TSG-RAN Meeting #12
Stockholm, Sweden, 12 - 15 June 2001

TSGRP#12(01) 0389

Title: **Agreed CRs to TS 25.401**

Source: **TSG-RAN WG3**

Agenda item: **8.3.3/8.3.4**

Tdoc_Num	Specification	CR_Num	Revision_Num	CR_Subject	CR_Category	WG_Status	Cur_Ver_Num	New_Ver_Num	Workitem
R3-011314	25.401	026		Rel4 only changes based on R3-011195	F	agreed	4.0.0	4.1.0	LCR TDD-lublur
R3-011631	25.401	029		Removal of Release dependency for the TNL	F	agreed	4.0.0	4.1.0	TEI

3GPP TSG-RAN3 Meeting #21
Busan, South Korea, 21 - 25 May 2001

Tdoc R3-011314

CR-Form-v3

CHANGE REQUEST

⌘ **25.401** **CR** **026** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☒ Core Network ☐

Title:	⌘	Rel4 only changes based on R3-011195
Source:	⌘	R-WG3
Work item code:	⌘	LCR TDD-IublIur
Date:	⌘	May 2001
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	1. Timing Advance function is only used in 3.84Mcps TDD.
Summary of change:	⌘	1. In section 7.1, '[1.28Mcps TDD – Uplink Synchronisation]' is added into the list of UTRAN functions. 2. in section 7.2.4.14,the title '[TDD-Timing Advance]' is changed to '[3.84Mcps TDD-Timing Advance]' 3. some editorial corrections.
Consequences if not approved:	⌘	Backward compatibility: These descriptive additions are backward compatible with the previous version of the TS.

Clauses affected:	⌘	6, 7.1,7.2.4.14
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

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.

There are two chip-rate options in the TDD mode: 3.84Mcps TDD and 1.28Mcps TDD. Each TDD cell supports either of these options.

A Node B which supports TDD cells can support one chip-rate option only, or both options.

A~~n~~ RNC which supports TDD cells can support one chip-rate option only, or both options.

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.

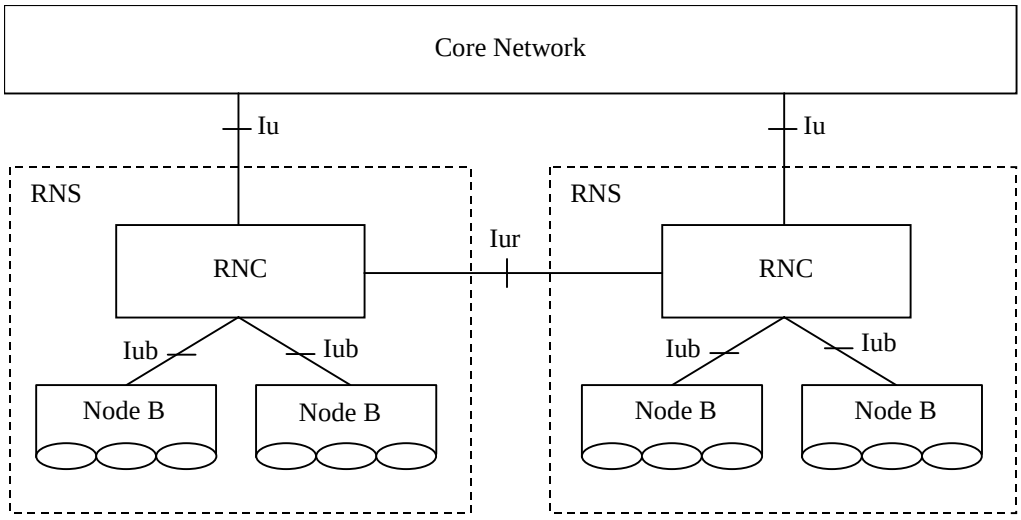

Figure 4: UTRAN Architecture

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.

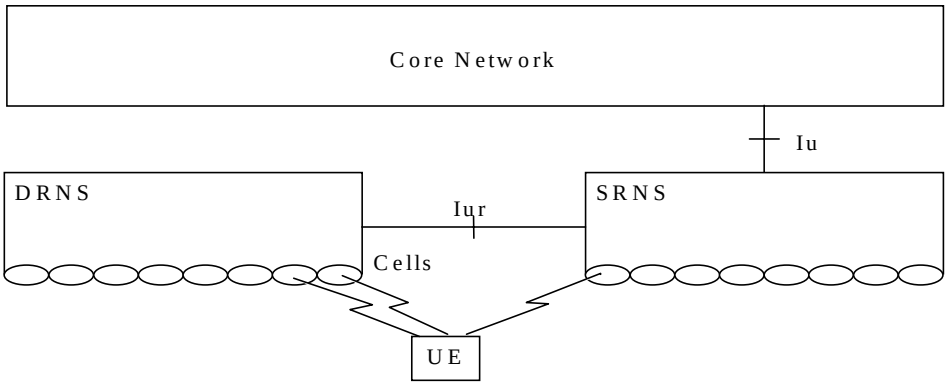

Figure 5: Serving and Drift RNS

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.

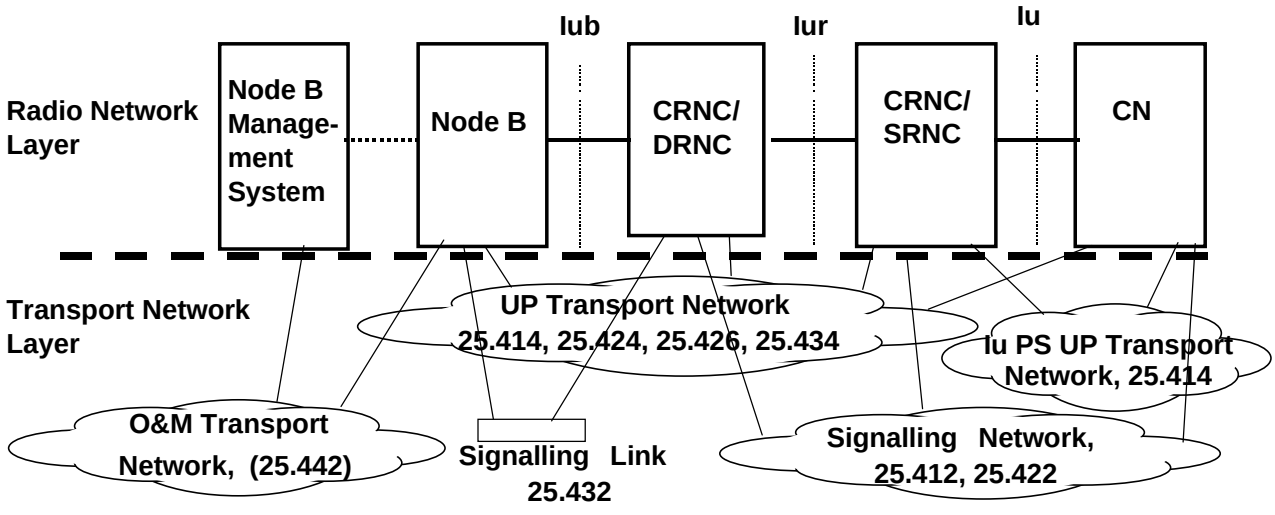

Figure 6: Protocol layering

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.

/* partly omitted*/

7 UTRAN Functions description

7.1 List of functions

- 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
  - Connection set-up and release
  - Allocation and deallocation of Radio Bearers
  - [TDD - Dynamic Channel Allocation (DCA)]
  - Radio protocols function
  - RF power control

- [3.84Mcps TDD - Timing Advance]
- [1.28Mcps TDD – Uplink Synchronisation]
- Radio channel coding
- Radio channel decoding
- Channel coding control
- Initial (random) access detection and handling
- CN Distribution function for Non Access Stratum messages

- Synchronisation
- 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 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 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.

7.2.1.1 Admission Control

The purpose of the admission control is to admit or deny new users, new radio access bearers or new radio links (for example due to handover). The admission control should try to avoid overload situations and base its decisions on interference and resource measurements. The admission control is employed at for example initial UE access, RAB assignment/reconfiguration and at handover. These cases may give different answers depending on priority and situation.

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

The Serving RNC is performing admission Control towards the Iu interface.

7.2.1.2 Congestion Control

The task of congestion control is to monitor, detect and handle situations when the system is reaching a near overload or an overload situation with the already connected users. This means that some part of the network has run out, or will soon run out of resources. The congestion control should then bring the system back to a stable state as seamless as possible.

NOTE: This admission Control function is related to Radio Resources.

Congestion control is performed within UTRAN.

7.2.1.3 System information broadcasting

This function provides the mobile station with the Access Stratum and Non Access Stratum information which are needed by the UE for its operation within the network.

The basic control and synchronisation of this function is located in UTRAN.

7.2.2 Radio channel ciphering and deciphering

This function is a pure computation function whereby the radio transmitted data can be protected against a non-authorised third-party. Ciphering and deciphering may be based on the usage of a session-dependent key, derived through signalling and/or session dependent information.

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

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.

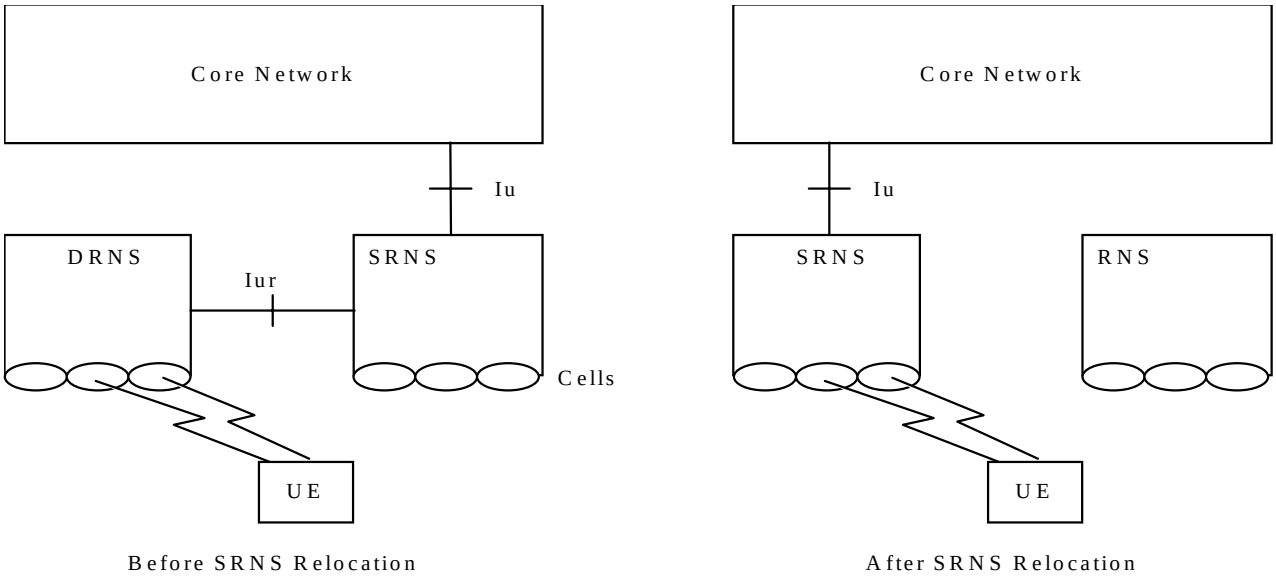

Figure 7: Serving RNS Relocation

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, 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.

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 Connection set-up and release

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.

7.2.4.5 Allocation and deallocation of Radio Bearers

This function consists of translating the connection element set-up (resp. release) requests into physical radio channel allocation (resp. deallocation) accordingly to the QoS of the Radio Access Bearer.

This function may be activated during the call since e.g. the user service request may vary, or macro diversity may be used.

This function is located in the CRNC and SRNC.

7.2.4.6 [TDD - Dynamic Channel Allocation (DCA)]

DCA is used in the TDD mode. It includes Fast DCA and Slow DCA. Slow DCA is the process of assigning radio resources, including time slots, to different TDD cells according to the varying cell load. Fast DCA is the process of assigning resources to Radio Bearers, and is related to Admission Control.

7.2.4.7 Radio protocols function

This function provides user data and signalling transfer capability across the UMTS radio interface by adapting the services (according to the QoS of the Radio Access Bearer) to the Radio transmission. This function includes amongst other:

- Multiplexing of services and multiplexing of UEs on Radio bearers;

- Segmentation and reassembly;

- Acknowledged/Unacknowledged delivery according to the Radio Access Bearer QoS.

7.2.4.8 RF 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. It consist of the following functions: UL Outer Loop Power Control, DL Outer Loop Power Control, UL Inner Loop Power Control, DL Inner Loop Power Control, UL Open Loop Power Control and DL Open Loop Power Control.

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).

7.2.4.8.2 DL OUTER LOOP POWER CONTROL

The DL Outer Loop Power Control sets the target quality value for the DL inner loop power control. It receives input from quality estimates of the transport channel, measured in the UE. The DL outer loop power control is mainly used for a long-term quality control of the radio channel.

This function is located mainly in the UE, but some control parameters are set by the UTRAN.

The SRNC, regularly (or under some algorithms), sends the target down link power range based on the measurement report from UE.

7.2.4.8.3 UL INNER LOOP POWER CONTROL

The UL Inner Loop Power Control sets the power of the uplink dedicated physical channels.

In FDD, it is a closed loop process. It receives the quality target from UL Outer Loop Power Control and quality estimates of the uplink dedicated physical control channel. The power control commands are sent on the downlink dedicated physical control channel to the UE. This function is located in both the UTRAN and the UE.

In TDD it is a open loop process, it receives the quality target from the UL Outer Loop Power Control and uses the quality target and quality estimates of downlink channels to set the transmit power. This function is located in the UE.

7.2.4.8.4 DL INNER LOOP POWER CONTROL

The DL Inner Loop Power Control sets the power of the downlink dedicated physical channels. It receives the quality target from DL Outer Loop Power Control and quality estimates of the downlink dedicated physical control channel. The power control commands are sent on the uplink dedicated physical control channel to the UTRAN.

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

7.2.4.8.5 UL OPEN LOOP POWER CONTROL

The UL Open Loop Power Control sets the initial power of the UE, i.e. at random access. The function uses UE measurements and broadcasted cell/system parameters as input.

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

7.2.4.8.6 DL OPEN LOOP POWER CONTROL

The DL Open Loop Power Control sets the initial power of downlink channels. It receives downlink measurement reports from the UE.

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

7.2.4.9 Radio channel coding

This function introduces redundancy into the source data flow, increasing its rate by adding information calculated from the source data, in order to allow the detection or correction of signal errors introduced by the transmission medium. The channel coding algorithm(s) used and the amount of redundancy introduced may be different for the different types of logical channels and different types of data.

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

7.2.4.10 Radio channel decoding

This function tries to reconstruct the source information using the redundancy added by the channel coding function to detect or correct possible errors in the received data flow. The channel decoding function may also employ a priori error likelihood information generated by the demodulation function to increase the efficiency of the decoding operation. The channel decoding function is the complement function to the channel coding function.

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

7.2.4.11 Channel coding control

This function generates control information required by the channel coding/ decoding execution functions. This may include channel coding scheme, code rate, etc.

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

7.2.4.12 Initial (random) access detection and handling

This function will have the ability to detect an initial access attempt from a mobile station and will respond appropriately. The handling of the initial access may include procedures for a possible resolution of colliding attempts, etc. The successful result will be the request for allocation of appropriate resources for the requesting mobile station.

This function is located in the UTRAN.

7.2.4.13 CN Distribution function for Non Access Stratum messages

In the RRC protocol, messages from the NAS shall be transparently transferred within the Access Stratum using the Direct Transfer procedure. A distribution function in the UE and the SRNC shall handle the CN domain indicator being part of the AS message to direct messages to the appropriate NAS entity i.e. the appropriate Mobility Management instance in the UE domain and the appropriate CN domain.

In the downlink direction the UE shall be provided by the SRNC with the information on the originating CN domain for the individual NAS message.

In the uplink direction, the process performed by the distribution function in the UE consists in inserting the appropriate values for the CN domain indicator in the AS message and the process performed by the SRNC consists in evaluating the CN domain indicator contained in the AS message and distribute the NAS message to the corresponding RANAP instance for transfer over Iu interface.

This distribution function is located in both the UE and in the SRNC.

7.2.4.14 [3.84Mcps TDD - Timing Advance]

This function is used in uplink to align the uplink radio signals from the UE to the UTRAN. ~~In the 3.84Mcps TDD option,~~ Timing Advance is based on uplink burst timing measurements performed by the Node B L1, and on Timing Advance commands sent downlink to the UE. ~~In the 1.28Mcps TDD option, the Timing Advance function can be achieved by the uplink synchronisation procedure.~~

7.2.4.15 Service specific function for Non Access Stratum messages

A service specific function in the UE provides a SAP for a particular service (e.g. a given priority). In the downlink direction, the SRNC may base the routing on this SAP.

This service specific function is located in both the UE and the SRNC.

7.2.4.x [1.28Mcps TDD – Uplink Synchronisation]

This function is used in uplink to synchronise the uplink radio signals from the UE to the UTRAN. At the detection of uplink burst, the Node B will evaluate the received power level and timing, and reply by sending the adjustment information to UE to modify its timing and power level for next transmission and for establishment of the Uplink synchronisation procedure.

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

See note.

7.2.5.1 Broadcast/Multicast Information Distribution

The broadcast/multicast information distribution function distributes received CBS messages towards the BMC entities configured per cell for further processing. The distribution of broadcast/multicast information relate on the mapping between service area and cells controlled by the RNC. The provision of this mapping information is an O&M function.

NOTE: Only Broadcast is applicable for Release 99.

7.2.5.2 Broadcast/Multicast Flow Control

When processing units of the RNC becomes congested, the Broadcast/Multicast Flow Control function informs the data source about this congestion situation and takes means to resolve the congestion.

7.2.5.3 CBS Status Reporting

The RNC collects status data per cell (e.g. No-of-Broadcast-Completed-List, Radio-Resource-Loading-List), and matches these data to Service Areas. The status data is transmitted to the CBC, if a query has been made by the CBC.

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.

/* partly omitted*/

3GPP TSG-RAN WG3 Meeting #21
Busan, Korea, May 21st – May 25th, 2001

R3-011631

CR-Form-v3

CHANGE REQUEST

⌘ **25.401** **CR** **029** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☒ Core Network ☐

Title:	⌘	Removal of Release dependency for the TNL
Source:	⌘	R-WG3
Work item code:	⌘	TEI
Date:	⌘	2001-05-18
Category:	⌘	**F**
Release:	⌘	Rel-4

Use one of the following categories:
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Detailed explanations of the above categories can be found in 3GPP TR 21.900.

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Reason for change:	⌘	The specification states that “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…”. Starting from Release 4, this statement is incorrect as this might relate to a transport network layer of a different release. The dependency on the Release should be removed for Forward Compatibility reasons.
Summary of change:	⌘	The statement “R99” is deleted.
Consequences if not approved:	⌘	There is an inconsistency regarding the releases of the different specifications. This CR is backward compatible with the Release 99 version of the specification.

Clauses affected:	⌘	6
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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There are two chip-rate options in the TDD mode: 3.84Mcps TDD and 1.28Mcps TDD. Each TDD cell supports either of these options.

A Node B which supports TDD cells can support one chip-rate option only, or both options.

An RNC which supports TDD cells can support one chip-rate option only, or both options.

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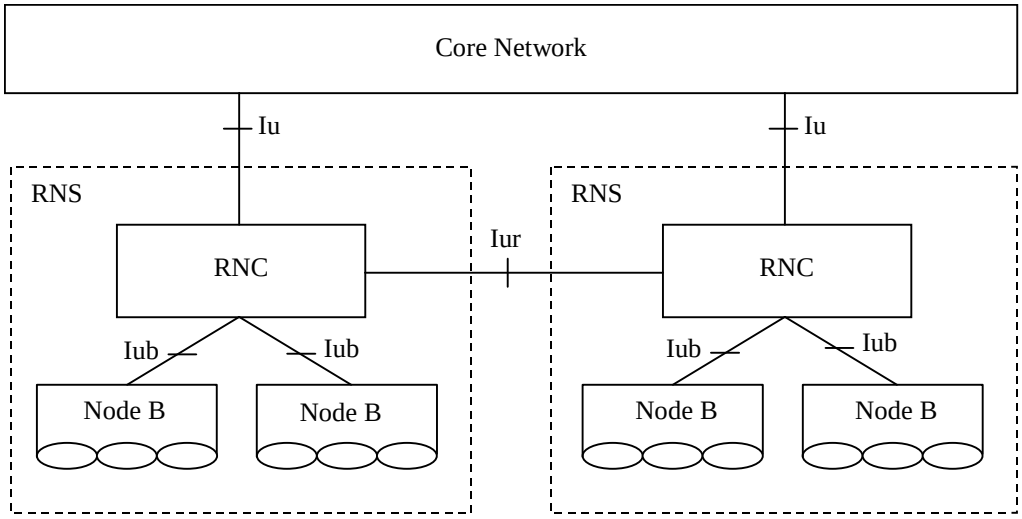

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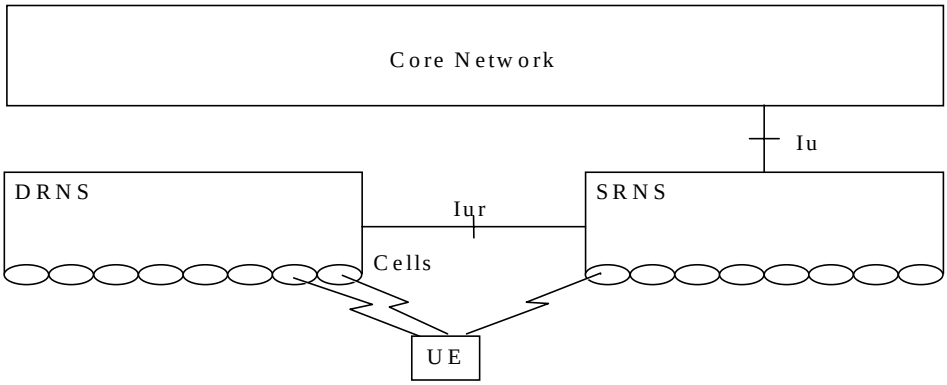

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The UTRAN is layered into a Radio Network Layer and a Transport Network Layer.

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.

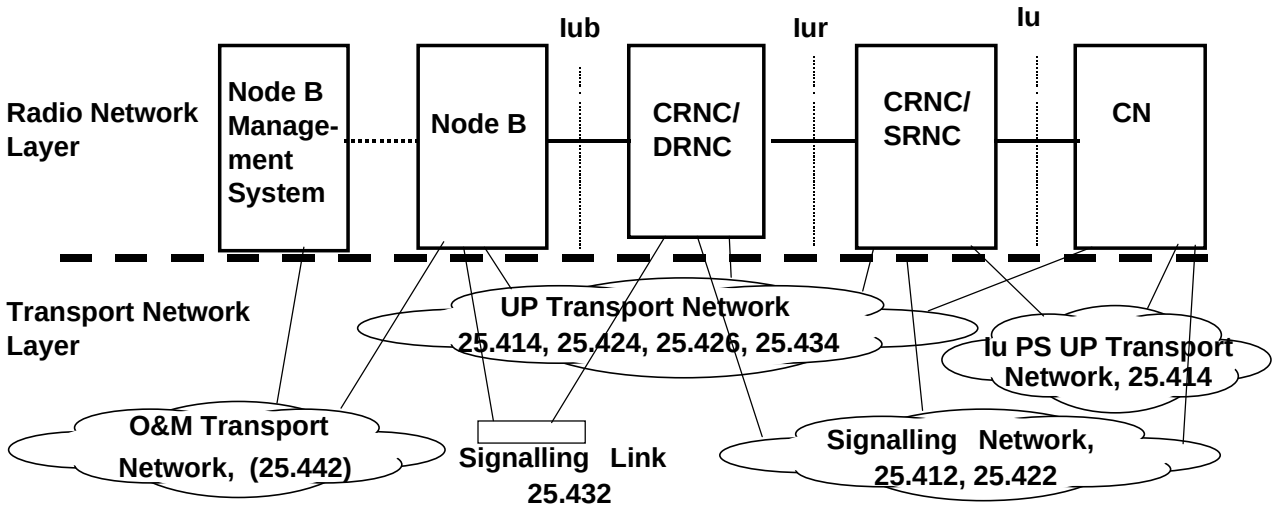

Figure 6: Protocol layering

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.