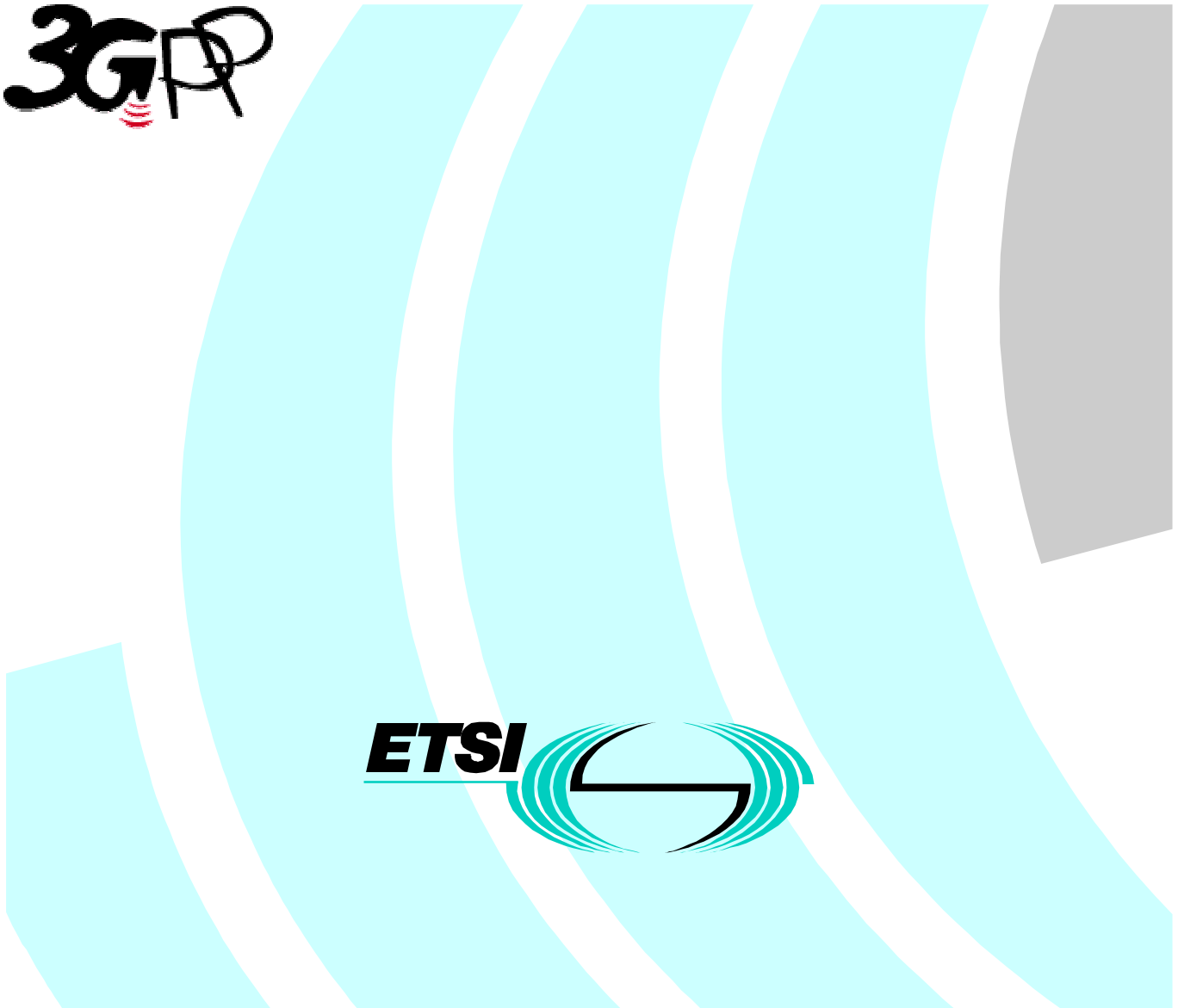
Technical Report

Universal Mobile Telecommunications System (UMTS);
Iu Principles
(3GPP TR 23.930 version 4.0.0 Release 4)



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Foreword

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Contents

Foreword

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

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where:

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  - 1 presented to TSG for information;
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  - 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.
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Introduction

The Iu reference point of UMTS is defined to be at the boundary of the URAN and the IWU [1]. In case the IWU is null, the Iu is between URAN and CN. The purpose of this document is to analyze the basic issues related to the Iu before starting the actual standardisation of the related interface(s).

1 Scope

This report identifies the requirements on the Iu and studies relevant principles to guide further standardisation of the related interface(s).

The different instances of the UMTS radio access currently identified are the following:

UMTS radio access network (URAN)

UMTS Terrestrial Radio Access Network (UTRAN)

Broadband Radio Access Network (BRAN)

UMTS satellite radio access network

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 TS 23.101: "Universal Mobile Telecommunications System (UMTS): General Architecture".

[2] 3GPP TS 23.110: "UMTS Access Stratum, Services and Functions".

3 Definitions, symbols and abbreviations

3.1 Definitions

Iu: Interconnection point between the RNS and Core Network. It is also considered as a reference point. The Iu will be implemented as one or more physical interfaces.

Iu-CS: The physical instance of Iu towards the CS-Service Domain of the core network.

Iu-PS: The physical instance of Iu towards the PS-Service Domain of the core network.

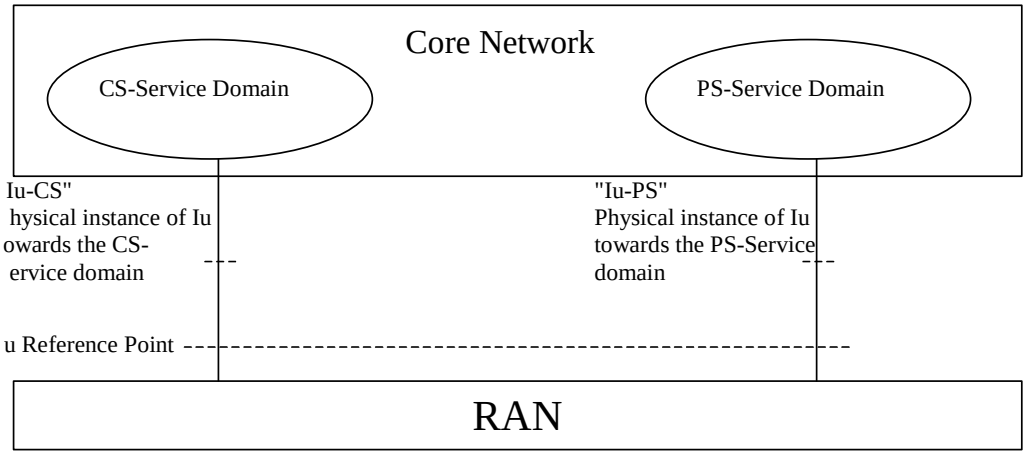


Figure 1: Iu Reference point, and the Iu-CS and Iu-PS physical instances

3.2 Symbols

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

TBD

3.3 Abbreviations

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

TBD

4 Iu requirements

4.1 General Requirements

1. The Iu shall support all service capabilities offered to UMTS users

   Iu shall particularly cater for a variety of services e.g. classical telephony, internet-based services (www, e-mail etc.), and multimedia services. This implies that Iu supports efficiently:

   * dedicated circuits, especially for voice
   * best-effort packet services (e.g. Internet/IP)
   * real-time multimedia services requiring a higher degree of QoS. These real time services may be based on real-time packet data or circuit-switched data.
   * UMTS signalling and backward compatibility towards GSM signalling scheme.

2. The Iu shall support separate evolution of O&M facilities
3. The Iu shall support separation of each User Equipment (UE) on the protocol level for mobile specific signalling management.
4. The Iu shall support transfer of transparent non-access signalling between UE and CN.
5. The Iu shall support procedures to establish, maintain and release various types of Iu bearers.
6. The Iu shall support procedures for Intersystem handover, and the CN shall support corresponding switching capability.

7. The Iu shall support mechanisms for resource reservation for packet data streams (e.g. IP)

8. The specifications, for the Control and User planes, of the I_U shall be such that the Radio Network Layer and the Transport Layer are independent, allowing either layer to change without impacting the other layer.

9. The Transport Layer Protocols and the Radio Network Layer Protocols, for the Control and User planes, of the I_U shall be specified in separate documents, allowing for either document to change without impacting the other document.

4.2 UMTS Terrestrial Radio Access Network (UTRAN)

1. (Not used)

2. The design of Iu shall support connection of UTRAN via IWF to A and Gb interfaces of GSM.

3. The Iu shall support connection of various manufacturers' URANs to various manufacturers' IWF/CN

4. The Iu shall support separate evolution of URAN and IWF/CN

5. "The specification of the Iu shall cater for both the circuit switched (GSM) and packet (GPRS) domains. In order to enable each domain to develop according to their specific characteristics, Iu shall allow different protocol stacks towards the PSTN/ISDN domain and the IP domain.

6. The Iu shall support the combined process of relocating the SRNS role to another RNS and changing the Iu connection point for a specific UE (streamlining) and the CN shall support switching capability.

7. As long as the Iu connection point is not modified, the UTRAN can be requested by the CN to prevent all loss of data (i.e. independently of the handovers on the radio interface).

8. In case the Iu connection point is changed (e.g. SRNS relocation, streamlining), the CN is not supposed to buffer packets in view of ensuring a high data reliability. Hence, at SRNC relocation, for high reliability Radio Access Bearers, the old SRNC has to send downstream packets not yet acknowledged by UE to the new SRNC. Furthermore, no flow control between CN and UTRAN needs to be defined in order to control the IP domain user plane downstream flow.

9. A single set of radio access bearer services shall be offered by the UTRAN to the Core Network.

10. There shall be a single functional split between the UTRAN and the Core Network.

11. A single Access Stratum signalling protocol between the UTRAN and the Core Network over Iu shall be defined to access the services provided by UTRAN.
    Note: The statements 9, 10 and 11 apply regardless of the scenario applied for the Core Network.

12. If the GSM/UMTS Core Network consists of different core network node types, UTRAN shall support simultaneous access to these node types for one UE.

13. The Iu shall support general procedures that are not related to a specific UE. Such procedures may be used e.g. in failure situations, for flow control in procedure level, or in the initialisation phase (this does not refer to O&M procedures).

14. (Not used)

15. The Iu shall support a set of general UTRAN procedures from the Core Network such as paging –notification

16. (Not used)

17. The Iu shall support procedures to establish, maintain and release various types of UTRAN Radio Access Bearers.

18. The Iu shall enable the CN node to request UTRAN to obtain and send the location information for a specific UE located in the coverage of the present UTRAN. The location information consists of both a geographic area identity and a set of global co-ordinates with uncertainty parameters

19. AAL2 is used as the data transport bearer for the user plane towards the PSTN/ISDN domain.

20. The AAL Type signalling protocol 2 (q.aal2) Capability Set 1 (CS1) developed by ITU SG11 is used to establish the AAL2 connections towards the PSTN/ISDN domain

21. To ensure the necessary load sharing on the Iu_PS interface,

    - When the CN requests the establishment of a Radio Access Bearer (associated with a PDP context) or at SRNS relocation for all Radio Access Bearers (associated with PDP contexts) of an UE, the CN specifies the IP address of the packet processing function allocated to this / each of these PDP context(s) in the CN.

    - In the response to the CN request, the RNC specifies the IP address of the packet processing function allocated to this / each of these Radio Access Bearer(s) in the RNC.

      When it sends downstream traffic in a RAB, the packet processing function in the CN sends the packet to the RNC IP address received from the SRNC at RAB establishment or at SRNS relocation.

      When it sends upstream traffic in this RAB, the packet processing function in the RNC sends the packet to the CN IP address received from the CN at RAB establishment or at SRNS relocation.

4.2.1 SRNS-Relocation

To carry out SRNS relocation, the source SRNC must launch the SRNS relocation procedure, since it is not the target SRNC but the source SRNC that knows the current services of an user. This is done only when this procedure has the least adverse effect on user traffic,

The SRNC relocation procedures shall ensure that there is only one Serving RNC for an user even if this user has services through more than one (IP or ISDN) domain.

The SRNS relocation procedure is split in 2 phases. In the first one resources are reserved on the new Iu interfaces and (if needed) inside the CN. Only when this first phase has been successfully carried out for all domains on which the user has currently some services, the source SRNC can launch the second phase i.e. hand-over the role of SRNC to the target SRNC.

4.2.2 Position for header compression

Header compression function is allocated at RNC because:

- differential header compression algorithms work better if they are located in the place where packets are more likely to be discarded (after having discarded packets the compression algorithm can send a packet with full header). This place is the RNC (where the queues for downstream packets waiting for radio resources are located).

- The compression entity is as close as possible to the reliable link (as in 2G) which in this case is the RLC. Therefore it can be stated that a faster recovery of packets is possible after loss of packets in the radio interface and this solution will therefore minimize the amount of buffering in the UE and network.

- the compression can be optimized for the used RAN.

- It increases the possible data rates that can be achieved: Locating the compression function in the RAN defers the SGSN from the task of opening and processing packets

- efficient inter-system hand-over can be supported

4.3 UMTS Satellite Radio Access Network (USRAN)

1. The Iu shall support connection to UMTS Satellite Radio Access Network (USRAN)

2. The Iu shall support low rate source encoded speech;

3. [The Iu shall support radio access and link control protocols that are tolerant to changes in delay at handovers.]

4. (Editorial, Requirement 3 is currently put into brackets since Iu related requirements related to handover scenarios including Satellite based access are for further study)

5. The Iu shall ensure that location information wherever and whenever present, shall support global co-ordinate formats.

6. The Iu shall support connection establishment protocols working over radio resources of different power and penetration levels such as to request the user to move to a more favourable location to complete the establishment of the connection.

7. The Iu shall support low rate data services.

4.4 Broadband Radio Access Network (BRAN)

1. The Iu shall support connection of an EP BRAN HIPERLAN 2 radio access network.

2. The Iu shall support high data rates according to the capability of HIPERLAN2.

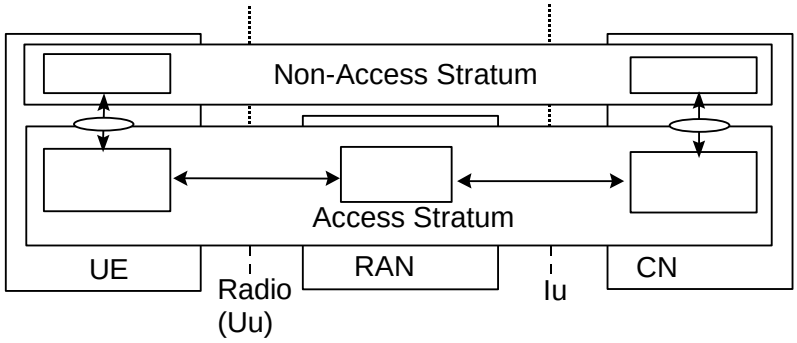
3. The Iu shall support UMTS QoS mechanisms also for high data rate services according to the capability of HIPERLAN2.

4. The Iu shall support handover within/between HIPERLAN2 radio access networks.

5. The Iu shall support handover between HIPERLAN 2 and UTRAN. Other systems are ffs.

5 Access stratum vs. Non-access stratum

The Access Stratum (AS) offers its services to the Nonaccess Stratum through SAPs in the UE and CN. These services are described in [2]. The Access Stratum contains a set of UE – RAN protocols and a set of RAN – CN protocols ref. [1].



6 Working Assumptions

6.1 General

1. Source dependent coding (e.g. voice) shall be located in the core network domain, and logically belong outside the Access Stratum. For release 99 the location is expected to be the visited MSC. However the release 99 standard shall facilitate the evolution of the codec into the gateway/interworking MSC; i.e., at the PLMN border. To do this, it is (at least) required that the interface between RNC and the transcoder is fully standardised in release 99.

2. Transport protocol across the Iu interface for UTRAN shall be based on ATM.

6.2 Interface and protocols over Iu for UTRAN purposes

1. The UMTS standard shall allow for both separated and combined MSC/VLR and SGSN configurations
2. The UTRAN shall support two logically separate signalling flows via Iu to combined or separate network nodes of different types (MSC and SGSN)
3. The UE shall be able to handle separated or combined MSCs and SGSNs.
4. There can be several user planes to these CN nodes.
5. Addressing in RANAP should follow the following principles (subject to evaluation of performance impact):

   5a. Addressing for signalling messages on the Iu interface (in RANAP) should be independent of underlying layers allowing for independent evolution of the underlying layers.

   5b. Addressing for signalling messages on the Iu interface (in RANAP) should use the same addressing scheme for both the PS-domain and the CS-domain

Annex A:
Change History

Document History		
August 1997		Scope agreed
November 1997	0.1.0	Version 0.1.0 mailed to SMG3 SA delegates prior to SMG3 SA meeting in Stockholm.
November 1997	0.1.1	Version 0.1.1 presented at SMG3 SA in Stockholm
August 1998	0.2.0	Version 0.2.0 with the changes agreed in the Sophia Antipolis meeting.
September 1998	0.3.0	Version 0.3.0 with the changes agreed in the Rome meeting
October 1998	0.4.0	Added req. due to Td 98S853. Added section “Access Stratum vs. Non-Access Stratum due to Td 98S864
December 1998	0.5.0	Restructured to handle different types of the UMTS radio access network
December 1998	0.6.0	New USRAN and BRAN sections. New working assumptions.
February 1999	1.0.0	Based on decisions in Walnut Creek and Kista meetings
March 1999	1.1.0	Section 6.1, Working assumption on Transcoder Location included
March 1999	1.2.0	Changes from Nynäshamn (S2-99148)
April 1999	1.2.1	Change to 3GPP format
June 1999	1.3.0	Changes from Sophia Antipolis (S2-99345, S2-99404)
June 1999	1.3.1	Editorial changes in section 4.2 (Editor : Bo Axerud, e-mail:bo.axerud@nokia.com)
June 1999	2.0.0	Version 1.3.1 has been approved by e-mail and agreed to be updated to version 2.0.0, for submission to TSG SA for approval
July 1999	3.0.0	Template changed, clauses and sub-clauses numbering corrected, administrative clauses added.
April 2001	4.0.0	Version 4.0.0 created with same technical content as v.3.0.0

History

Document history		
V4.0.0	April 2001	Publication