

3G TS 25.410 V3.0.0 (1999-10)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group Radio Access Network; UTRAN Iu Interface: General Aspects and Principles (3G TS 25.410 version 3.0.0)



Reference

DTS/TSGR-0225410U

Keywords

3GPP

Postal address

3GPP support office address

650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

<http://www.3gpp.org>

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© 1999, 3GPP Organizational Partners (ARIB, CWTS, ETSI, T1, TTA, TTC).
All rights reserved.

Contents

Foreword.....	5
1 Scope	6
2 References	6
3 Definitions and abbreviations.....	6
3.1 Definitions.....	6
3.2 Abbreviations	6
4 General Aspects.....	7
4.1 UTRAN Architecture	7
4.1.1 Iu Interface Architecture.....	7
4.1.2 Iu connection principles	8
4.2 I _u Interface General Principles	8
4.3 I _u Interface Specification Objectives.....	9
4.4 I _u Interface Capabilities.....	9
4.5 I _u Interface Characteristics	10
4.5.1 Use of Transport Network User Plane as Signalling Bearer.....	10
4.5.1.1 Use of SCCP	10
4.5.1.1.1 General.....	10
4.5.1.1.2 SCCP connection establishment.....	10
4.5.1.1.3 SCCP connection release	12
4.5.1.1.4 General SCCP Abnormal Conditions.....	12
4.5.2 Use of Transport Network User Plane as User Data Bearer.....	12
4.5.2.1 Use of AAL2.....	12
4.5.2.2 Use of GTP-U.....	12
5 Functions of the I _u Interface Protocols & Functional Split	12
5.1 General.....	12
5.2 RAB management Functions.....	14
5.2.1 RAB establishment, modification and release function	14
5.2.2 RAB characteristics mapping to Uu bearers function.....	14
5.2.3 RAB characteristics mapping to Iu transport bearers	14
5.2.4 RAB queuing, pre-emption and priority function.....	14
5.3 Radio Resource Management over Iu.....	14
5.3.1 Radio resource admission control.....	14
5.3.2 Broadcast information management	15
5.4 Rate adaptation for external networks.....	15
5.5 Iu link Management functions.....	15
5.5.1 Iu Signalling Link Management function	15
5.5.2 ATM Virtual Connection Management function.....	15
5.5.3 AAL2 connection establish and release function.....	15
5.5.4 AAL5 management function.....	15
5.5.5 GTP-U tunnels management function	16
5.5.6 Buffer Management.....	16
5.6 Iu U-plane (RNL)Management Functions.....	16
5.6.1 Iu U-plane frame protocol mode selection function	16
5.6.2 Iu U-plane frame protocol initialisation	16
5.7 Mobility Management Functions	16
5.7.1 Mobility Management	16
5.7.2 Location information update function	16
5.7.3 Handover and Relocation functions.....	17
5.7.3.1 Active Cell Management, intra RNC	17
5.7.3.2 Active Cell Management, inter RNC, when Iur is available	17
5.7.3.3 Inter RNC hard HO function, Iur not used or not available	17
5.7.3.4 Serving RNS Relocation function.....	17
5.7.3.5 Inter system Handover (e.g. GSM-UMTS) function.....	17

5.7.4	Paging.....	17
5.7.4.1	Paging triggering function	17
5.7.4.2	Paging execution function.....	17
5.7.5	Location Management	17
5.8	Security Functions.....	18
5.8.1	Data Confidentiality	18
5.8.1.1	Radio interface ciphering function.....	18
5.8.1.2	Ciphering key management function.....	18
5.8.1.3	User identity confidentiality function	18
5.8.2	Terminal identity check function.....	18
5.8.3	User Authentication function.....	18
5.8.4	Data integrity	18
5.8.4.1	Integrity checking	18
5.8.4.2	Integrity key management	18
5.9	Service and Network Access Functions	18
5.9.1	Core Network signalling data transfer function.....	18
5.9.2	Transcoding function.....	19
5.9.3	CS data -Network Interworking function.....	19
5.9.4	Charging	19
5.9.5	UE Tracing	19
5.9.6	Location reporting function.....	19
5.10	Co-ordination Functions.....	19
5.10.1	Paging Co-ordination function	19
6	I _u Interface Protocol Structure	19
6.1	General.....	19
6.2	Iu-CS.....	20
6.3	Iu-PS	20
7	Other I _u Interface Specifications.....	21
7.1	UTRAN Iu Interface: Layer 1 (UMTS 25.411)	21
7.2	UTRAN Iu Interface: Signalling Transport (UMTS 25.412).....	21
7.3	UTRAN Iu Interface: RANAP Specification (UMTS 25.413)	21
7.4	UTRAN Iu Interface: Data Transport and Transport Signalling (UMTS 25.414)	21
7.5	UTRAN Iu Interface: CN-UTRAN User Plane Protocol (UMTS 25.415)	22
7.8	Summary	22
	History	23

Foreword

This Technical Specification has been produced by the 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 this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version 3.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 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 specification;

1 Scope

The present document is an introduction to the UMTS 25.41x series of Technical Specifications that define the Iu interface for the interconnection of Radio Network Controller (RNC) component of the UMTS Terrestrial Radio Access Network (UTRAN) to the Core Network of the UMTS system.

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.

- [1] UMTS 25.401, UTRAN Overall Description
- [2] UMTS 23.930, Iu Principles
- [3] UMTS 23.110, UMTS Access Stratum; Services and Functions
- [4] UMTS 25.411, UTRAN Iu Interface: Layer 1
- [5] UMTS 25.412, UTRAN Iu Interface: Signalling Transport
- [6] UMTS 25.413, UTRAN Iu Interface: RANAP Signalling
- [7] UMTS 25.414, UTRAN Iu Interface: Data Transport & Transport Signalling
- [8] UMTS 25.415, UTRAN Iu Interface: CN-RAN User Plane Protocol
- [9] Q.711 (7/96), Functional description of the signalling connection control part
- [10] Q.712 (7/96), Definition and function of signalling connection control part messages
- [11] Q.713 (7/96), Signalling connection control part formats and codes
- [12] Q.714 (7/96), Signalling connection control part procedures

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in [1] apply.

3.2 Abbreviations

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

3G-MSC	3 rd Generation Mobile Switching Centre
3G-SGSN	3 rd Generation Serving GPRS Support Node
ATM	Asynchronous Transfer Mode
BSSMAP	Base Station Subsystem Management Application Part
CC	Connection Confirm

CN	Core Network
CR	Connection Release
CREF	Connection Refusal
CS	Circuit Switched
GT	Global Title
IMSI	International Mobile Subscriber Identity
ISDN	Integrated Services Digital Network
NAS	Non Access Stratum
O&M	Operation and Maintenance
PS	Packet Switched
PSTN	Public Switched Telephone Network
PVC	Permanent Virtual Circuit
QoS	Quality of Service
RAB	Radio Access Bearer
RANAP	Radio Access Network Application Part
RLP	Radio Link Protocol
RNC	Radio Network Controller
RNL	Radio Network Layer
RRC	Radio Resource Control
SAP	Service Access Point
SCCP	Signalling Connection Control Part
SPC	Signalling Point Code
SRNS	Serving Radio Network Subsystem
SSN	Sub-System Number
SVC	Switched Virtual Circuit
UE	User Equipment
UP	User Plane
URA	UTRAN Registration Area
UTRAN	UMTS Terrestrial Radio Access Network
VC	Virtual Circuit

4 General Aspects

4.1 UTRAN Architecture

4.1.1 Iu Interface Architecture

The overall UMTS architecture and UTRAN architectures are described in [1]. This section specifies only the architecture of the Iu interface, and shall not constrain the network architecture of either Core or Radio Access Networks.

The I_u interface is specified at the boundary between the Core Network and UTRAN. Figure 4.1 depicts the logical division of the I_u interface. From the Iu perspective, the UTRAN access point is an RNC.

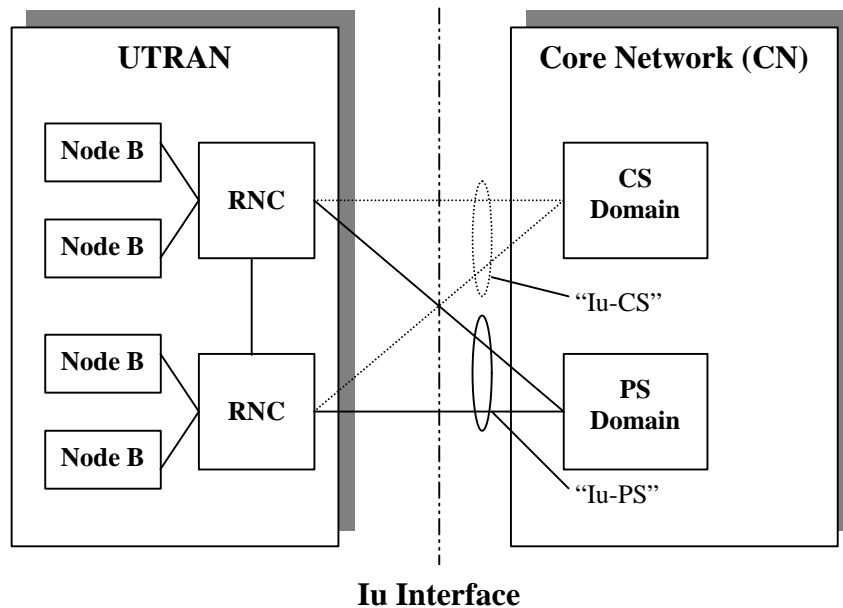


Figure 4.1: Iu Interface Architecture

The Iu interface towards the PS-domain of the core network is called Iu-PS, and the Iu interface towards the CS-domain is called Iu-CS. The differences between Iu-CS and Iu-PS are treated elsewhere in this specification.

There may be at most two distinct Iu interface for any RNC - one (Iu-CS) towards the CS domain and one (Iu-PS) towards the PS-domain.

In the separated core network architecture, this means that there are separate signalling and user data connections towards the two domains -this applies in both transport and radio network layers.

In the combined architecture, there are separate connections in the user plane (in both transport and radio network layers). In the control plane, there are separate SCCP connections to the two logical domains.

In either architecture, there can be several RNCs within UTRAN and so UTRAN may have several I_u access points towards the Core Network. As a minimum, each Iu access point (in UTRAN or CN) shall independently fulfil the requirements of the Iu specifications (25.41x series -see section 7).

4.1.2 Iu connection principles

The Iu interface has a hierarchical architecture where one higher layer entity controls several lower layer entities. The hierarchy for the CN - UTRAN signalling connection end points is described below.

- Each CN Access Point may be connected to one or more UTRAN Access Points;
- Each UTRAN Access Point may be connected to no more than one CN Access Point per CN domain.

4.2 I_u Interface General Principles

From a UTRAN perspective, maximising the commonality of the various protocols that flow on the Iu interface is desirable. This means at the minimum that :

- A common set of radio access bearer services will be offered by UTRAN to the Core Network nodes, regardless of their type (e.g. 3G-MSC or 3G-SGSN).

There will be a common functional split between UTRAN and the Core Network nodes, regardless of their type (e.g. 3G-MSC or 3G-SGSN).

Signalling in the radio network control plane shall not depend on the specific choice of transport layers.

4.3 I_u Interface Specification Objectives

The following objectives are partly derived from [2].

The I_u interface shall be specified such that it can support:

- the interconnection of RNCs with Core Network Access Points within a single PLMN
- the interconnection of RNCs with Core Network Access Points irrespective of the manufacturer of any of the elements.
- all UMTS services

The I_u interface shall facilitate the use of the same RNC, MSC or SGSN in all PLMNs.

The I_u interface shall allow interworking to the GSM Core Network.

Independence between the protocol layers and between control and user planes shall be maintained on the I_u interface.

The I_u interface shall allow independent evolution of technologies within the Core, Radio Access and Transport Networks.

The I_u interface shall allow separate evolution of O&M facilities.

The I_u interface shall be standardised as an open and multi-vendor interface.

The I_u interface specifications shall facilitate the migration of some services from the CS-domain to the PS-domain. In particular, the RANAP protocol shall be common to both domains, and the I_u user plane protocol(s) shall be independent of the core network domain, except where a specific feature is only required for one domain.

4.4 I_u Interface Capabilities

The following capabilities are derived from the requirements described in [2].

The I_u interface supports:

- procedures to establish, maintain and release Radio Access Bearers;
- procedures to perform intra-system handover, inter-system handover and SRNS relocation;
- a set of general procedures, not related to a specific UE;
- the separation of each UE on the protocol level for user specific signalling management;
- the transfer of NAS signalling messages between UE and CN;
- location services by transferring requests from the CN to UTRAN, and location information from UTRAN to CN. The location information may comprise a geographical area identifier or global co-ordinates with uncertainty parameters;
- simultaneous access to multiple CN domains for a single UE;
- mechanisms for resource reservation for packet data streams.

4.5 I_u Interface Characteristics

4.5.1 Use of Transport Network User Plane as Signalling Bearer

4.5.1.1 Use of SCCP

4.5.1.1.1 General

The SCCP is used to support signalling messages between the CNs and the RNC. One user function of the SCCP, called Radio Access Network Application Part (RANAP), is defined. The RANAP uses one signalling connection per active UE and CN for the transfer of layer 3 messages.

Both connectionless and connection-oriented procedures are used to support the RANAP. TS 25.413 explains whether connection oriented or connectionless services should be used for each layer 3 procedure.

RANAP may use SSN, SPC and/or GT and any combination of them as addressing schemes for the SCCP. Which of the available addressing scheme to use for the SCCP is an operator matter.

Which of the possible GT formats to be used is FFS. One option is to use the same format as for the MAP specification, i.e. GT format 4.

The following sections describe the use of SCCP connections for RANAP transactions. Section 4.5.1.2 describes the connection establishment procedures. Section 4.5.1.3 describes the connection release procedures. Section 4.5.1.4 describes abnormal conditions.

4.5.1.1.2 SCCP connection establishment

A new SCCP connection is established when information related to the communication between a UE and the network has to be exchanged between RNC and CN, and no SCCP connection exists between the CN and the RNC involved, for the concerned UE.

Various SCCP connection establishment cases have to be distinguished:

- i) RNC Initiated SCCP Signalling Connection
- ii) CN Initiated SCCP Signalling Connection

The above cases are the only cases currently identified for SCCP connection establishment. Others may emerge in the future.

4.5.1.1.2.1 Establishment procedure in case i

The SCCP signalling connection establishment is initiated, by the RNC, at the reception of the first layer 3 non access stratum message from the UE.

Initiation

The RNC sends SCCP connection request message to the Core Network. A RANAP message is included in the user data field of the SCCP connection request message.

Termination

- **successful outcome**
 - The SCCP connection confirm message, which may optionally contain a connection oriented RANAP message in the user data field, is returned to the RNC.
- **unsuccessful outcome**
 - If the SCCP signalling connection establishment fails, an SCCP connection refusal message will be sent back to the RNC. This message may contain a transparent message to be sent to the UE.

For more information on how the RANAP procedure Initial UE message is handled, please see the elementary procedure Initial UE message in TS 25.413 [6].

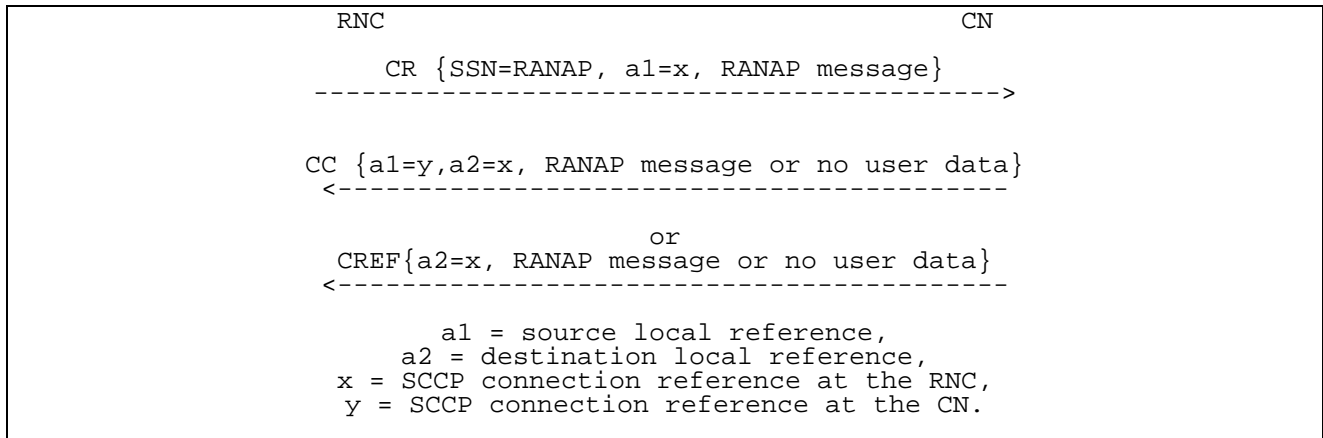


Figure 4.2: Setting-up of RNC Initiated SCCP Signalling Connection

4.5.1.1.2.2 Establishment procedure in case ii

The SCCP signalling connection establishment is initiated, by the Core Network, in connection with performing a Relocation.

Initiation

The Core Network initiates the connection establishment by sending an SCCP connection request message to the RNC. Optionally, a RANAP message may be included in the user data field of the SCCP connection request message.

Termination

- **successful outcome**
 - The SCCP connection confirm message, which may optionally contain a connection oriented RANAP message in the user data field, is returned to the Core Network.
- **unsuccessful outcome**
 - If the SCCP signalling connection establishment fails, an SCCP connection refusal message will be sent back to the Core Network. This message may contain a RANAP message in the user data field.

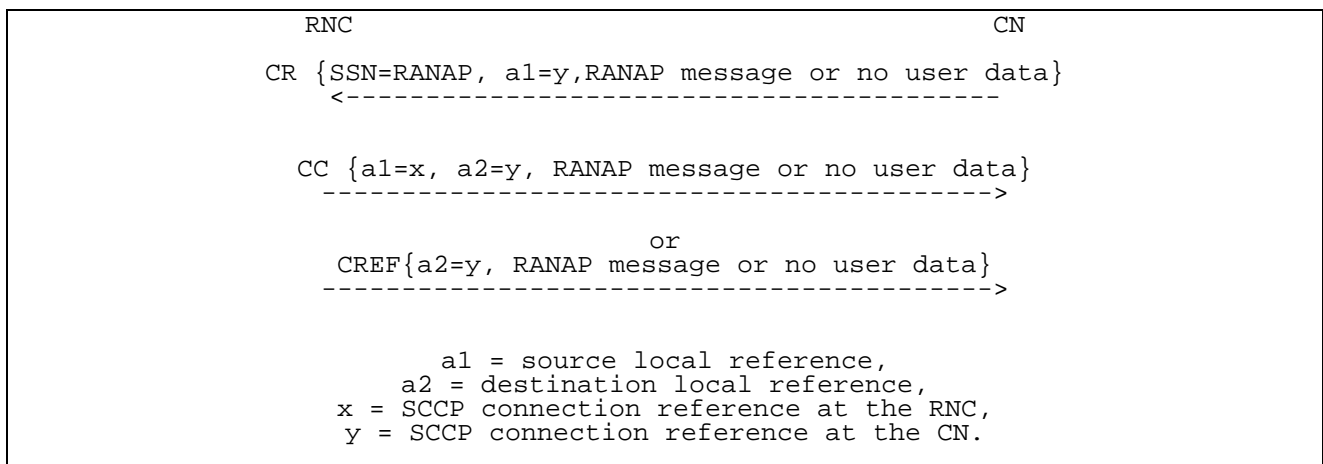


Figure 4.3: Setting-up of CN Initiated SCCP Signalling Connection

4.5.1.1.3 SCCP connection release

This procedure is always initiated at the Core Network side.

An SCCP connection is released when the CN realises that a given signalling connection is no longer required.

The CN sends a SCCP Released message.

4.5.1.1.4 General SCCP Abnormal Conditions

If a user-out-of-service information or signalling-point-inaccessible information is received by the RANAP, no new attempt to establish SCCP connections towards the affected point code will be started until the corresponding user-in-service information or signalling-point-accessible information is received.

When a user-out-of-service information or signalling-point-inaccessible is received by the RNC, an optional timer may be started. When the timer expires, all the SCCP connections towards the affected point code will be released. When the user-in-service or signalling-point-accessible is received, the timer is stopped.

If for any reason an SCCP connection is released, the optional timer expires or a connection refusal is received while any of the RANAP procedures are being performed or while a dedicated resource is still allocated, the following actions are taken:

At RNC:

- Any RNC procedure relating to that connection is abandoned.
- The UTRAN resources allocated to the connection are released.

At Core Network:

- The resources associated with the SCCP connection are cleared as soon as possible.

4.5.2 Use of Transport Network User Plane as User Data Bearer

4.5.2.1 Use of AAL2

AAL2 is used as the user data bearer towards the CS domain.

Q.2630.1 is used as the protocol for dynamically setup AAL-2 connections over Iu towards the CS domain.

4.5.2.2 Use of GTP-U

GTP-U is used as the user data bearer towards the PS domain.

RANAP Signalling is used to establish, modify and release the GTP-U tunnels towards the PS domain.

5 Functions of the I_u Interface Protocols & Functional Split

5.1 General

This section defines the functional split between the core network and the UMTS radio access network. In addition, the possible interaction between the functions is defined. The functional split is shown in table 5.1.

Table 5.1: Iu interface functional split

Function	UTRAN	CN
RAB management functions:		
RAB establishment, modification and release	X	X
RAB characteristics mapping Iu transmission bearers	X	
RAB characteristics mapping Uu bearers	X	
RAB queuing, pre-emption and priority	X	X
Radio Resource Management functions:		
Radio Resource admission control	X	
Broadcast Information	X	X
Rate Adaptation:		
Rate Adaptation for External Network		X
Iu link Management functions:		
Iu signalling link management	X	X
ATM VC management	X	X
AAL2 establish and release	X	X
AAL5 management	X	X
GTP-U Tunnels management	X	X
Buffer Management	X	
Iu U-plane (RNL) Management:		
Iu U-plane frame protocol management		X
Iu U-plane frame protocol initialization	X	
Mobility management functions:		
Mobility Management		X
Location information reporting	X	X
Handover and Relocation		
Active cell management, intra RNC	X	
Active cell management, inter RNC when Iur available (intra/inter MSC)	X	
Inter RNC hard HO, Iur not used or not available	X	X
Serving RNS Relocation (intra/inter MSC)	X	X
Inter system hard HO (UMTS-GSM)	X	X
Paging		
Paging triggering		X
Paging execution	X	
Location Management	X	X
Security Functions:		
Data confidentiality		
Radio interface ciphering	X	
Ciphering key management		X
User identity confidentiality	X	X
User Authentication		X
Data integrity		
Integrity checking	X	
Integrity key management		X
Service and Network Access functions:		
CN Signalling data	X	X
Transcoding		X
CS Data- Network Interworking function		X
Charging		X
UE Tracing	X	X
Location reporting	X	X
Iu Co-ordination functions:		
Paging co-ordination	X	X

5.2 RAB management Functions

5.2.1 RAB establishment, modification and release function

The RAB, Radio Access Bearer, is defined to be set-up between UE and CN. Depending on subscription, service, requested QoS etc. different types of RABs will be used. It is the CN that controls towards the UTRAN the establishment, modification or release of a RAB.

The RAB identity is allocated by CN and is locally significant over one Iu signalling instance.

RAB establishment, modification and release is a CN initiated function.

RAB establishment, modification and release is a UTRAN executed function.

RAB release request is a UTRAN initiated function, triggered when UTRAN fails to keep the RAB established with the UE.

5.2.2 RAB characteristics mapping to Uu bearers function

The RAB characteristics mapping function is used to map the radio access bearers to the Uu bearers. The mapping is performed during the establishment of the RAB. UTRAN shall perform the mapping between the bearers.

RAB mapping to Uu transmission bearers is a UTRAN function.

5.2.3 RAB characteristics mapping to Iu transport bearers

The RAB characteristics mapping function is used to map the radio access bearers to the Iu interface transport bearers. The mapping is performed during the establishment of the RAB.

UTRAN shall perform this mapping between the bearers if AAL2 is used, since it is the UTRAN that establishes the AAL2 connections.

In case of RAB towards the IP domain, UTRAN shall perform the mapping between the radio access bearers and the IP layer.

RAB characteristics mapping to Iu transport bearers is a UTRAN function.

5.2.4 RAB queuing, pre-emption and priority function

The priority level of a RAB is determined by the CN based on e.g. subscription information, QoS information etc.. Accordingly, the CN shall request RAB establishment or modification with an indication of the priority level and the pre-emption capability of that RAB and the queuing vulnerability. Queuing and resource pre-emption shall be performed by UTRAN accordingly.

RAB queuing, pre-emption and priority handling is a UTRAN controlled function.

RAB queuing, pre-emption and priority setting is a CN function.

5.3 Radio Resource Management over Iu

5.3.1 Radio resource admission control

This function is used at radio access bearer establishment and it is divided in two parts:

a) Subscription based admission control

When CN receives a request to establish or modify a radio access bearer, the CN verifies if the subscriber is allowed to use a radio access bearer with the requested parameters. Based on the verification the CN will accept or reject the request. This part is called "Subscription based admission control" and it is handled by the CN.

b) Radio resource admission control

When UTRAN receives a request to establish or modify a radio access bearer from the CN, the current radio resource situation is analysed and the admission control either accepts or rejects the request. This part is called "Radio resource admission control" and it is handled by the UTRAN. If the request is queued, this part is handled by the RAB queuing, pre-emption and priority function.

Part b) is only performed if CN accept the request to establish a radio access bearer

5.3.2 Broadcast information management

This function consists in the broadcast from network toward UE of some information in the coverage area of the whole network or different parts of the network.

There are two kinds of Broadcast information management. UTRAN broadcast information and CN broadcast information management. All UTRAN broadcast information management shall be handled locally within UTRAN. All CN related broadcast information is controlled by CN. UTRAN executes the broadcast of CN information.

5.4 Rate adaptation for external networks

The rate adaptation function is used to adapt the radio interface data transmission rates with the terrestrial link transmission rates and with the external networks (such as PSTN and ISDN) rates.

The Rate adaptation for external network is a CN function.

5.5 Iu link Management functions

5.5.1 Iu Signalling Link Management function

The Iu signalling link management function provides a reliable transfer of the radio network signalling between UTRAN and CN. Both CN and UTRAN manage the function.

This function is in particular responsible for Iu signalling connection establishment, which can be established either by the CN or the RNC and for Iu signalling connection release, which is controlled by CN possibly upon UTRAN request.

5.5.2 ATM Virtual Connection Management function

This function refers to handling of ATM Virtual Connections (VCs) between CN and UTRAN.

This function shall be used to establish, maintain and release the ATM VCs. For permanent VCs, it is regarded to be an O&M function.

This function also includes the selection of a Virtual Circuit to be used for a particular RAB. The selection of ATM VC upon an Iu radio access bearer service request, shall be done by UTRAN. The selected VC shall fulfil the requirements of the request. AAL5 adaptation layer will be used over a virtual circuit for signalling. AAL5 and AAL2 adaptation layers will be used over virtual connections for user data. The VC may consist of several sublinks: such as SCCP connections, AAL2 connections or IP flows.

5.5.3 AAL2 connection establish and release function

This function is used to establish and release the AAL type 2 connections between CN and UTRAN upon an Iu radio access bearer service request. Both UTRAN and CN are taking part in the establishment of AAL2 connection. UTRAN shall initiate the establishment. UTRAN shall perform the release of the AAL2 connection upon request of the CN. The use of AAL2 for Iu transmission bearers depends on type of CN.

5.5.4 AAL5 management function

AAL5 connections between CN and UTRAN shall be pre-configured at system initialisation. Basic configuration is

PVCs. For user data, SVC is possible.

The AAL5 management is a function handled by both the CN and the UTRAN.

5.5.5 GTP-U tunnels management function

This function is used to establish and release GTP-U tunnels between CN and UTRAN upon a radio access bearer service request. This involves assigning a tunnel identifier for each direction and the creation of a context containing the tunnel information. The use of GTP-U for Iu transport bearers depends on type of CN.

5.5.6 Buffer Management

Congestion control shall be performed over the Iu user plane toward the PS domain using buffer management and no flow control.

This function includes buffers to store received packet data units that at reception can not be processed due to e.g. congestion. In UTRAN, there must be a buffer management function handling received packets from the peer CN node.

Congestion control shall be performed over Iu user plane towards to PS domain using buffer management and no flow control.

The used mechanism is not in the scope of this document and not relevant to be standardised.

Buffer management is a UTRAN function.

5.6 Iu U-plane (RNL)Management Functions

5.6.1 Iu U-plane frame protocol mode selection function

The Iu UP in the Radio Network Layer provides modes of operation that can be activated on RAB basis. For a given RAB, the Iu UP operates either in a Transparent or in Support mode. Iu U-plane frame protocol mode is selected by the CN.

This function is a CN function.

5.6.2 Iu U-plane frame protocol initialisation

Iu U-plane frame protocol is initialised by the UTRAN.

5.7 Mobility Management Functions

5.7.1 Mobility Management

The mobility management is used to maintain the information in the CN about the location of the terminal. The function is needed for support of UE roaming and for support of UE terminating traffic. All Mobility Management signalling between UE and CN are transferred transparently through UTRAN, except paging.

For Mobility Management purposes, the location information shall be at Location and Routing Area level.

5.7.2 Location information update function

Functionality within the CN, such as Charging, needs information about the present location of active UE, i.e. UE with established signalling connection. The Location information update function is used to transfer this information from the UTRAN to the CN. It is the UTRAN responsibility to send this information initially at the signalling connection establishment for an UE and at any change of the UE location as long as the signalling connection exists. For Mobility Management purposes, the location information shall be at Location and Routing Area level.

5.7.3 Handover and Relocation functions

5.7.3.1 Active Cell Management, intra RNC

This functionality includes procedures for adding and removing cells controlled by one RNC to and from the active set. The handovers may be hard or soft. This functionality is handled by UTRAN and it does not involve the CN.

5.7.3.2 Active Cell Management, inter RNC, when Iur is available

This functionality includes procedures for adding and removing cells controlled by an other RNC to and from the active set. This is possible only when Iur interface is available between the RNCs in question. As long as the Iur is available, the RNCs may be controlled by different MSCs, i.e. both intra and inter MSC cases are applicable. The handovers may be hard or soft. This functionality is handled by UTRAN and it does not involve the CN.

5.7.3.3 Inter RNC hard HO function, Iur not used or not available

This functionality includes procedures for handover from one RNC to other RNC when Iur interface is not used or is not available, i.e. soft handover is not possible. The connection is switched in the CN, so both UTRAN and CN are involved. Both intra and inter CN entity cases are applicable.

5.7.3.4 Serving RNS Relocation function

This functionality allows moving the Serving RNS functionality from one RNC to an other RNC, e.g. closer to where the UE has moved during the communication. The Serving RNS Relocation procedure may be applied when active cell management functionality has created a suitable situation for it. Both UTRAN and CN are involved.

5.7.3.5 Inter system Handover (e.g. GSM-UMTS) function

Inter system handover is performed when a mobile hands over between cells belonging to different systems such as GSM and UMTS. This may imply also a change of radio access type. For intersystem handover between UMTS and GSM, the GSM procedures are used with the GSM network. Both UTRAN and CN are involved.

NOTE: The GSM BSSMAP procedures are outside the scope of this specification.

5.7.4 Paging

5.7.4.1 Paging triggering function

The Core Network shall, when considered necessary, trigger the paging in the UTRAN system.

5.7.4.2 Paging execution function

The paging function shall be executed by UTRAN.

5.7.5 Location Management

The location management is used to maintain the information about the location of the terminal.

The location management of an idle terminal is handled within the CN at the level of Location/Routing Area. The UTRAN controls the location management of active terminals, i.e. the UTRAN knows which cells/URA are used by the active terminal.

5.8 Security Functions

5.8.1 Data Confidentiality

5.8.1.1 Radio interface ciphering function

The radio interface shall be ciphered upon request of the Core Network. Both Signalling and user data may be subject to ciphering. The ciphering shall be done within UTRAN.

5.8.1.2 Ciphering key management function

The ciphering key and the permitted algorithm shall be supplied by the CN. UTRAN selects the used algorithm.

5.8.1.3 User identity confidentiality function

The UMTS user identity confidentiality is obtained by using a temporary UE identity rather than the permanent UE identity (i.e. IMSI) over the radio path.

The CN allocates to each visiting UE a temporary identity. This identity is used by the UE when establishing a new connection between the CN and the UE. It is used by the CN when requesting a page.

In addition, UTRAN allocates to each UE with established RRC connection a temporary identity (Radio Network Temporary Identity, RNTI). This identity is used to identify an UE when on common radio channels.

5.8.2 Terminal identity check function

The terminal identity check be provided by the CN. The Iu interface is required to transport necessary request and response messages between the CN and UE.

5.8.3 User Authentication function

The user authentication shall be provided by the CN. The authentication functions are transparent for the Iu Interface, and therefore outside the scope of Iu Interface documents.

5.8.4 Data integrity

5.8.4.1 Integrity checking

The purpose of the integrity check is to make sure that the signalling continues between the same elements as by authentication. The integrity check shall be done within the UTRAN.

5.8.4.2 Integrity key management

The integrity key and the permitted algorithm shall be supplied by the CN. UTRAN selects the used algorithm.

5.9 Service and Network Access Functions

5.9.1 Core Network signalling data transfer function

The PS respective the CS CN signalling data such as Call Control (CC), Session Management (SM), Mobility Management (MM), Short Message Services Point to Point and Supplementary Services (SS) shall be transparently conveyed over the Iu interface. The signalling information shall be conveyed transparently over the same Iu interface channel that is used for the UTRAN-CN signalling.

5.9.2 Transcoding function

The transcoding functionality is needed for changing the coding of a voice call from one coding scheme to another. The transcoder placement is within the CN. The transcoding functionality is therefore placed in the CN only. Over the Iu interface, transcoded speech shall be treated a data service with specific Quality of Service requirement.

5.9.3 CS data – Network Interworking function

The network interworking function is used to modify the Iu UP frames to match the requirements of the external network such as PSTN or ISDN. The network interworking function may consist of rate adaptation and/or error correcting link protocol such as GSM RLP.

The network interworking function between the CN and external networks (such as PSTN and ISDN) shall be handled by CN.

5.9.4 Charging

Charging shall be handled by CN. The charging may be based on the used radio resources, received Quality of Service or on the amount of transmitted data.

5.9.5 UE Tracing

This feature allows tracing of various events related to the UE and its activities. This is an O&M functionality.

5.9.6 Location reporting function

The positioning function performs the determination of the geographical position for an UE. The location reporting function transfer the positioning information between the UTRAN and the CN according to CN commands. This function involves UTRAN and CN.

5.10 Co-ordination Functions

5.10.1 Paging Co-ordination function

The two CN domain architecture implies need for a page co-ordination, i.e. handling of page triggered by one CN node when UE has a signalling connection to the other CN node. The paging co-ordination is performed by UTRAN and/or optionally by CN. The Common ID is used for UTRAN paging co-ordination. The CN provides the UTRAN with the Common ID.

The paging co-ordination is a UTRAN function. Optionally the paging co-ordination may be performed in the CN.

6 I_u Interface Protocol Structure

6.1 General

The Radio Network signalling over Iu consists of the Radio Access Network Application Part (RANAP). The RANAP consists of mechanisms to handle all procedures between the CN and UTRAN. It is also capable of conveying messages transparently between the CN and the UE without interpretation or processing by the UTRAN.

Over the Iu interface the RANAP protocol is, e.g. used for:

- Facilitate a set of general UTRAN procedures from the Core Network such as paging -notification as defined by the notification SAP in [3].
- Separate each User Equipment (UE) on the protocol level for mobile specific signalling management as defined

by the dedicated SAP in [3].

- Transfer of transparent non-access signalling as defined in the dedicated SAP in [3].
- Request of various types of UTRAN Radio Access Bearers through the dedicated SAP in [3].
- Perform the SRNS Relocation function.

The Radio Access Bearers are provided by the Access Stratum.

6.2 Iu-CS

Figure 6.1 shows the protocol structure for Iu-CS, following the structure described in [1].

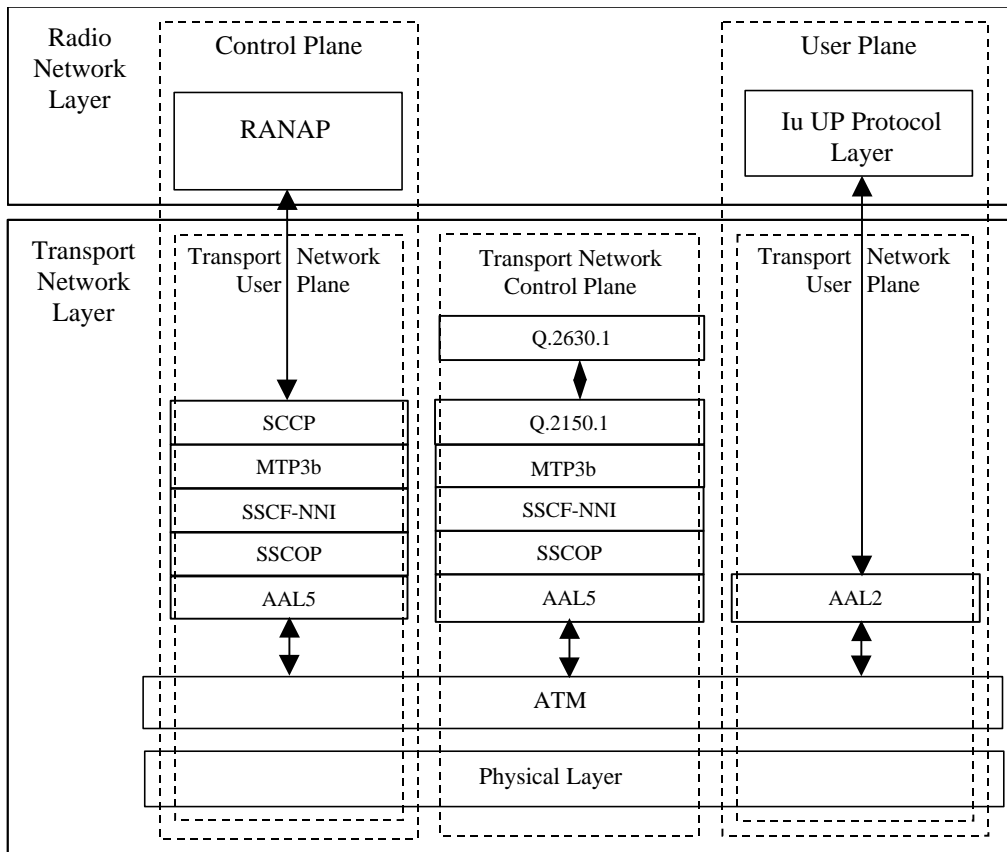


Figure 6.1: Iu –Interface Protocol Structure towards CS Domain

6.3 Iu-PS

Figure 6.2 shows the protocol structure for Iu-PS, following the structure described in [1].

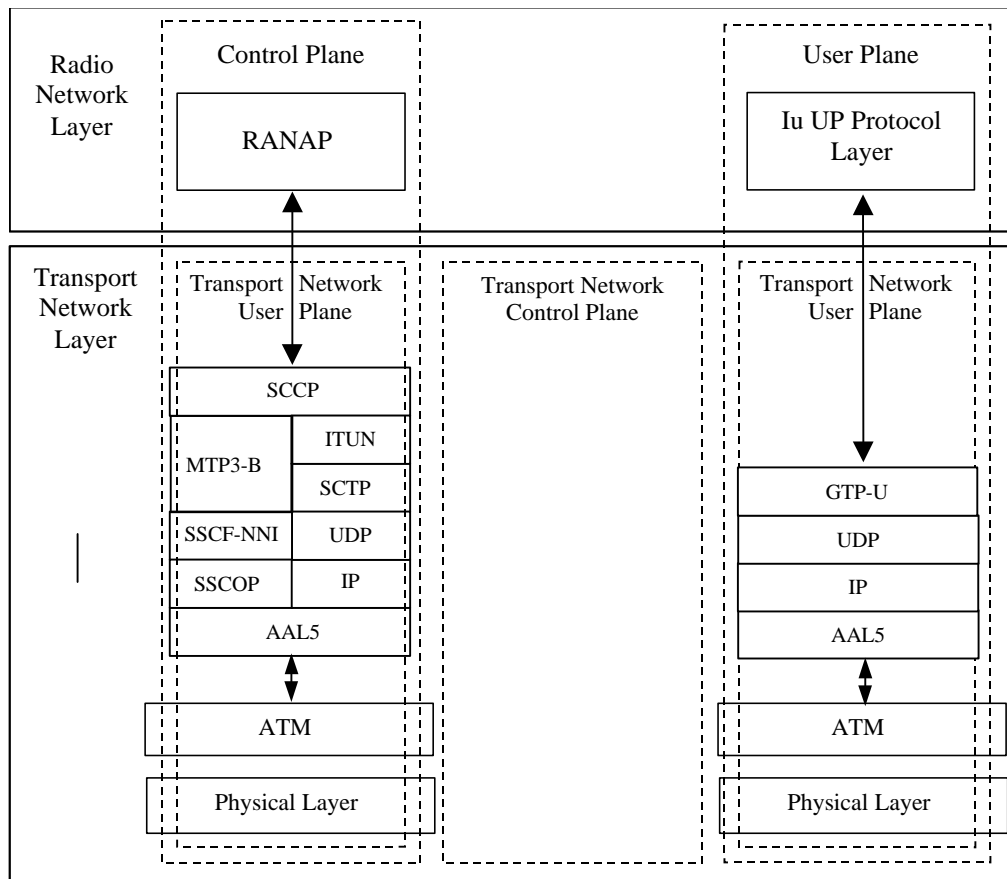


Figure 6.2: I_u Interface Protocol Structure towards PS Domain

7 Other I_u Interface Specifications

7.1 UTRAN Iu Interface: Layer 1 (UMTS 25.411)

UMTS 25.411 [4] specifies the range of physical layer technologies that may be used to support the Iu interface.

7.2 UTRAN Iu Interface: Signalling Transport (UMTS 25.412)

UMTS 25.412 [5] specifies the signalling bearers for the RANAP and transport network control plane protocols for both Iu-PS and Iu-CS.

7.3 UTRAN Iu Interface: RANAP Specification (UMTS 25.413)

UMTS 25.413 [6] specifies the RANAP protocol for radio network control plane signalling over the Iu interface.

7.4 UTRAN Iu Interface: Data Transport and Transport Signalling (UMTS 25.414)

UMTS 25.414 [7] specifies the transport bearers for the user plane of the Iu interface. It also specifies the protocol used to control these transport bearers.

7.5 UTRAN Iu Interface: CN-UTRAN User Plane Protocol (UMTS 25.415)

UMTS 25.415 [8] specifies the user plane frame handling protocol for the Iu interface.

7.8 Summary

The present document, UMTS 25.410, specifies the general aspects and principles of the Iu interface as a whole.

The relationship between the other technical specifications that define the UTRAN Iu interface is shown in figure 7.1.

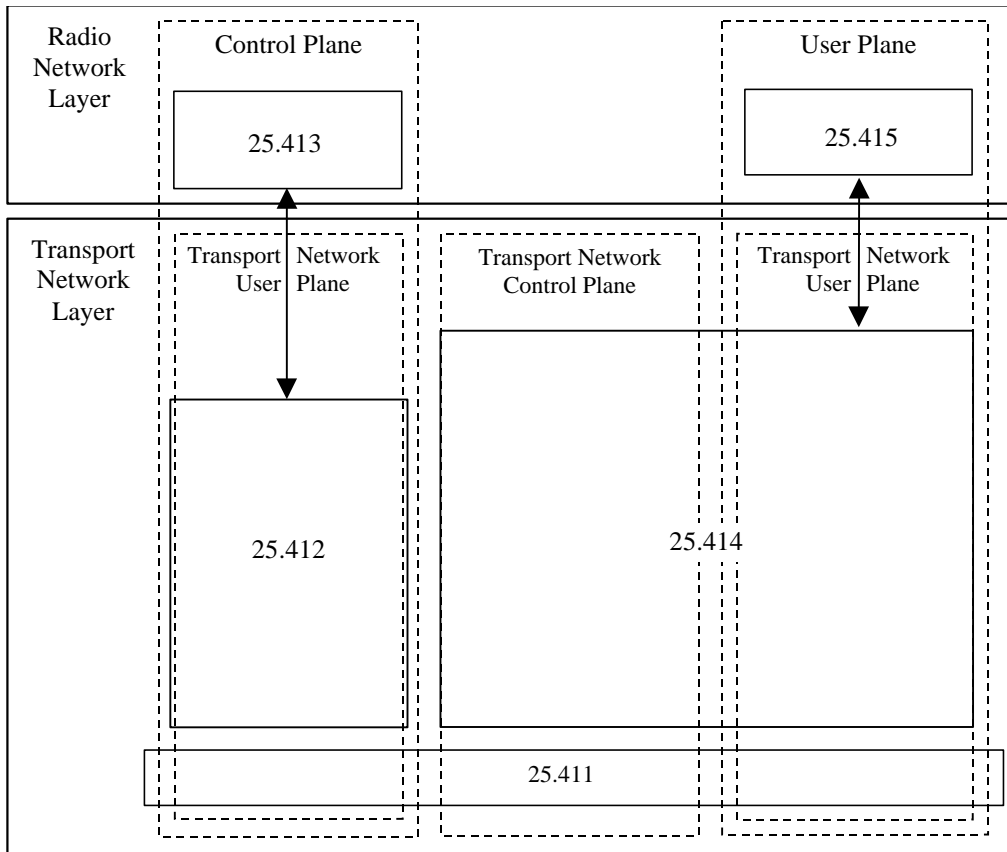


Figure 7.1: Summary of Iu Interface Specification Structure

History

Document history		
V3.0.0	October 1999	Approved at RAN #5. Under TSG RAN Change Control.