TSG-RAN Meeting #9 **TSGRP#9(00)0370**
Hawaii, US, 20 - 22 September 2000

Title: **Agreed CRs to TS 25.401**

Source: **TSG-RAN WG3**

Agenda item: **5.3.3**

Tdoc_Num	Specification	CR_Num	Revision_Num	CR_Subject	CR_Category	WG_Status	Cur_Ver_Num	New_Ver_Num
R3-002126	25.401	013	3	Principles for functional distribution between SRNC and CRNC	F	agreed	3.3.0	3.4.0
R3-001857	25.401	014		Removal of UTRAN Identifier definition and reference made to TS 23.003	F	agreed	3.3.0	3.4.0
R3-001997	25.401	015	1	Delay performance requirements	F	agreed	3.3.0	3.4.0
R3-002317	25.401	016		Alignment of list of functions and cleaning of editorial notes	F	agreed	3.3.0	3.4.0
R3-002373	25.401	017	1	Layered architecture view	F	agreed	3.3.0	3.4.0

3GPP RAN WG3 Meeting #15
Berlin, Germany, 21-25 August 2000

Document R3-002126
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.401	**CR**	**13r3**	Current Version:	3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG RAN#9	for approval	X	strategic		*(for SMG use only)*
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from:* ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME		UTRAN / Radio	X	Core Network	

Source R-WG3 **Date:** 2000-08-21

Subject: Principles for functional distribution between SRNC and CRNC.

Work item:

Category:	F	Correction	X	**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change:

CR13:
The principles for functional distribution needs clarification, what regards:
radio resource management
node internal equipment
transport network management.

These are principles that are agreed but not written down.

CR13r1:
Dynamic control is clarified. Highlighted in green.
Scheduling for dedicated channels are added. Highlighted in green.
R3-001855 principle for monotoring of user plane in DRNC is merged into this CR. Added text is highlighted in yellow.
The FFS for resource negotiation between SRNS and DRNS is deleted, according to decision in R3#14. Highlighted in green.

CR13r2:
The principle of monotoring UP in DRNC is modified to text agreed on email reflector. Added text is highlighted in turquoise, while deleted text is highlighted in yellow.

Clauses affected: 3, 6.3 and 7.2.4.8.1

Other specs affected:	Other 3G core specifications		→ List of CRs:
	Other GSM core specifications		→ List of CRs:
	MS test specifications		→ List of CRs:
	BSS test specifications		→ List of CRs:
	O&M specifications		→ List of CRs:

Other

comments:

help.doc

<--------- double-click here for help and instructions on how to create a CR.

3 Definitions and abbreviations

3.1 Definitions

NOTE: Cleaned version of subclause 5.1 from [1] with a reference to a more general vocabulary document

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

ALCAP: Generic name for the transport signalling protocols used to set-up and tear-down transport bearers.

Cell: Radio Network object that can be uniquely identified by a User Equipment from a (cell) identification that is broadcasted over a geographical area from one *UTRAN Access Point*
A Cell is either FDD or TDD mode.

Iu: Interconnection point between the RNS and the Core Network. It is also considered as a reference point.

Iub: Interface between the RNC and the Node B.

Iur: A logical interface between two RNCs. Whilst logically representing a point to point link between RNCs, the physical realisation may not be a point to point link.

Logical Model: A Logical Model defines an abstract view of a network or network element by means of information objects representing network element, aggregations of network elements, the topological relationship between the elements, endpoints of connections (termination points), and transport entities (such as connections) that transport information between two or more termination points.
The information objects defined in the Logical Model are used, among others, by connection management functions. In this way, a physical implementation independent management is achieved.

Node B: A logical node responsible for radio transmission / reception in one or more cells to/from the UE. The logical node terminates the Iub interface towards the RNC.

Radio Resources: Resources that constitute the radio interface in UTRAN, e.g. frequencies, scrambling codes, spreading factors, power for common and dedicated channels.

Radio Network Controller: This equipment in the RNS is in charge of controlling the use and the integrity of the radio resources.

Controlling RNC: A role an RNC can take with respect to a specific set of Node B's. There is only one Controlling RNC for any Node B. The Controlling RNC has the overall control of the logical resources of its node B's.

Serving RNC: A role an RNC takes within a Serving RNS. The Serving RNC has the overall control of the connections to a UE within the UTRAN.

Radio Network Subsystem: Either a full network or only the access part of a UMTS network offering the allocation and the release of specific radio resources to establish means of connection in between an UE and the UTRAN.
A Radio Network Subsystem contains one RNC and is responsible for the resources and transmission/reception in a set of cells.

Serving RNS: A role an RNS can take with respect to a specific connection between an UE and UTRAN. There is one Serving RNS for each UE that has a connection to UTRAN. The Serving RNS is in charge of the radio connection between a UE and the UTRAN. The Serving RNS terminates the Iu for this UE.

Drift RNS: The role an RNS can take with respect to a specific connection between an UE and UTRAN. An RNS that supports the Serving RNS with radio resources when the connection between the UTRAN and the UE need to use cell(s) controlled by this RNS is referred to as Drift RNS.

Radio Access Network Application Part: Radio Network Signalling over the Iu.

Radio Network Subsystem Application Part: Radio Network Signalling over the Iur.

RRC Connection: A point-to-point bi-directional connection between RRC peer entities on the UE and the UTRAN sides, respectively. An UE has either zero or one RRC connection.

User Equipment: A Mobile Equipment with one or several UMTS Subscriber Identity Module(s).

UMTS Terrestrial Radio Access Network: UTRAN is a conceptual term identifying that part of the network which consists of RNCs and Node Bs between Iu an Uu. The concept of UTRAN instantiation is currently undefined.

UTRAN Access Point: A conceptual point within the UTRAN performing radio transmission and reception. A UTRAN access point is associated with one specific *cell*, i.e. there exists one UTRAN access point for each cell. It is the UTRAN-side end point of a *radio link*.

Radio Link: A "radio link" is a logical association between a single User Equipment and a single UTRAN access point. Its physical realisation comprises one or more radio bearer transmissions.

Radio Link Set: A set of one or more Radio Links that has a common generation of Transmit Power Control (TPC) commands in the DL.

Uu: The Radio interface between UTRAN and the User Equipment.

RAB sub-flows: A Radio Access Bearer can be realised by UTRAN through several sub-flows. These sub-flows correspond to the NAS service data streams that have QoS characteristics that differ in a predefined manner within a RAB e.g. different reliability classes.

RAB sub-flows have the following characteristics:

1) The sub-flows of a RAB are established and released at the RAB establishment and release, respectively.

2) The sub-flows of a RAB are submitted and delivered together at the RAB SAP.

3) The sub-flows of a RAB are carried over the same Iu transport bearer.

4) The sub-flows of a RAB are organised in a predefined manner at the SAP and over the Iu interface. The organisation is imposed by the NAS as part of its co-ordination responsibility.

Coordinated DCHs: Coordinated DCHs are dedicated transport channels that are always established and released in combination. Coordinated DCHs cannot be operated on individually e.g. if the establishment of one DCH fails, the establishment of all other coordinated DCHs shall be terminated unsuccessfully. A set of coordinated DCHs is transferred over one transport bearer.

3.2 Abbreviations

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

ALCAP	Access Link Control Application Part
BM-IWF	Broadcast Multicast Interworking Function
BMC	Broadcast/Multicast Control
BSS	Base Station Subsystem
SAB	Service Area Broadcast
CBC	Cell Broadcast Centre
CBS	Cell Broadcast Service
CN	Core Network
CPCH	Common Packet Channel
CRNC	Controlling Radio Network Controller
DCH	Dedicated Channel
DL	Downlink
DRNS	Drift RNS
FACH	Forward Access Channel
FFS	For Further Study
GTP	GPRS Tunnelling Protocol
MAC	Medium Access Control
NAS	Non Access Stratum
NBAP	Node B Application Protocol
PCH	Paging Channel
QoS	Quality of Service
RAB	Radio Access Bearer
RACH	Random Access Channel

RANAP	Radio Access Network Application Part
RNC	Radio Network Controller
RNS	Radio Network Subsystem
RNSAP	Radio Network Subsystem Application Part
RNTI	Radio Network Temporary Identity
SRNC	Serving Radio Network Controller
SRNS	Serving RNS
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunication System
USIM	UMTS Subscriber Identity Module
UTRAN	UMTS Terrestrial Radio Access Network

3.3 Notation

Parts of the document apply only to one mode, FDD or TDD. Any such area will be tagged by [FDD — xxxxxxxxx] and [TDD — yyyyyyyyyyy] respectively. The tag applies to the text until the closing bracket.

6.3 Function Distribution Principles

For radio resource management functionality, the following principles apply:

- The CRNC owns the radio resources of a cell.
- The SRNC handles the connection to one UE, and may borrow radio resources of a certain cell from the CRNC.
- Dynamical control of power for dedicated channels, within limits admitted by CRNC, is done by the SRNC.
- Dynamic control on smaller time-scale for some radio links of the UE connection may be done by the Node B. This "inner loop" control is controlled by an "outer loop", for which the SRNC has overall responsibility.
- Scheduling of data for dedicated channels is done by the SRNC, while for common channels it is done by the CRNC.

For management of node-internal resources, the following principle apply:

- Each UTRAN node is considered a network element on its own. The knowledge about the equipment of a network element is kept within the network element itself and its management system. The node itself always manages node-internal resources.

For transport network resource management, the following principle apply:

- Management of transport network resources belong to the Transport Layer. Mechanisms relevant for the selected transport technology are used. No functional split between UTRAN nodes is specified what regards the Transport Layer.

~~It shall not be required for the DRNC to monitor the information passed in the user plane other then for the combining/splitting function. Any information the DRNC needs to be aware of e.g. in case of SRNS relocation, shall be passed to the DRNC in the control plane.~~

As a general guideline, the UTRAN protocols should be designed in such a way that they minimise the need for a DRNC to interpret the user plane frame protocol information other than for the combining/splitting purpose.

7.2.4.8.1 UL OUTER LOOP POWER CONTROL

The UL Outer Loop Power Control located in the SRNC sets the target quality value for the UL Inner Loop Power Control which is located in Node B for FDD and is located in the UE for TDD. It receives input from quality estimates of the transport channel. The UL outer loop power control is mainly used for a long-term quality control of the radio channel.

In FDD this function is located in the UTRAN, in TDD the function is performed in UTRAN and the target quality value is sent to the UE by the SRNC.

In FDD, if the connection involves both a SRNS and a DRNS the function UL Outer Loop Power Control (located in the SRNC) sets the target quality for the UL Inner Loop Power Control function (located in Node B). Additional quality information for the case when macro diversity combining is performed in DRNC is for further study.

~~NOTE: Some additional function is needed for resource negotiation between the SRNS and the DRNS across the Iur. This is FFS.~~

3GPP TSG RAN WG3 Meeting #14
Helsinki, Finland, July 3rd - July 7th 2000

Document TSGR3#14 (00)01857
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.401 CR 014 Current Version: 3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-RAN #9	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: (U)SIM [ ] ME [ ] UTRAN / Radio [X] Core Network [ ]
(at least one should be marked with an X)

Source: R-WG3 **Date:** 2000-07-04

Subject: Removal of UTRAN Identifier definition and reference made to TS 23.003

Work item:

Category:
(only one category shall be marked with an X)

F	Correction	X	**Release:**	Phase 2	
A	Corresponds to a correction in an earlier release			Release 96	
B	Addition of feature			Release 97	
C	Functional modification of feature			Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: Avoid duplication of PLMN, RNC, Service Area, CN domain Identifiers definitions between 25.401 and 23.003

Clauses affected:
2 References
6.1.1 PLMN Identifier
6.1.2 CN Domain Identifier
6.1.3 RNC Identifier
6.1.4 Service Area Identifier

Other specs affected:

Other 3G core specifications		→ List of CRs:	
Other GSM core specifications		→ List of CRs:	
MS test specifications		→ List of CRs:	
BSS test specifications		→ List of CRs:	
O&M specifications		→ List of CRs:	

Other comments:

help.doc

<---------- double-click here for help and instructions on how to create a CR.

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] Merged UTRAN Architecture Description V0.0.2.

[2] UMTS 23.10: "UMTS Access Stratum Services and Functions".

[3] UMTS 25.211: "Physical channels and mapping of transport channels onto physical channels (FDD)".

[4] TS 25.442: "Implementation Specific O&M Transport".

[5] TS 25.402: "Synchronisation in UTRAN, Stage 2".

[6] TS 23.003: " Numbering, Addressing and Identification"

NOTE: [1] is a temporary reference only to ease the definition of what should be in the different sections of this document.

6.1.1 PLMN Identifier

A Public Land Mobile Network is uniquely identified ~~by its PLMN identifier. PLMN-Id is made of Mobile Country Code (MCC) and Mobile Network Code (MNC).~~

~~- **PLMN-Id = MCC + MNC**~~

~~The MCC and MNC are predefined within a UTRAN, and set in the RNC via O&M.~~as define in [6] sub-clause 12.1.

6.1.2 CN Domain Identifier

A CN Domain Edge Node is identified ~~within UTRAN by its CN Domain Identifier. The CN Domain identifier is used over UTRAN interfaces to identify a particular CN Domain Edge Node for relocation purposes. The CN Domain identifier is made of the PLMN-Id and of the LAC or RAC of the first accessed cell in the target RNS.~~

~~The two following CN Domains Identifiers are defined:~~

~~- **CN CS Domain-Id = PLMN-Id + LAC**~~

~~- **CN PS Domain-Id = PLMN-Id + LAC+ RAC**~~

~~The LAC and RAC are defined by the operator, and set in the RNC via O&M.~~as defined in [6] sub-clause 12.2.

6.1.3 RNC Identifier

An RNC node is uniquely identified within UTRAN ~~by its RNC Identifier (RNC-Id). RNC-Id together with the PLMN identifier is used to globally identify the RNC. RNC-Id or the RNC-Id together with the PLMN-Id is used as RNC identifier in UTRAN Iub, Iur and Iu interfaces. SRNC-Id is the RNC-Id of the SRNC. C-RNC-Id is the RNC-Id of the controlling RNC. D-RNC-Id is the RNC Id of the drift RNC.~~

~~- **Global RNC-Id = PLMN-Id + RNC-Id**~~

~~The RNC-Id is defined by the operator, and set in the RNC via O&M.~~as defined in [6] sub-clause 12.3.

6.1.4 Service Area Identifier

The Service Area Identifier (SAI) is ~~used to uniquely identify an area consisting of one or more cells belonging to the same Location Area. Such an area is called a Service Area and can be used for indicating the location of a UE to the CN.~~

~~The Service Area Code (SAC) together with the PLMN-Id and the LAC will constitute the Service Area Identifier.~~

~~- **SAI = PLMN-Id + LAC + SAC**~~

~~The SAC is defined by the operator, and set in the RNC via O&M.~~

~~For Release 99 the BC-domain requires that Service Area consists of one cell. This does not limit the usage of Service Area for other domains.~~defined in [6] sub-clause 12.4

3GPP TSG-RA WG3 Meeting #14
Helsinki, Finland, 3rd-7th July 2000

***Document* R3-001997**
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.401	**CR**	**015r1**	Current Version: V3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-RAN#9	for approval		strategic		(for SMG Use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG *The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc*

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME		UTRAN / Radio	X	Core Network	

Source: R-WG3 **Date:** July 2000

Subject: Delay performance requirements

Work item:

Category:				**Release:**	
	F	Correction	X	Phase 2	
	A	Corresponds to a correction in an earlier release		Release 96	
(only one category	B	Addition of feature		Release 97	
shall be marked	C	Functional modification of feature		Release 98	
with an X)	D	Editorial modification		Release 99	X
				Release 00	

Reason for change: In RAN3#14 it has been decided not to include delay requirements in TS 25.401, as a consequence the content of Chapter 12 has to be removed.

Clauses affected: 12

Other specs affected:			
	Other 3G core specifications		→ List of CRs:
	Other GSM core specifications		→ List of CRs:
	MS test specifications		→ List of CRs:
	BSS test specifications		→ List of CRs:
	O&M specifications		→ List of CRs:

Other comments: Renumbering of other figures has to be provided in updated CR.

12 UTRAN Performance Requirements

12.1 UTRAN delay requirements

~~The maximum transmission delay of a diversity branch and the maximum processing delay introduced by single UTRAN network elements shall be defined.~~

Void.

3GPP TSG RAN WG3 Meeting #15
Berlin, Germany, August 21st - August 25th 2000

Document TSGR3#15 (00)02317
e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.401	**CR**	**016**	Current Version:	3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-RAN #9	for approval	X	strategic		(for SMG use only)
list expected approval meeting # here ↑		for information		non-strategic		

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: *(at least one should be marked with an X)*	(U)SIM		ME		UTRAN / Radio	X	Core Network	

R-WG3	R-WG3	**Date:**	2000-08-24
Subject:	Alignment of List of functions and cleaning of editorial notes		
Work item:			

Category:	F	Correction	X	**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
shall be marked	C	Functional modification of feature			Release 98	
with an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change: Aligning the list of function described with the current state of the standards as well as removing out of date editor's notes

Clauses affected:

2 References
3.1 Definitions
3.2 Abbreviations
4 General principles
5.1 Overview
5.2.2 Control plane
6.1.7 UE Identifiers
6.1.7.1 Usage of RNTI
6.1.8.2 Transport Network Control Plane identifiers
7.1 List of functions
New section 7.2.0 Transfer of user data
7.2.1 Functions related to overall system access control
New section 7.2.3.3 Paging support
New section 7.2.3.4 Positioning
7.2.4 Functions related to radio resource management and control
7.2.4.1 Radio resource configuration and operation
7.2.4.2 Radio environment survey
7.2.4.4 Radio bearer connection set-up and release (Radio Bearer Control)
7.2.4.8.1 UL OUTER LOOP POWER CONTROL
New section 7.2.6 Tracing
New section 7.2.7 Volume Reporting
8 Mobility Management
8.2 Consequences for Mobility Handling

11.2.1 RACH Transport Channel
11.2.3 FACH Transport Channel

Other specs affected:	Other 3G core specifications		→ List of CRs:	
	Other GSM core specifications		→ List of CRs:	
	MS test specifications		→ List of CRs:	
	BSS test specifications		→ List of CRs:	
	O&M specifications		→ List of CRs:	

Other comments:

help.doc

<-------- double-click here for help and instructions on how to create a CR.

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] ~~Merged UTRAN Architecture Description V0.0.2.~~TR 25.990: "Vocabulary for UTRAN"

[2] UMTS 23.10: "UMTS Access Stratum Services and Functions".

[3] UMTS 25.211: "Physical channels and mapping of transport channels onto physical channels (FDD)".

[4] TS 25.442: "Implementation Specific O&M Transport".

[5] TS 25.402: "Synchronisation in UTRAN, Stage 2".

[6] TS 25.331: " RRC Protocol Specification"

~~NOTE: [1] is a temporary reference only to ease the definition of what should be in the different sections of this document.~~

3 Definitions and abbreviations

3.1 Definitions

~~NOTE: Cleaned version of subclause 5.1 from [1] with a reference to a more general vocabulary document~~

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

ALCAP: Generic name for the transport signalling protocols used to set-up and tear-down transport bearers.

Cell: Radio Network object that can be uniquely identified by a User Equipment from a (cell) identification that is broadcasted over a geographical area from one *UTRAN Access Point*
A Cell is either FDD or TDD mode.

Iu: Interconnection point between the RNS and the Core Network. It is also considered as a reference point.

Iub: Interface between the RNC and the Node B.

Iur: A logical interface between two RNCs. Whilst logically representing a point to point link between RNCs, the physical realisation may not be a point to point link.

Logical Model: A Logical Model defines an abstract view of a network or network element by means of information objects representing network element, aggregations of network elements, the topological relationship between the elements, endpoints of connections (termination points), and transport entities (such as connections) that transport information between two or more termination points.
The information objects defined in the Logical Model are used, among others, by connection management functions. In this way, a physical implementation independent management is achieved.

Node B: A logical node responsible for radio transmission / reception in one or more cells to/from the UE. The logical node terminates the Iub interface towards the RNC.

Radio Network Controller: This equipment in the RNS is in charge of controlling the use and the integrity of the radio resources.

Controlling RNC: A role an RNC can take with respect to a specific set of Node B's. There is only one Controlling RNC for any Node B. The Controlling RNC has the overall control of the logical resources of its node B's.

Radio Network Subsystem: Either a full network or only the access part of a UMTS network offering the allocation and the release of specific radio resources to establish means of connection in between an UE and the UTRAN.
A Radio Network Subsystem contains one RNC and is responsible for the resources and transmission/reception in a set of cells.

Serving RNS: A role an RNS can take with respect to a specific connection between an UE and UTRAN. There is one Serving RNS for each UE that has a connection to UTRAN. The Serving RNS is in charge of the radio connection between a UE and the UTRAN. The Serving RNS terminates the Iu for this UE.

Drift RNS: The role an RNS can take with respect to a specific connection between an UE and UTRAN. An RNS that supports the Serving RNS with radio resources when the connection between the UTRAN and the UE need to use cell(s) controlled by this RNS is referred to as Drift RNS.

Radio Access Network Application Part: Radio Network Signalling over the Iu.

Radio Network Subsystem Application Part: Radio Network Signalling over the Iur.

RRC Connection: A point-to-point bi-directional connection between RRC peer entities on the UE and the UTRAN sides, respectively. An UE has either zero or one RRC connection.

User Equipment: A Mobile Equipment with one or several UMTS Subscriber Identity Module(s).

UMTS Terrestrial Radio Access Network: UTRAN is a conceptual term identifying that part of the network which consists of RNCs and Node Bs between Iu an Uu. The concept of UTRAN instantiation is currently undefined.

UTRAN Access Point: A conceptual point within the UTRAN performing radio transmission and reception. A UTRAN access point is associated with one specific *cell*, i.e. there exists one UTRAN access point for each cell. It is the UTRAN-side end point of a *radio link*.

Radio Link: A "radio link" is a logical association between a single User Equipment and a single UTRAN access point. Its physical realisation comprises one or more radio bearer transmissions.

Radio Link Set: A set of one or more Radio Links that has a common generation of Transmit Power Control (TPC) commands in the DL.

Uu: The Radio interface between UTRAN and the User Equipment.

RAB sub-flows: A Radio Access Bearer can be realised by UTRAN through several sub-flows. These sub-flows correspond to the NAS service data streams that have QoS characteristics that differ in a predefined manner within a RAB e.g. different reliability classes.

RAB sub-flows have the following characteristics:

1) The sub-flows of a RAB are established and released at the RAB establishment and release, respectively.

2) The sub-flows of a RAB are submitted and delivered together at the RAB SAP.

3) The sub-flows of a RAB are carried over the same Iu transport bearer.

4) The sub-flows of a RAB are organised in a predefined manner at the SAP and over the Iu interface. The organisation is imposed by the NAS as part of its co-ordination responsibility.

Coordinated DCHs: Coordinated DCHs are dedicated transport channels that are always established and released in combination. Coordinated DCHs cannot be operated on individually e.g. if the establishment of one DCH fails, the establishment of all other coordinated DCHs shall be terminated unsuccessfully. A set of coordinated DCHs is transferred over one transport bearer.

3.2 Abbreviations

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

ALCAP	Access Link Control Application Part

BM-IWF	Broadcast Multicast Interworking Function
BMC	Broadcast/Multicast Control
BSS	Base Station Subsystem
SAB	Service Area Broadcast
CBC	Cell Broadcast Centre
CBS	Cell Broadcast Service
CN	Core Network
CPCH	Common Packet Channel
DCH	Dedicated Channel
DL	Downlink
DRNS	Drift RNS
FACH	Forward Access Channel
FFS	For Further Study
GTP	GPRS Tunnelling Protocol
MAC	Medium Access Control
NAS	Non Access Stratum
NBAP	Node B Application Protocol
PCH	Paging Channel
QoS	Quality of Service
RAB	Radio Access Bearer
RACH	Random Access Channel
RANAP	Radio Access Network Application Part
RNC	Radio Network Controller
RNS	Radio Network Subsystem
RNSAP	Radio Network Subsystem Application Part
RNTI	Radio Network Temporary Identity
SRNS	Serving RNS
TEID	Tunnel Endpoint Identifier
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunication System
USIM	UMTS Subscriber Identity Module
UTRAN	UMTS Terrestrial Radio Access Network

3.3 Notation

Parts of the document apply only to one mode, FDD or TDD. Any such area will be tagged by [FDD — xxxxxxxxx] and [TDD — yyyyyyyyyyy] respectively. The tag applies to the text until the closing bracket.

4 General principles

The general principles guiding the definition of UTRAN Architecture as well as the UTRAN interfaces are the following:

- Logical separation of signalling and data transport networks.

- UTRAN and CN functions are fully separated from transports functions. Addressing scheme used in UTRAN and CN shall not be tied to the addressing schemes of transport functions. The fact that some UTRAN or CN function resides in the same equipment as some transport functions does not make the transport functions part of the UTRAN or the CN.

- Macro diversity (FDD only) is fully handled in the UTRAN.

- Mobility for RRC connection is fully controlled by the UTRAN.

~~NOTE: Handover to other access networks is FFS.~~

- When defining the UTRAN interfaces the following principles were followed: The functional division across the interfaces shall have as few options as possible.

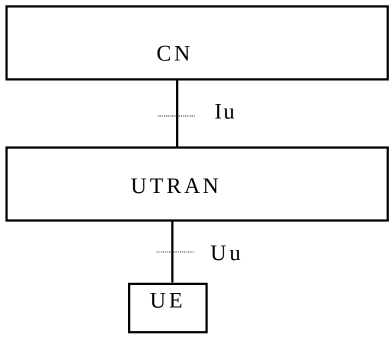
- Interfaces should be based on a logical model of the entity controlled through this interface.

Transport Network Control Plane is a functional plane in the interfaces protocol structure that is used for the transport bearer management. The actual signalling protocol that is in use within the Transport Network Control Plane depends on the underlying transport layer technology. The intention is not to specify a new UTRAN specific Application Part for the Transport Network Control Plane but to use signalling protocols standardised in other groups (if needed) for the applied transport layer technology.

5 UMTS General architecture

5.1 Overview

Figure 1 shows a simplified UMTS architecture with the external reference points and interfaces to the UTRAN. ~~The architecture is based on document [1].~~

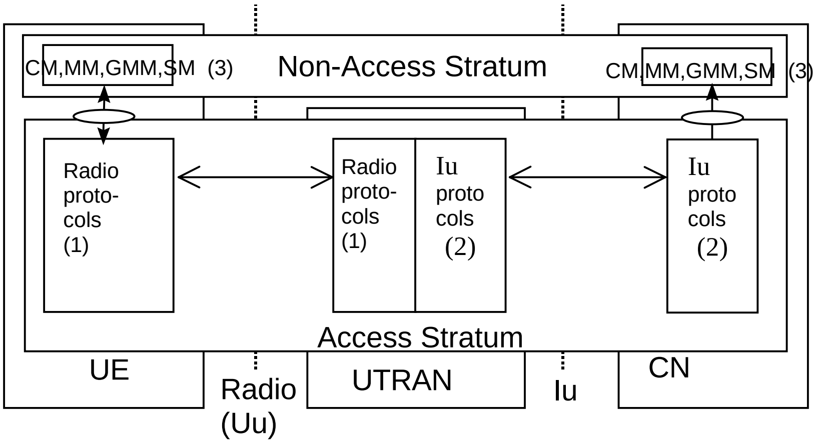


UTRAN UMTS Terrestrial Radio Access Network
CN Core Network
UE User Equipment

Figure 1: UMTS Architecture

5.2.2 Control plane

The figure below shows the control plane (signalling) protocol stacks on Iu and Uu interfaces.



(1) The radio interface protocols are defined in documents TS 25.2xx and TS 25.3xx.
(2) The protocol is defined in documents TS 25.41x. (Description of Iu interface).
(3) **CM,MM,GMM,SM:** This exemplifies a set of NAS control protocols between UE and CN. There may be different NAS protocol stacks in parallel. The evolution of the protocol architecture for these protocols is ~~FFS~~outside the scope of this specification.

Figure 3: Iu and Uu Control plane

NOTE: Both the Radio protocols and the Iu protocols contain a mechanism to transparently transfer NAS messages.

6.1.7 UE Identifiers

~~NOTE: This RNTI definition and usage needs to be confirmed by 3GPP TSG RAN WG2.~~

Radio Network Temporary Identities (RNTI) are used as UE identifiers within UTRAN and in signalling messages between UE and UTRAN.

Four types of RNTI exist:

1) Serving RNC RNTI (s-RNTI);

2) Drift RNC RNTI (d-RNTI);

3) Cell RNTI (c-RNTI);

4) UTRAN RNTI (u-RNTI);

s-RNTI is used:

- by UE to identify itself to the Serving RNC;
- by SRNC to address the UE;
- by DRNC to identify the UE to Serving RNC.

s-RNTI is allocated for all UEs having a RRC connection, it is allocated by the Serving RNC and it is unique within the Serving RNC. s-RNTI is reallocated always when the Serving RNC for the RRC connection is changed.

d-RNTI is used:

- by serving RNC to identify the UE to Drift RNC.

NOTE: The d-RNTI is never used on Uu.

d-RNTI is allocated by drift RNC upon drift UE contexts establishment and it shall be unique within the drift RNC. Serving RNC shall know the mapping between s-RNTI and the d-RNTIs allocated in Drift RNCs for the same UE. Drift RNC shall know the s-RNTI and SRNC-ID related to existing d-RNTI within the drift RNC.

c-RNTI is used:

- by UE to identify itself to the controlling RNC;
- by controlling RNC to address the UE.

c-RNTI is allocated by controlling RNC upon UE accessing a new cell. C-RNTI shall be unique within the accessed cell. Controlling RNC shall know the d-RNTI associated to the c-RNTI within the same logical RNC (if any).

u-RNTI

The u-RNTI is allocated to an UE having a RRC connection and identifies the UE within UTRAN.

u-RNTI is composed of:

- SRNC identity;
- s-RNTI.

Each RNC has a unique identifier within the UTRAN part of the PLMN, denoted by RNC identifier (RNC-ID). This identifier is used to route UTRAN interface messages to correct RNC. RNC-ID of the serving RNC together with the s-RNTI is a unique identifier of the UE in the UTRAN part of the PLMN.

6.1.7.1 Usage of RNTI

u-RNTI is used as a UE identifier for the first cell access (at cell change) when a RRC connection exists for this UE and for UTRAN originated paging including associated response messages. RNC-ID is used by Controlling RNC to route the received uplink messages towards the Serving RNC.

NOTE: For the initial access ~~two different methods of identification, a random number and~~ a unique core network UE identifier ~~are under consideration~~is used.

c-RNTI is used as a UE identifier in all other DCCH/DTCH common channel messages on air interface.

6.1.8.2 Transport Network Control Plane identifiers

ALCAP identifier is used only in Transport Network Control plane (ALCAP protocol, if exist) and may be used in User Plane in the actual data transmission using the transport link. ALCAP identifier identifies the transport link according to the naming conventions defined for the transport link type in question. Both ends of the reference point of the ALCAP shall memorise the ALCAP identifier during the lifetime of the transport link. Each ALCAP identifier can be binded to an Application Part identifier.

Table 2 indicates examples of the identifiers used for different transmission link types.

Table 2: Examples of the identifiers used for different transmission link types

Transmission link type	ALCAP Identifier
AAL2	AAL2 Path ID + CID
GTP over IP	IP address + ~~GTP identifier (ffs.)~~TEID

7 UTRAN Functions description

7.1 List of functions

~~NOTE: This list of functions, their classification and definitions is an initial list, classification and definitions that will be further refined.~~

- Transfer of User Data
- Functions related to overall system access control
  - Admission Control
  - Congestion Control
  - System information broadcasting
- Radio channel ciphering and deciphering
- Integrity protection
- Functions related to mobility
  - Handover
  - SRNS Relocation
  - Paging support
  - Positioning
- Functions related to radio resource management and control
  - Radio resource configuration and operation
  - Radio environment survey
  - combining/splitting control
  - ~~Radio bearer~~ connection set-up and release ~~(Radio Bearer Control)~~
  - Allocation and deallocation of Radio Bearers
  - [TDD - Dynamic Channel Allocation (DCA)]
  - Radio protocols function
  - RF power control
  - ~~RF power setting~~
  - [TDD - Timing Advance]
  - Radio channel coding
  - Radio channel decoding
  - Channel coding control
  - Initial (random) access detection and handling
- Synchronisation
- CN Distribution function for Non Access Stratum messages

- Functions related to broadcast and multicast services (see note) (broadcast/multicast interworking function BM-IWF)

NOTE: Only Broadcast is applicable for Release 99.

- Broadcast/Multicast Information Distribution
- Broadcast/Multicast Flow Control
- CBS Status Reporting
- Tracing
- Volume reporting

7.2 ~~7.2~~ Functions description

7.2.0 Transfer of user data

This function provides user data transfer capability across the UTRAN between the Iu and Uu reference points.

7.2.1 Functions related to overall system access control

System access is the means by which a UMTS user is connected to the ~~UMTS~~ UTRAN in order to use UMTS services and/or facilities. User system access may be initiated from either the mobile side, e.g. a mobile originated call, or the network side, e.g. a mobile terminated call.

7.2.3 Functions related to Mobility

7.2.3.1 Handover

This function manages the mobility of the radio interface. It is based on radio measurements and it is used to maintains the Quality of Service requested by the Core Network.

Handover may be directed to/from another system (e.g. UMTS to GSM handover).

The handover function may be either controlled by the network, or independently by the UE. Therefore, this function may be located in the SRNC, the UE, or both.

7.2.3.2 SRNS Relocation

The SRNS Relocation function coordinates the activities when the SRNS role is to be taken over by another RNS. The SRNS relocation function manages the Iu interface connection mobility from an RNS to another.

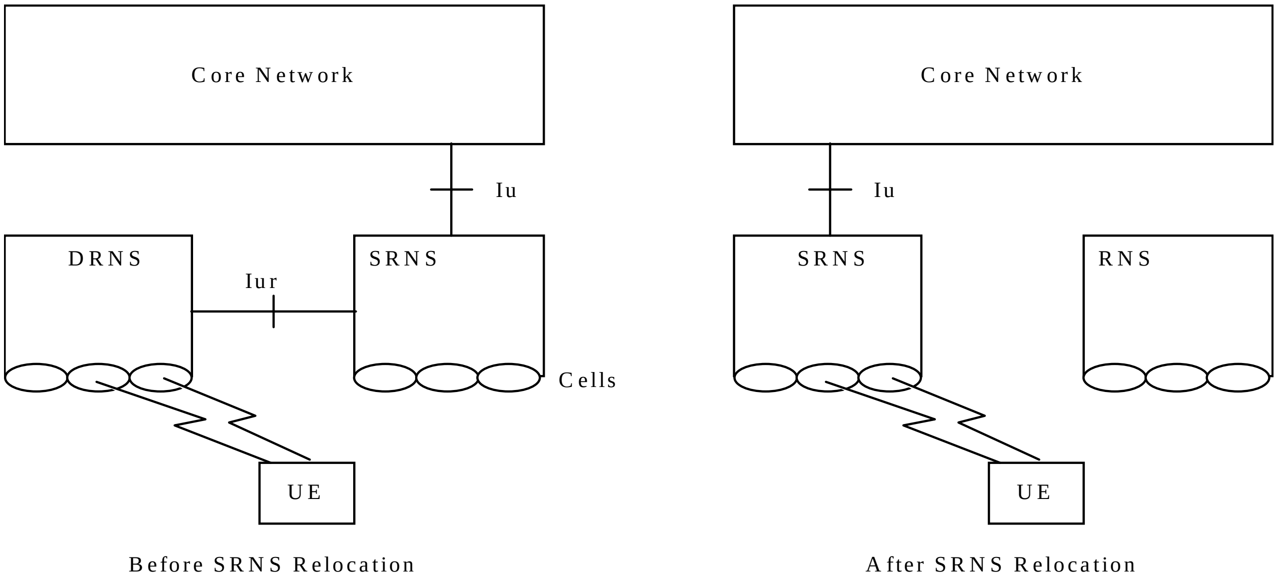


Figure 7: Serving RNS Relocation

The SRNS Relocation is initiated by the SRNC.

This function is located in the RNC and the CN.

7.2.3.3 Paging support

This function provides the capability to request a UE to contact the UTRAN when the UE is in Idle, CELL_PCH or URA PCH states [6]. This function also encompasses a coordination function between the different Core Network Domains onto a single RRC connection.

7.2.3.4 Positioning

This function provides the capability to determine the geographic position of a UE.

7.2.4 Functions related to radio resource management and control

Radio resource management is concerned with the allocation and maintenance of radio communication resources. UMTS radio resources must be shared between circuit transfer mode services and packet transfer modes services (i.e. Connection-oriented and/or connectionless-oriented services).

7.2.4.1 Radio resource configuration and operation

This function performs configures the radio network resources, i.e. cells and common transport channels~~ (BCH, RACH, FACH, PCH)~~, and takes the resources into or out of operation.

7.2.4.2 Radio environment survey

This function performs measurements on radio channels (current and surrounding cells) and translates these measurements into radio channel quality estimates. Measurements may include:

1) received signal strengths (current and surrounding cells),
2) estimated bit error ratios, (current and surrounding cells),
3) estimation of propagation environments (e.g. high-speed, low-speed, satellite, etc.),
4) transmission range (e.g. through timing information),
5) Doppler shift,
6) synchronisation status,
7) Received interference level,
8) Total DL transmission power per cell.

This function is located in the UE and in the UTRAN.

~~*Radio resource management* is concerned with the allocation and maintenance of radio communication resources. UMTS radio resources must be shared between circuit transfer mode services and packet transfer modes services (i.e. Connection-oriented and/or connectionless-oriented services).~~

7.2.4.3 combining/splitting control

This function controls the combining/splitting of information streams to receive/ transmit the same information through multiple physical channels (possibly in different cells) from/ towards a single mobile terminal.

The UL combining of information streams may be performed using any suitable algorithm, for example:

- [FDD - based on maximum ratio algorithm (maximum ratio combining)];
- [FDD - based on quality information associated to each TBS (selection-combining)];
- [TDD - based on the presence/absence of the signal (selection)].

[FDD - combining/splitting control should interact with channel coding control in order to reduce the bit error ratio when combining the different information streams].

In some cases, depending on physical network configuration, there may be several entities which combine the different information streams, i.e. there may be combining/splitting at the SRNC, DRNC or Node B level.

This function is located in the UTRAN.

7.2.4.4 ~~Radio bearer~~ connection set-up and release~~ (Radio Bearer Control)~~

This function is responsible for the control of connection element set-up and release in the radio access sub network. The purpose of this function is:

1) to participate in the processing of the end-to-end connection set-up and release,
2) and to manage and maintain the element of the end-to-end connection, which is located in the radio access sub network.

In the former case, this function will be activated by request from other functional entities at call set-up/release. In the latter case, i.e. when the end-to-end connection has already been established, this function may also be invoked to cater for in-call service modification or at handover execution.

This function is located both in the UE and in the RNC.

7.2.4.8.1 UL OUTER LOOP POWER CONTROL

The UL Outer Loop Power Control located in the SRNC sets the target quality value for the UL Inner Loop Power Control which is located in Node B for FDD and is located in the UE for TDD. It receives input from quality estimates of the transport channel. The UL outer loop power control is mainly used for a long-term quality control of the radio channel.

In FDD this function is located in the UTRAN, in TDD the function is performed in UTRAN and the target quality value is sent to the UE by the SRNC.

In FDD, if the connection involves both a SRNS and a DRNS the function UL Outer Loop Power Control (located in the SRNC) sets the target quality for the UL Inner Loop Power Control function (located in Node B). ~~Additional quality information for the case when macro diversity combining is performed in DRNC is for further study.~~

~~NOTE: Some additional function is needed for resource negotiation between the SRNS and the DRNS across the Iur. This is FFS.~~

7.2.6 Tracing

This function allows tracing of various events related to the UE and its activities.

7.2.7 Volume Reporting

The data volume reporting function is used to report the volume of unacknowledged data to the CN for accounting purpose.

8 Mobility Management

~~NOTE: Location based services have not been yet considered and need further studies.~~

8.2 Consequences for Mobility Handling

It is generally agreed ~~[1]~~ to contain radio access specific procedures within UTRAN. This means that all cell level mobility should be handled within UTRAN. Also the cell structure of the radio network should not necessarily be known outside the UTRAN.

When there exists a dedicated connection to the UE, the UTRAN shall handle the radio interface mobility of the UE. This includes procedures such as soft handover, and procedures for handling mobility in the ~~RACH/~~CELL_PCH ~~sub~~and URA_PCH states [6].

~~NOTE: Some reference will be necessary to a 3GPP TSG RAN WG2 document that defines that substate.~~

When a dedicated connection between the UTRAN and the UE does not exist, no UE information is needed in UTRAN. Therefore, the mobility is handled directly between UE and CN outside access stratum (e.g. by means of registration procedures). When paging the UE, the CN indicates a 'geographical area' that is translated within UTRAN to the actual cells that shall be paged. A 'geographical area' shall be identified in a cell-structure independent way. One possibility is the use of 'Location Area identities'.

During the lifetime of the dedicated connection, the registrations to the CN are suppressed by the UE. When a dedicated connection is released, the UE performs a new registration to the CN, when needed.

Thus, the UTRAN does not contain any permanent 'location registers' for the UE, but only temporary contexts for the duration of the dedicated connection. This context may typically contain location information (e.g. current cell(s) of the UE) and information about allocated radio resources and related connection references.

11.2.1 RACH Transport Channel

Figure 11 shows the protocol stack model for the RACH transport channel when the Controlling and Serving RNC are co-incident.

For the RACH transport channel, Dedicated MAC (MAC-d) uses the services of Common MAC (MAC-c/sh).

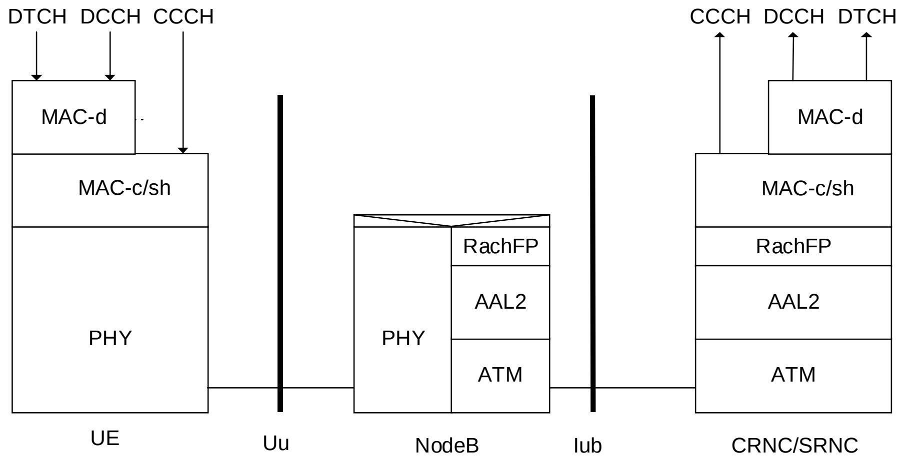


Figure 11: RACH: Coincident Controlling and Serving RNC

The Common MAC (MAC-c/sh) entity in the UE transfers MAC-c/sh PDU to the peer MAC-c/sh entity in the RNC using the services of the Physical Layer.

An Interworking Function (IWF) in the NodeB interworks the RACH frame received by the PHY entity into the RACH Frame Protocol (RACH FP) entity.

The RACH Frame Protocol entity adds header information to form a RACH FP PDU that is transported to the RNC over an AAL2 (or AAL5) connection.

At the RNC, the RACH FP entity delivers the MAC-c/sh PDU to the MAC-c/sh entity.

Figure 12 shows the protocol model for the RACH transport channel with separate Controlling and Serving RNC. In this case, Iur RACH Frame Protocol (DchFP) is used to interwork the Common MAC (MAC-c/sh) at the Controlling RNC with the Dedicated MAC (MAC-d) at the Serving RNC~~ (the exact Iur FACH Frame Protocol is FFS)~~.

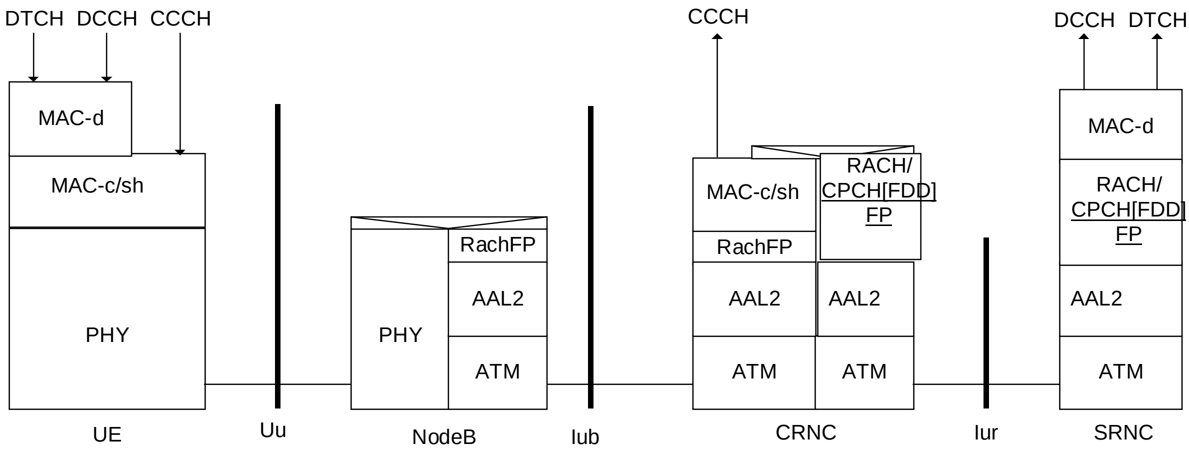


Figure 12: RACH: Separate Controlling and Serving RNC

11.2.3 FACH Transport Channel

Figure 15 shows the protocol model for the FACH transport channel when the Controlling and Serving RNC are co-incident.

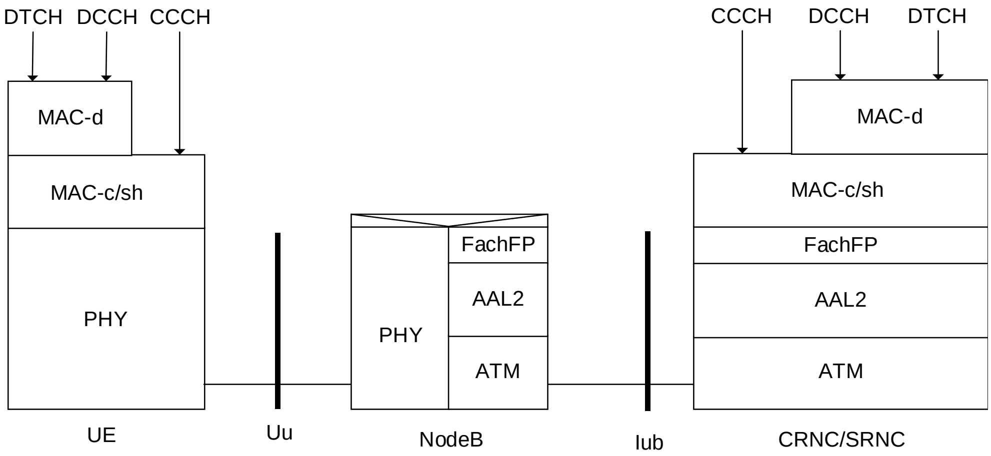


Figure 15: FACH Co-incident Controlling and Serving RNC

The Common MAC (MAC-c/sh) entity in the RNC transfers MAC-c PDU to the peer MAC-c entity in the UE using the services of the FACH Frame Protocol (FACH FP) entity.

The FACH Frame Protocol entity adds header information to form a FACH FP PDU which is transported to the NodeB over an AAL2 (or AAL5) connection.

An Interworking Function (IWF) in the NodeB interworks the FACH frame received by FACH Frame Protocol (FACH FP) entity into the PHY entity.

FACH scheduling is performed by MAC-c/sh in the CRNC.

Figure 16 shows the protocol model for the FACH transport channel with separate Controlling and Serving RNC. In this case, Iur FACH Frame Protocol is used to interwork the Common MAC (MAC-c) at the Controlling RNC with the Dedicated MAC (MAC-d) at the Serving RNC~~ (the exact Iur RACH Frame Protocol is FFS)~~.

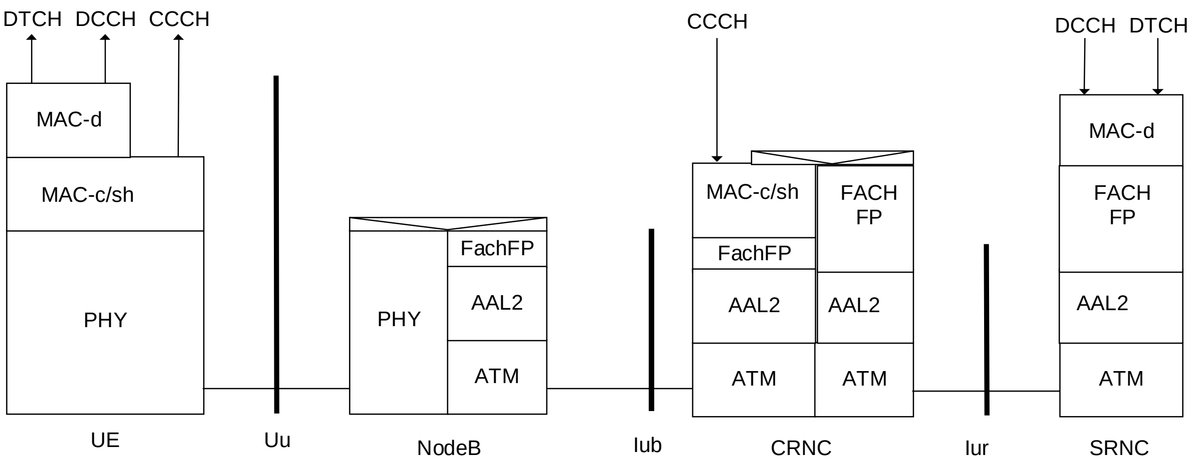


Figure 16: FACH: Separate Controlling and Serving RNC

3GPP TSG-RA WG3 Meeting #15
Berlin Germay, 21-25 August 2000

***Document* R3-002373**

e.g. for 3GPP use the format TP-99xxx
or for SMG, use the format P-99-xxx

CHANGE REQUEST

Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.

25.401	**CR**	**17r1**	Current Version: V3.3.0

GSM (AA.BB) or 3G (AA.BBB) specification number ↑ *↑ CR number as allocated by MCC support team*

For submission to:	TSG-RAN#9	for approval		strategic		*(for SMG*
list expected approval meeting # here ↑		for information		non-strategic		*Use only)*

Form: CR cover sheet, version 2 for 3GPP and SMG The latest version of this form is available from: ftp://ftp.3gpp.org/Information/CR-Form-v2.doc

Proposed change affects: *(at least one should be marked with an)*	(U)SIM		ME		UTRAN / Radio	X	Core Network	

Source:	R-WG3	**Date:**	August 2000
Subject:	Layered architecture view		
Work item:			

Category:	F	Correction	X	**Release:**	Phase 2	
	A	Corresponds to a correction in an earlier release			Release 96	
(only one category	B	Addition of feature			Release 97	
Shall be marked	C	Functional modification of feature			Release 98	
With an X)	D	Editorial modification			Release 99	X
					Release 00	

Reason for change:	In the email discussion between R3#14 and R#15 on layered architecture only 1 input was received. This contribution is based on that input, extended with comments received during R3#15.
Clauses affected:	6

Other specs affected:	Other 3G core specifications		→ List of CRs:
	Other GSM core specifications		→ List of CRs:
	MS test specifications		→ List of CRs:
	BSS test specifications		→ List of CRs:
	O&M specifications		→ List of CRs:

Other comments:	

help.doc

<--------- double-click here for help and instructions on how to create a CR.

6 UTRAN Architecture

The UTRAN consists of a set of Radio Network Subsystems connected to the Core Network through the Iu.

A RNS consists of a Radio Network Controller and one or more Node Bs. A Node B is connected to the RNC through the Iub interface.

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

The RNC is responsible for the Handover decisions that require signalling to the UE.

A RNC may include a combining/splitting function to support combination/splitting of information streams (see subclause 7.2.4.3).

Inside the UTRAN, the RNCs of the Radio Network Subsystems can be interconnected together through the Iur. Iu(s) and Iur are logical interfaces. Iur can be conveyed over direct physical connection between RNCs or virtual networks using any suitable transport network.

The UTRAN architecture is shown in figure 4.

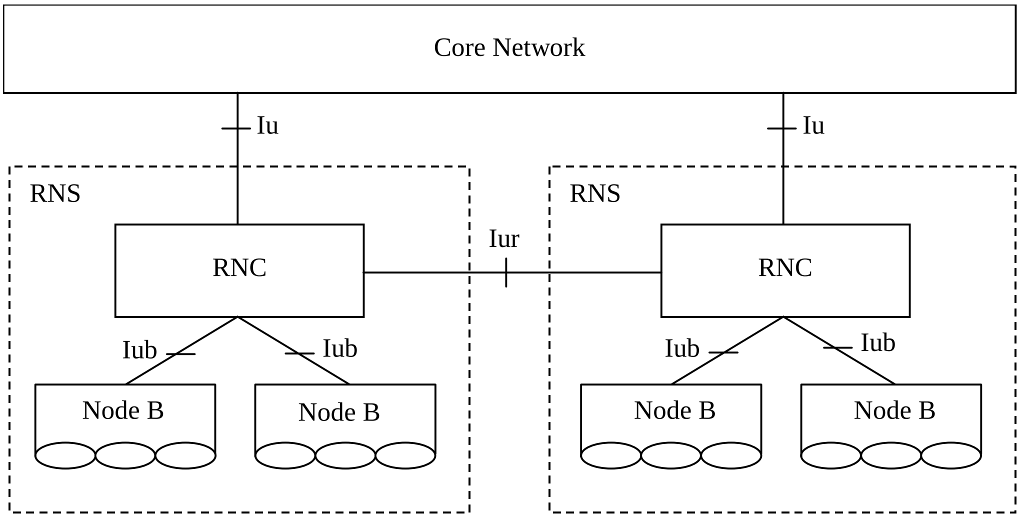


Figure 4: UTRAN Architecture

Each RNS is responsible for the resources of its set of cells.

For each connection between User Equipment and the UTRAN, One RNS is the Serving RNS. When required, Drift RNSs support the Serving RNS by providing radio resources as shown in figure 5. The role of an RNS (Serving or Drift) is on a per connection basis between a UE and the UTRAN.

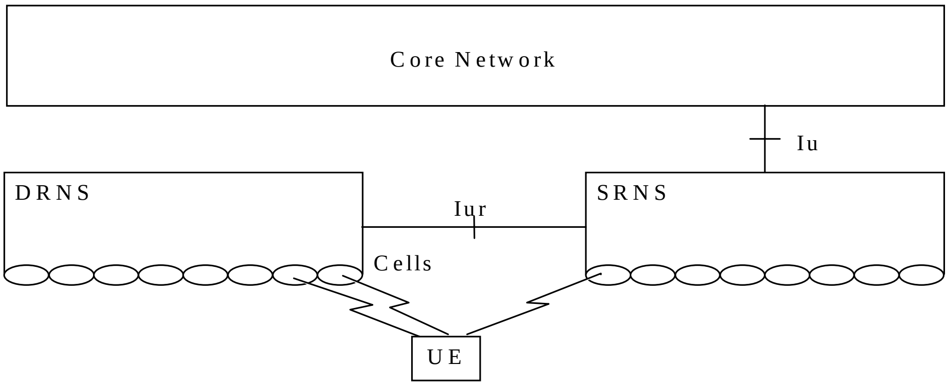


Figure 5: Serving and Drift RNS

The UTRAN is layered into a Radio Network Layer and a Transport Network Layer.

The UTRAN architecture, i.e. the UTRAN logical nodes and interfaces between them, are defined as part of the Radio Network Layer.

For each UTRAN interface (Iu, Iur, Iub) the related transport network layer protocol and functionality is specified. The transport network layer provides services for user plane transport, signalling transport and transport of implementation specific O&M.

An implementation of equipment compliant with the specifications of a certain interface shall support the Radio Network Layer protocols specified for that interface. It shall also as a minimum, for interoperability, support the transport network layer protocols according to the transport network layer specifications for that interface.

The network architecture of the transport network layer is not specified by 3GPP and is left as an operator issue.

The equipment compliant to 3GPP standards shall at least be able to act as endpoints in the transport network layer, and may also act as a switch/router within the transport network layer.

For implementation specific O&M signalling to the Node B, only the transport network layer protocols are in the scope of UTRAN specifications.

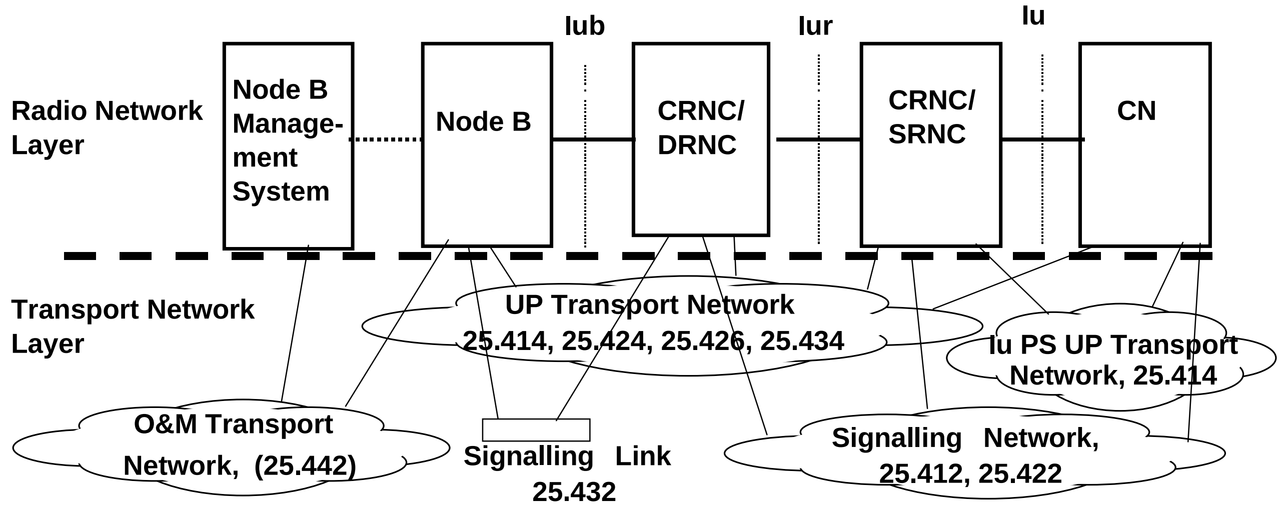


Figure 6: Protocol layering

Figure 6 illustrates which parts of the R99 transport network layer that may be (but are not mandated to be) configured by the operator as transport networks, i.e. the radio network layer provides a destination address, namely:

- Transport network for implementation specific O&M traffic

- Signalling network for Iu and Iur

- Transport network for Iub, Iur and Iu CS user plane connections

- Transport network for Iu PS user plane connections

The signalling link for Iub signalling as seen by the radio network layer cannot be configured as a network (no address provided).

A transport network for UTRAN may be configured by the operator to be used also for other traffic than UTRAN traffic.