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Document for: Information

Introduction

Version 0.1.2 of the TSG-RAN WG3 specification 25.430: UTRAN I_{ub} Interface: General Aspects and Principles is attached. Revision marks show the changes based on decisions at the last meeting in Warwick (June 1st to 4th). These changes have not yet been approved in RAN WG3.

TS 25.430 V0.1.~~1~~ 2 (1999-0~~6~~5)

Technical Specification

3rd Generation Partnership Project (3GPP);
Technical Specification Group (TSG) RAN;

UTRAN I_{ub} Interface: General Aspects and Principles

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3GPP

Postal address

Office address

Internet
secretariat@3gpp.org
Individual copies of this deliverable
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Contents

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Foreword

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

The contents of this TS are subject to continuing work within 3GPP and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released with an identifying change of release date and an increase in version number as follows:

Version m.t.e

where:

- m indicates [major version number]
- x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated into the specification.

Introduction

This clause is optional. If it exists, it is always the third unnumbered clause.

No text block identified

1 Scope

The present document is an introduction to the TSG RAN TS 25.43x series of UMTS Technical Specifications that define the Iub Interface. The Iub interface is a logical interface for the interconnection of NodeB and Radio Network Controller (RNC) components of the UMTS Terrestrial Radio Access Network (UTRAN) for 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

Editors Comment: The following references taken from Tdoc R3 99-469 agreed at the last meeting.

[1] 25.401 UTRAN Overall Description

[2] 25.442 UTRAN Implementation Specific O&M transport

[3] 25.432 UTRAN iub interface signalling transport

3 Definitions, symbols and abbreviations

3.1 Definitions

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

3.2 Symbols

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

3.3 Abbreviations

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

4 General Aspects

4.1 UTRAN Architecture

[Editor´s note: This chapter should describe the UTRAN architecture from I_{ub} point of view. The RNS architecture with its elements RNC and NodeB is described to facilitate the description of functional split in chapter 5.

In order to avoid inconsistency between documents, appropriate references should be included.]

A RNS consists of a Radio Network Controller and one or more abstract entities currently called Node B. Node B are connected to the RNC through the Iub interface.

A Node B can support FDD mode, TDD mode or dual-mode operation.

The Node B can comprise an optional combining/splitting function to support macro diversity inside a Node B.

The Iub interface within the UTRAN architecture is shown in Figure 1.

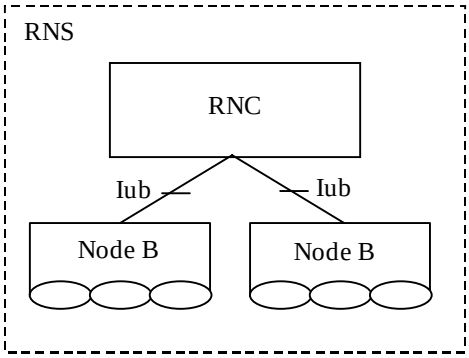

Figure 1. UTRAN Iub Interface

4.2 I_{ub} Interface General Principles

The general principles for the specification of the Iub interface are as follows:

- Transmission sharing between the GSM/GPRS Abis interface and the Iub interface shall not be precluded.
- The functional division between RNC and NodeB shall have as few options as possible;
- Iub should be based on a logical model of NodeB;
- NodeB controls a number of cells and can be ordered to add/remove radio links in those cells;
- Neither the physical structure nor any internal protocols of the NodeB shall be visible over Iub and are thus not limiting factors, e.g., when introducing future technology.

Editors Comment: The following change was taken from Tdoc R3 99-469 agreed at the last meeting.

- ~~Operation and Maintenance of NodeB hardware and software resources is not a part of the Iub standardisation. Note: It is FFS which functions belong to this group.~~Only the logical O&M [1] of NodeB is supported by the Iub.
- Complex functionality shall as far as possible be avoided over Iub. This is important so that the Iub specification is ready on time. Advanced optimisation solutions may be added in later versions of the standard.
- The Iub functional split shall take into account the probability of frequent switching between different channel types.

4.3 I_{ub} Interface Specification Objectives

The I_{ub} interface specifications shall facilitate the following:

- Inter-connection of RNCs and NodeBs from different manufacturers;
- Separation of I_{ub} interface Radio Network functionality and Transport Network functionality to facilitate introduction of future technology.

The Iub parts to be standardised by TSG-RAN are:

1. User data

2. Signalling for handling the user data

Editors Comment: The following changes were included from Tdoc R3 99-469 agreed at the last meeting.

3. Management of logical resources of Node B
   Note: The definition of logical resources is FFSNodeB Logical Model [1] [1].

It should be possible to transport the O&M information via the Iub interface and, hence, the lower layer transport mechanisms should be standardised to this effect. The content of the O&M information is not specified in this document but will be described in an external document which is tbd.

4.4 Iub Interface Capabilities

The Iub interface connects a RNC and a Node B.

The information transferred over the Iub reference point can be categorised as follows:

1. Radio application related signalling

   The Iub interface allows the RNC and the Node B to negotiate about radio resources, for example to add and delete cells controlled by the Node B to support communication of the dedicated connection between UE and SRNC. Information used to control the broadcast and paging channels, and information to be transported on the broadcast and paging channels, belong to this category also.

2. Iub/Iur DCH data stream

   The Iub interface provides means for transport of uplink and downlink DCH Iub frames between RNC and Node B. The DCH Iub frame header includes uplink quality estimates and synchronisation information. The DCH Iub frame body comprises of data to be transferred over the radio interface.

   Editors Note: The removal of this sentence is still a basis of an ongoing e-mail discussion and is retained for the time being..

The DCH Iub frames can be carried on pre-defined transmission links or switched connections.

3. Iub RACH data stream

   The Iub interface provides means for transport of uplink RACH transport frames between RNC and Node B. The RACH transport frame header includes synchronisation information. The RACH transport frame body includes the data received over radio interface. The transport frames can be carried on pre-defined transmission links or switched connections.

4. Iub FACH data stream

   The Iub interface provides means for transport of downlink FACH transport frames between RNC and Node B. The FACH transport frame header includes synchronisation information. The FACH transport frame body includes the data to be sent over radio interface. The transport frames can be carried on pre-defined transmission links or switched connections.

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[1] It should be possible to transport the Implementation Specific O&M [1] interface via the same transport bearer as the Iub interface and, hence, the lower layer transport mechanisms should be standardised to this effect. The application level content of the Implementation Specific O&M interface is out of scope of TSG-RAN-WG3. Where the implementation specific O&M interface shares the same bearer as the Iub interface, the transport layers shall be as specified in [2] and [3] respectively. is not specified in this document.

5. Iub DSCH data stream

   The Iub interface provides the means for transport of downlink shared channel, DSCH, data frames between RNC and Node B. The DSCH Iub frame body comprises of data to be transferred over the radio interface. The DSCH Iub frames can be carried on pre-defined transmission links or switched connections.

4.5 Iub Interface Characteristics

[Editor´s note: This chapter should shortly describe the I_{ub} -Interface Characteristics

"1-Mapping of Iub data streams

- DCH

Editors Comment: The following definition was included based on Tdoc R3 99-450 agreed at the last meeting.

One Iub DCH data stream is carried on one transport bearer except in the case of coordinated DCHs in which case a set of coordinated DCHs are multiplexed onto the same transport bearer.~~.~~

- RACH

  One Iub RACH data stream is carried on one transport bearer. For each RACH in a cell, an Iub RACH data stream must be established over the Iub interface.
- FACH

  One Iub FACH data stream is carried on one transport bearer. For each FACH in a cell, an Iub FACH data stream must be established over the Iub Interface.
- DSCH

  One Iub DSCH data stream is carried on one transport bearer.

5 Functions of the I_{ub} Interface Protocols

[Editor´s note: This section has been enhanced by the addition describing the functional split over the Iub interface. The existing text is incorporated in the new section Iub Functions.

5.1 Iub Functions

Editors Comment: The changes to this section were included from Tdoc R3 99-469 agreed at the last meeting.

The list of functions on the Iub interface is the following:

1. Management of Iub Transport Resources
2. Logical OA&M of Node B
   - Iub ~~Signalling Bearer~~Link Management
   - Cell Configuration Management
   - ~~Interference Measurements~~Radio Network Performance Measurements
   - ~~Notification of Available Logical Resources~~Resource Event Management
   - Common Channels Management
   - Radio Resource Management
3. ~~Physical~~ Implementation Specific O~~A~~&M Transport

4. Traffic Management of Common Channels
    - Admission Control
    - Power Management
    - Data Transfer
5. Traffic Management of Dedicated Channels
    - Channel Allocation / De-allocation
    - Power Management
    - Measurement Reporting
    - Dedicated Transport Channel Management
    - Data Transfer
6. Traffic Management of Downlink Shared Channels (FFS)
    - Channel Allocation / Deallocation
    - Power Management
    - Transport Channel Management
    - Data Transfer
7. Timing and Synchronisation Management

5.2 Functional split over Iub

Note: This is only an initial list.

5.2.1 Traffic management

5.2.1.1 Management of dedicated resources

These functions are related to the activation of logical resources (e.g. Radio Links, Iub ports), and the connection of these various resources together.

Some freedom may be left to Node B on some functions like allocation of codes or soft combining within Node B, since soft combining has merits for being executed as close as possible to the radio (both in terms of transmission cost and efficiency). This is FFS.

In particular it is FFS whether the allocation of channelisation codes is done by the Controlling RNC or by the Node B

5.2.1.2 Management of common radio channels

The common channels need to be controlled from the RNC. This is typically the control of the RACH channel, the information which is broadcast on the Broadcast control channel, and the control and request for sending information on the paging channels.

5.2.1.3 Control of traffic flows

Congestion on the Iub interface will need to be covered for asynchronous flows (i.e. those which may flow via AAL5). This concerns in particular the flow from radio channels where retransmission takes place in Node B and where soft handover is not applied.

5.2.2 Macro-diversity Combining of Radio Frames

Node B may perform macro-diversity combining/splitting of data streams communicated via its cells. RNC performs macro-diversity combining/splitting of Iub data streams received from/sent to several Node B(s).

5.2.3 Control of Macro-diversity Combining/Splitting Topology

When requesting the addition of a new cell for a UE-UTRAN connection, the RNC can explicitly request to the Node B a new Iub data stream, in which case the macro-diversity combining and splitting function within the Node B is not used for that cell. Otherwise, the Node B takes the decision whether macro-diversity combining and splitting function is used inside the Node B for that cell i.e. whether a new Iub data stream shall be added or not.

The internal Node B handling of the macro-diversity combining/splitting of radio frames is controlled by the Node B.

5.2.4 Soft Handover Decision

To support mobility of the UE to UTRAN connection between cells, UTRAN uses measurement reports from the UE and detectors at the cells. The mechanisms for this are FFS.

The RNC takes the decision to add or delete cells from the connection.

5.2.5 Handling of Node B Hardware Resources

Mapping of Node B logical resources onto Node B hardware resources, used for Iub data streams and radio interface transmission/reception, is performed by Node B.

5.2.6 Allocation of Downlink Channelisation Codes

Allocation of downlink channelisation codes of cells belonging to Node B is performed in the Controlling RNC.

5.2.7 UpLink Power Control

This group of functions controls the level of the transmitted power in order to minimise interference and keep the quality of the connections. The function UL Outer Loop Power Control located in SRNC sets the target quality for the UL Inner Loop Power Control function located in Node B.

5.2.8 Down-Link Power Control

This group of functions controls the level of the downlink transmitted power in order to correct the downlink power drifting between several radio links. SRNC regularly (or under some algorithms) sends the target down link power range based on the measurement report from UE.

5.2.9 Admission Control

The Admission Control function based on UL interference and DL power is located in the Controlling RNC.

The Node B shall be able to report UL interference measurements and DL power information over Iub.

The Controlling RNC controls this reporting function, i.e. if these information need to be reported and the period of these reports.

Note : Other parameters for Admission Control are FFS.

Note : The possibility to have this Admission Control function in Node B is FFS.

5.2.10 Power and Interference Management

A threshold for reporting may be given to NodeB from the CRNC (using the MEASUREMENT CONTROL NBAP message) to prevent frequent reporting over the Iub. NodeB has a function to measure "UL interference level and DL TX Power" and a function to compare the averaged "UL interference level and DL TX power" with the threshold value. How this average value is calculated is for further study. Also NodeB has a function to report (using the MEASUREMENT REPORT NBAP message) when the average measured value exceeds the threshold value to the CRNC. The CRNC has a function to modify the "threshold value" for neighbour cell co-ordination.

An indication of exceeding UL interference threshold or DL TX power can be included as a cause of failure when a NodeB is requested to set-up a radio link or add to an existing radio link. This may be used when a number of radio links set-up requests or additions are received on the Iub during the reporting interval.

The cause value for uplink interference threshold is for further study

Co-ordination between CRNCs is for further study.

6. Node B logical Model over Iub

6.1 Overview

The model described in Figure 2. shows the Node B as seen from the controlling RNC. The model includes:

- the logical resources provided by Node B to UTRAN (via its Controlling RNC)
- the dedicated channels which have been established on Node B
- the common channels that Node B provides to the RNC

The procedures for controlling the connections between radio links and Iub DCH data ports are sent from the RNC to the Node B via the Communication Control Ports.

Editors Comment: The following fogure has been updated to include TDD data ports based on Tdoc R3 99-496 agreed at the last meeting.

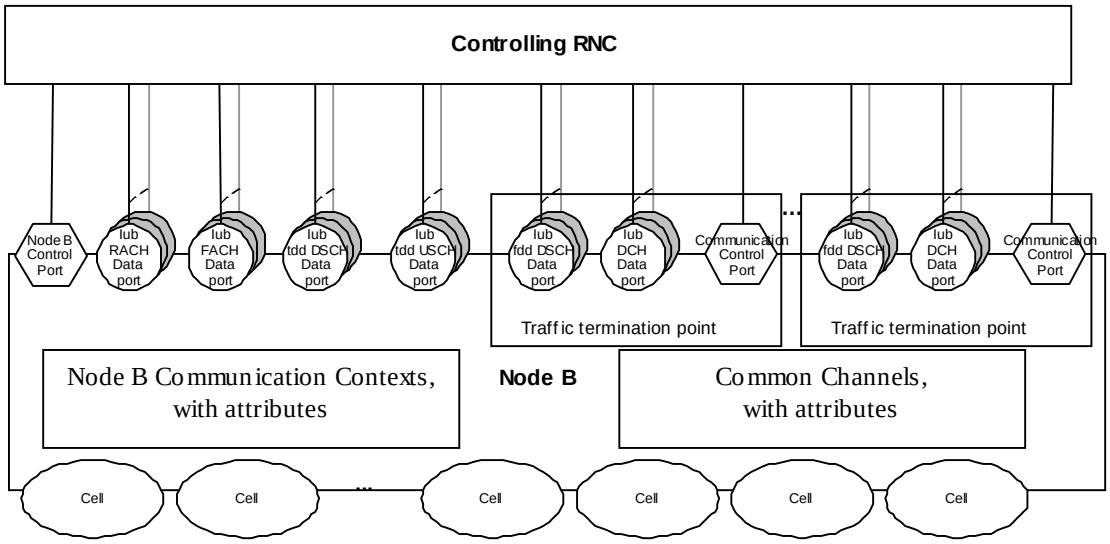

Figure 2. Logical Model of Node B

6.2 Elements of the logical model

6.2.1 Radio Network Logical resources

The notion of cell is the same as defined for the DRNC. Node B may have one or more cells.

6.2.2 Transport network logical resources

6.2.2.1 Node B Control Port

Editors Comment: The following changes were included from Tdoc R3 99-469 agreed at the last meeting.

The Node B Control Port is used to exchange the signalling information for the logical O&M of Node B resources, the creation of Node B Communication Contexts, the configuration of the common transport channels that Node B provides in a given cell, PCH and BCH control information between the RNC and the Node B. The Node B Control Port corresponds to one signalling bearer between the controlling RNC and the Node B. Whether there a Node B can have multiple Node B Control Ports (multiple signalling bearers), e.g. for load sharing or redundancy purposes, is FFS.

6.2.2.2 Communication Control Port

A Communication Control Port corresponds to one signalling bearer between the RNC and Node B for the control of Node B Communication Contexts. Node B may have multiple Communication Control Ports (one per Traffic Termination Point). The Communication Control Port is selected at creation of the Node B Communication Context.

6.2.2.3 Traffic Termination Point

Traffic Termination Point represents DCH and DSCH data streams belonging to one or more Node B Communication Contexts (UE contexts), which are controlled via one Communication Control Port. The Traffic Termination Point is thus a descriptive entity which neither is controlled over Iub nor by O&M.

6.2.2.4 Iub DCH Data Port

An Iub DCH Data Port represents a user plane bearer (carrying one Iub DCH Data Stream) between the Node B and

Editors Comment: The following definition was taken from Tdoc R3 99-450 agreed at the last meeting.

RNC.One Iub DCH Data port represents one user plane transport bearer. One user plane transport bearer will carry only one DCH data stream except in the case of coordinated DCHs, in which case the data streams of all combined DCHs shall be multiplexed on one and the same user plane transport bearer.

6.2.2.5 Iub RACH Data Port

An Iub RACH Data Port represents a user plane bearer carrying one Iub RACH Data Stream between the Node B and the RNC. There is one RACH Data Port for each RACH channel of Node B.

6.2.2.6 Iub FACH Data Port

An Iub FACH Data Port represents a user plane bearer carrying one Iub FACH Data Stream between the Node B and the RNC. There is one CCH Data Port for each FACH channel of Node B.

6.2.2.7 Iub fdd DSCH Data Port

An Iub fdd DSCH Data Port represents a user plane bearer carrying one Iub fdd DSCH Data Stream between the Node B and the RNC. For each DSCH there is one Iub fdd DSCH Data Port per NodeB communication context with data multiplexed on this DSCH (see Note 6.1-1).

Note The concepts of the DSCH data port within the NodeB logical model is a working assumption only valid in the case where a DSCH is associated with a downlink DPCCH.

Editors Comment: The following definition was based on Tdoc R3 99-496 agreed at the last meeting.

6.2.2.7 Iub tdd DSCH Data Port

For each DSCH there is of single Iub tdd DSCH Data Port per cell.

6.2.2.8 Iub tdd USCH Data Port

For each USCH there is a single Iub tdd USCH Data Port per cell.

6.2.3 Node B Communication Contexts for Dedicated Channels

A Node B Communication Context corresponds to all the dedicated resources which are necessary for a user in dedicated mode and using dedicated channels as restricted to a given Node B.

There are a number of Node B Communication Contexts inside a given Node B.

The attributes to a Node B Communication Context are the following (not exhaustive):

- The list of Cells where dedicated physical resources are used
- The list of DCH which are mapped on the dedicated physical resources for that Node B Communication Context
- For each DCH, Identified by its DCH-ID, the complete characteristics as defined in [8]
- The list of Iub DCH Data Ports
- For each Iub DCH Data Port, the corresponding DCH and cells which are carried on this data port
- When the UE is using a DSCH, the identity of the DSCH Common Channel Context.
- Physical layer parameters (outer loop power control, etc)

6.2.4 Common Channels

A Common Channel corresponds to a radio Common Channel as configured by the Node B.

The BCCH and the PCCH are carried directly on the Node B control port using NBAP procedures. These Common Channels will not be mapped to individual data ports.

The RACH has a associated Iub RACH Data Port and the FACH has an associated Iub FACH Data Port.

Each UE multiplexed on each DSCH has an associated Iub DSCH Data Port.

The attributes of a Common channel are (not exhaustive)

Editors Comment: The inclusion of USCH was based on Tdoc R3 99-496 agreed at the last meeting.

- Type (RACH, FACH, DSCH, USCH)
- Cell (only one)
- Associated Iub RACH Data Port for a RACH, Iub FACH Data Port for a FACH.
- List of associated Iub DSCH Data ports for the DSCH.
- List of Node B Communication contexts identity
- Physical parameters

7 Iub Interface Protocol Structure

[Editor´s note: This chapter should provide an introduction to the structure of the Iub interface protocols.

Editor´s note: Protocols stack for transport network control plane updated to use Q. series numbers.

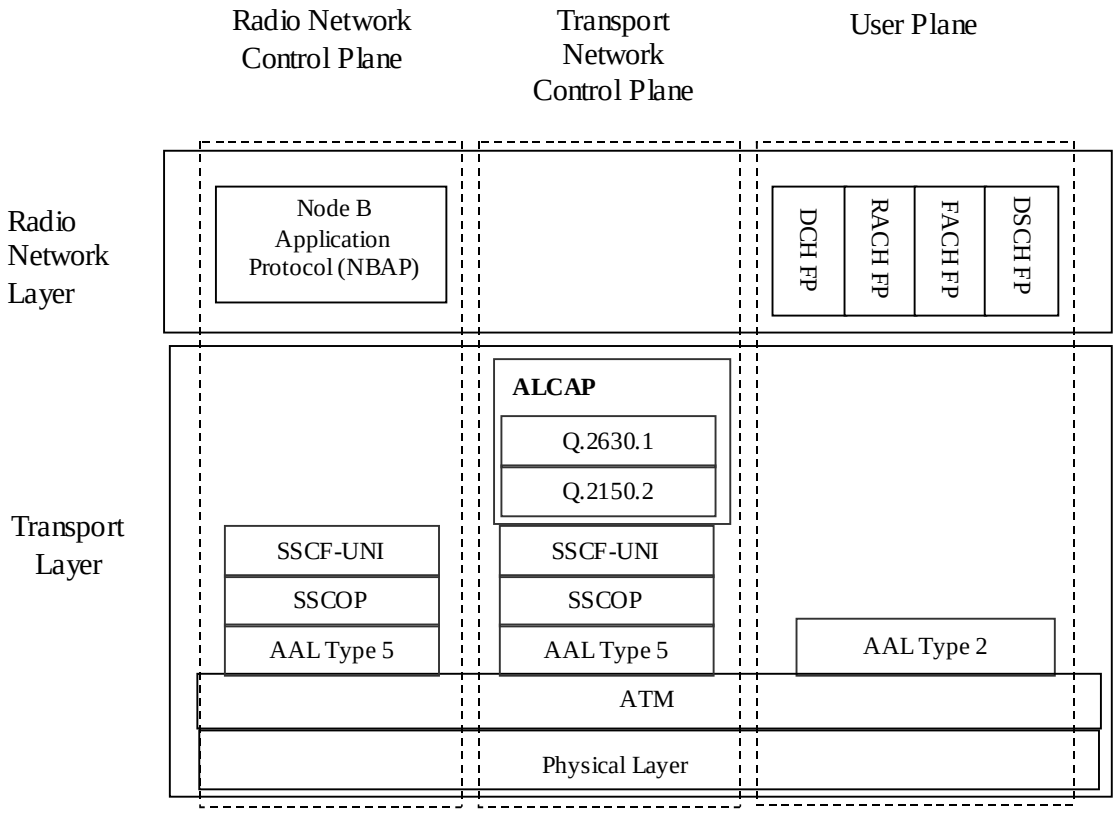

Figure 3: Iub Interface Protocol Structure.
Note: The possibility to share AAL2 needs further clarification; the FAUSCH FP is FFS.

The Iub interface protocol architecture consists of two functional layers:

1. Radio Network Layer, defines procedures related to the operation of Node B. The radio network layer consists of a radio network control plane and a radio network user plane.

2. Transport Layer, defines procedures for establishing physical connections between Node B and the RNC.

There shall be one dedicated AAL2 connection for each physical code channel conveying RACH data streams, and there shall be one dedicated AAL2 connection for each physical code channel conveying FACH data streams. The establishment and release of the AAL2 connection shall occur when the corresponding physical code channel is created and released, respectively.

8 Other Iub Interface Specifications

8.1 UTRAN Iub Interface: Layer 1 (TSG RAN S3.31)

8.2 UTRAN Iub Interface: Signalling Transport (TSG RAN S3.32)

8.3 NBAP Specification (TSG RAN S3.33)

8.4 UTRAN Iub Interface: CCH, Transport Layer (TSG RAN S3.34)

8.5 UTRAN Iub Interface: CCH, Radio Network Layer (TSG RAN S3.35

8.6 UTRAN Iur/Iub Interface: DCH, Transport Layer (TSG RAN S3.26)

8.7 UTRAN Iur/Iub Interface: DCH, Radio Network Layer (TSG RAN S3.27)

9 Bibliography

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

10 History

Document history		
V0.0.1	1999-02	Initial Specification Structure
V0.0.2	1999-02	Inclusion of complete text from sections 6,7 and 8 of the baseline specification entitled "Merged Description of Iub Interface, Version 0.0.2"
V0.0.3	1999-03	Included new TTC Protocol Structure figure and removed AAL-5 in the user plane along with associated transport control.
V0.1.0	1999-04	Approved by TSG RAN WG3
V0.1.1	1999-05	Incorporated changes agreed during the RAN WG3 meeting (Kawasaki) including: Statement of scope and overview of Other Iub specifications (Tdoc R3-99274), UTRAN Architecture (section 4.1) , Interface Characteristics (section 4.4), Functional Split over the Iub (section 5.2), Node B logical Model over Iub (section 6) taken from TS25.401 UTRAN Overall Architecture (proposed in Tdoc R3-99274) Protocol Structure combining separate TTC and ETSI stacks (Tdoc R3-99274) Added the functional split for Power and Interference Management (section 5.2.10) taken from Tdoc R3-99365 Added assumption from TS 25.434 (Tdoc R3-99400) that MAC scheduling for common channels is done in the RNC into section 7. Inclusion of DSCH Data Port concepts into the NodeB Logical model based on Tdoc R3 99308.
V0.1.2	1999-06	Updated DCH descriptions in NodeB Logical Model to accommodate combined DCH concept from Tdoc 99-450. Updated NodeB Logical Model for TDD mode including USCH for TDD from Tdoc 99-496. Aligned O&M terminology/functions with current O&M specifications from Tdoc 99-469.
Editor for 3GPP RAN TS 25.430 is:		
Mick Wilson Fujtsu Europe Telecom R&D Centre Tel.: +44 181 606 4801 Fax : +44 181 573 3602 Email : m.wilson@fujitsu.co.uk		
This document is written in Microsoft Word version 7/97.		

Annex

Editors Status Report		
Section	**Status**	**Outstanding issues**
1 Scope	Complete	
2 References	Empty	

3 Definitions, symbols and abbreviations		
3.1 Definitions	Empty	
3.2 Symbols	Empty	
3.3 Abbreviations	Empty	
4 General Aspects		
4.1 UTRAN Architecture	80% complete? - review	
4.2 I_{ub} Interface General Principles	80% complete? - review	Operation and Maintenance of NodeB hardware and software resources is not a part of the Iub standardisation. Note: It is FFS which functions belong to this group
4.3 I_{ub} Interface Specification Objectives	80% complete? - review	Management of logical resources of Node B Note: The definition of logical resources is FFS
4.4 I_{ub} Interface Capabilities	80% complete? - review	Requires decision on what to do with the sentences "The xxxx Iub frames can be carried on pre-defined transmission links or switched connections".
4.5 I_{ub} Interface Characteristics	Some text - needs additional input - 20% complete	
5 Functions of the I_{ub} Interface Protocols		
5.1 Iub Functions	80% complete? - review	Traffic Management of Downlink Shared Channels (FFS)
5.2 Functional split over Iub		
5.2.1 Traffic management		
5.2.1.1 Management of dedicated resources	25% complete? - review	Allocation of channelisation codes and soft combining in NodeB or CRNC is ffs
5.2.1.2 Management of common radio channels	Complete? - review	
5.2.1.3 Control of traffic flows	Complete? - review	
5.2.2 Macro-diversity Combining of Radio Frames	Complete? - review	
5.2.3 Control of Macro-diversity Combining/Splitting Topology	Complete? - review	
5.2.4 Soft Handover Decision	50% complete? - review	Mechanisms for measurement reporting are ffs
5.2.5 Handling of Node B Hardware Resources	Compete - review	
5.2.6 Allocation of Downlink	Compete - review	

Channelisation Codes		
5.2.7 UpLink Power Control	Compete - review	
5.2.8 Down-Link Power Control	Compete - review	
5.2.9 Admission Control	50% complete	*Parameters for Admission Control are FFS.* The possibility to have this Admission Control function in Node B is FFS.
5.2.10 Power and Interference Management	80% complete	*The cause value for uplink interference threshold is for further study* *Co-ordination between CRNCs is for further study.*
6 Node B logical Model over Iub		
6.1 Overview	80% complete	DSCH Data Port - a working assumption
6.2 Elements of the logical model		
6.2.1 Radio Network Logical resources	Editorial updates required	
6.2.2 Transport network logical resources	80% complete	NodeB with multiple control ports is ffs DSCH Data Ports - a workin assumption
6.2.3 Node B Communication Contexts for Dedicated Channels	50% complete	List of attributes - are more required?
6.2.4 Common Channels	50% complete	List of attributes - are more required?
7 I_{ub} Interface Protocol Structure	80% complete	~~Assumption that MAC scheduling is in the RNC~~
8 Other I_{ub} Interface Specifications	empty	
9 Bibliography	empty	