TSG-RAN Meeting #6
Nice, France, 13 – 15 December 1999

TSGRP#6(99)621

Title: **Agreed CRs of category "C" (Modification) and "F" (Correction) to TS 25.301**

Source: **TSG-RAN WG2**

Agenda item: **5.2.3**

Doc #	Status-	Spec	CR	Rev	Subject	Cat	Versio	Versio
R2-99g19	agreed	25.301	026	1	Support of shared channel operation	C	3.2.0	3.3.0
R2-99h95	agreed	25.301	028		Radio Interface Functions for Cell	C	3.2.0	3.3.0
R2-99k65	agreed	25.301	031	1	Definition of ciphering unit	C	3.2.0	3.3.0

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***Document* (R2-99g19)**
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25.301	CR	026r1	Current Version:	3.2.0

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

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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	X	UTRAN / Radio	X	Core Network	

Source: TSG-RAN WG2 **Date:** 04/11/99

Subject: Support of shared channel operation in TDD

Work item:

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

F	Correction		**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	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: An optional extension to the currently defined shared channel operation is introduced that allows to send capacity requests on the USCH and capacity allocation messages on the DSCH

Clauses affected: 5.3.1.1, 5.3.1.1.2, 5.3.5.6, 5.6.5.2.3, 5.6.6, 5.6.6.1, 5.6.6.2, 5.6.6.3

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	25.321 CR025
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:

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5.3.1.1 MAC Services to upper layers

- **Data transfer**. This service provides unacknowledged transfer of MAC SDUs between peer MAC entities. This service does not provide any data segmentation. Therefore, segmentation/reassembly function should be achieved by upper layer.
- **Reallocation of radio resources and MAC parameters**. This service performs on request of RRC execution of radio resource reallocation and change of MAC parameters, i.e. reconfiguration of MAC functions such as change of identity of UE, change of transport format (combination) sets, change of transport channel type. In TDD mode, in addition, resource allocation can be handled by the MAC autonomously.
- **Reporting of measurements**. Local measurements such as traffic volume, quality indication, MAC status indication, [other MAC measurements tbd.], are reported to RRC.

~~The following potential services are regarded as further study items:~~

- ~~**Allocation/deallocation of radio resources**. Indication to RRC that allocation/deallocation of a MAC bearer is required. In TDD mode, resource allocation can alternatively be performed by the MAC autonomously.~~

5.3.1.1.2 Mapping between logical channels and transport channels

The following connections between logical channels and transport channels exist:

- SCCH is connected to SCH
- BCCH is connected to BCH and may also be connected to FACH
- PCCH is connected to PCH
- CCCH is connected to RACH and FACH
- SHCCH is connected to RACH and USCH/ ~~and~~ FACH and DSCH
- DTCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, a CPCH (FDD only) or to USCH (TDD only)
- CTCH is connected to FACH. Whether it can be connected to DSCH or BCH is ffs.
- DCCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, a CPCH (FDD only) to FAUSCH, CPCH (FDD only), or to USCH (TDD only).

The mappings as seen from the UE and UTRAN sides are shown in Figure 1 and Figure 2 respectively. Figure 6 illustrates the mapping from the UE in relay operation. Note that ODMA logical channels and transport channels are employed only in relaylink transmissions (i.e. not used for uplink or downlink transmissions on the UE-UTRAN radio interface).

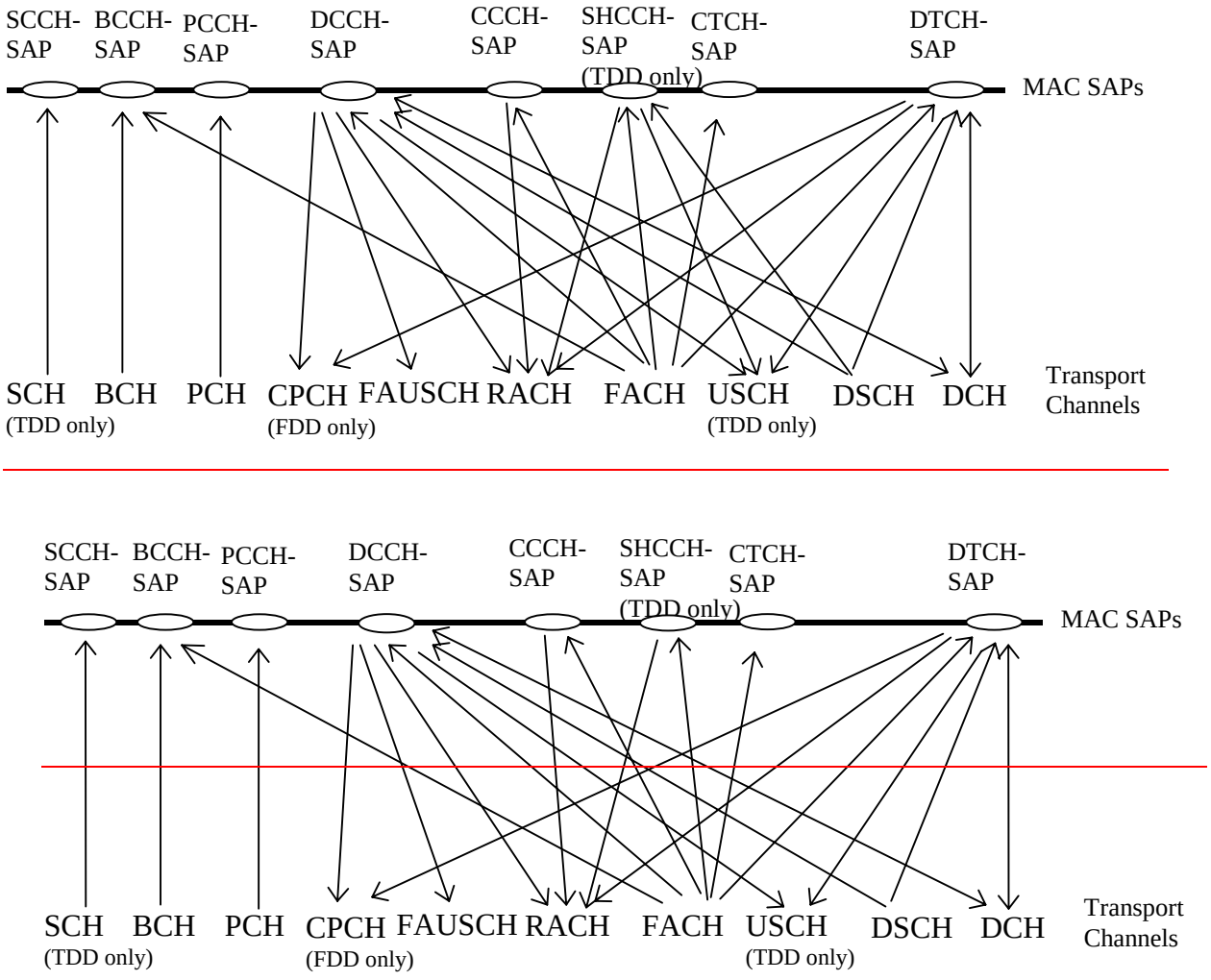

Figure 1: Logical channels mapped onto transport channels, seen from the UE side

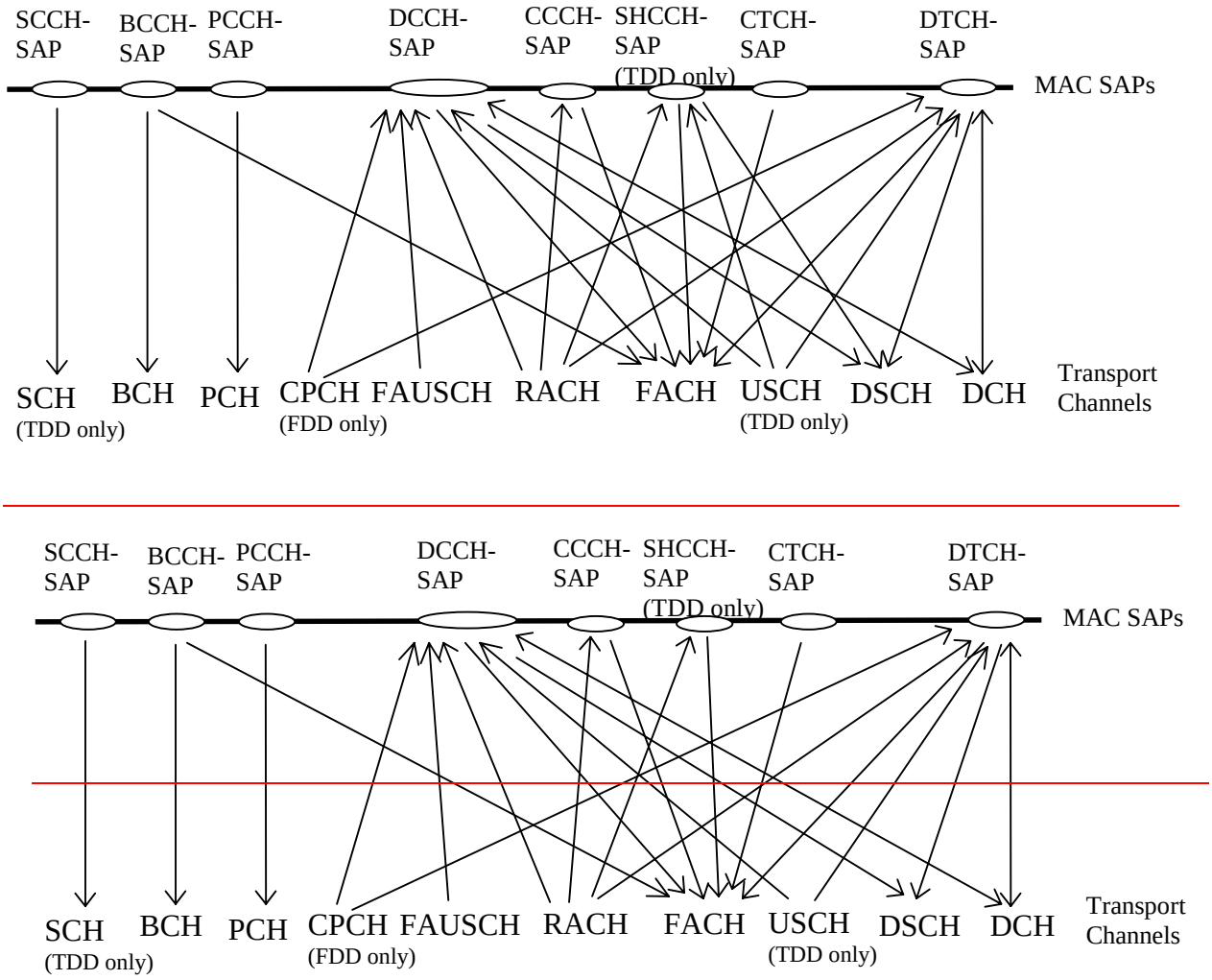

Figure 2: Logical channels mapped onto transport channels, seen from the UTRAN side

5.3.5.6 Data flow for SHCCH mapped to USCH

For SHCCH, transparent or unacknowledged transmission mode on RLC is employed. A MAC header may be used for logical channel identification (SHCCH, DCCH, DTCH). When no MAC header is used, SHCCH must be the only channel mapped to USCH/DSCH. If the transparent RLC transfer mode is applied, depending on whether the MAC header is needed or not, either the data flow Figure 7 or Figure 8 is applicable. If the unacknowledged RLC transfer mode is applied, depending on whether the MAC header is needed or not, either the data flow Figure 9 or Figure 10 is applicable.

5.6.5.2.3 Case C (UE requires a downlink SHCCH) (TDD only)

The information which physical downlink shared channels to listen to and when is sent by RRC on the SHCCH logical channel which is mapped on RACH and USCH/FACH and DSCH. The transmitted Layer 3 messages contain information about the used PDSCHs and the timing of the allocation.

5.6.6 Protocol termination for transport channel of type USCH

5.6.6.1 USCH definition

The USCH is only supported for TDD. It is a resource that exists in uplink only. It has only impact on the physical and transport channel levels, so there is no definition of shared channel in the logical channels provided by MAC.

The USCH is a transport channel shared dynamically between several UEs. The USCH is mapped to one or several physical channels such that a specified part of the uplink resources is employed.

The USCH is defined as a shared uplink channel for which resource allocation is performed by RRC in Controlling RNC. The allocation requests and allocation messages, including UE identification, are transmitted on SHCCH, which is mapped on RACH and USCH/FACH and DSCH. Several USCHs can be multiplexed on a CCTrCH in the physical layer, the transport formats of the USCHs have to be selected from the transport format combination set of this CCTrCH. Each CCTrCH is mapped on one or more PUSCHs. If the transport format combination subset of a CCTrCH contains more than one transport format combination, a TFCI can be transmitted inside the PUSCH, or blind detection can be applied in the NodeB.

Interleaving for the USCH may be applied over a multiplicity of radio frames.

In every radio frame, one or several PUSCHs can be used in the uplink. Therefore, the USCH supports physical channel multiplexing. MAC multiplexing of different UEs shall not be applied within a radio frame, i.e. within one radio frame a PUSCH is assigned to a single UE. However, MAC multiplexing is allowed on a frame by frame basis, i.e. one PUSCH may be allocated to different UEs at each frame.

The transport format combination set on the USCH can change with each transmission time interval.

5.6.6.2 Resource allocation and UE identification on USCH

The information which physical uplink shared channels to transmit on and when is sent by RRC on the SHCCH logical channel which is mapped on RACH and USCH/FACH and DSCH. The transmitted Layer 3 messages contain information about the assigned PUSCHs and the timing of the allocation.

5.6.6.3 Model of USCH in UTRAN

Figure 19 captures the working assumption on the Uplink Shared Channel (USCH). The two RLCs point to logical channel (DTCH) specific RLC-entities of specific users while MAC refers to the provision of MAC sublayer functions for all users.

The MAC sublayer of a USCH is split between the Controlling RNC and SRNC. For a given user, the RLC sublayer is terminated in its SRNC. Since Iur can support USCH data streams, the users on that USCH can depend on different SRNCs. For a given user, the Controlling RNC and the Serving RNC can be separate RNCs. The MAC in the network takes care of mapping uplink data either from a common channel (RACH, not shown in this figure), DCH or the USCH.

Allocations of uplink capacity are requested by the UEs and signaled to the UEs on the SHCCH (Shared channel control channel) which is mapped on RACH and USCH/FACH and DSCH.

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25.301	CR	028	Current Version:	3.2.0

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

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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	X	UTRAN / Radio	X	Core Network	

Source: TSG-RAN WG2 **Date:** 1999-11-25

Subject: Radio Interface Functions for Cell Broadcast Service

Work item:

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

F	Correction		**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	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: Details of the Broadcast/Multicast Control (BMC) protocol (TS 25.324) have been agreed now in WG2. Some previously open issues on Cell Broadcast Service related functions of the various radio interface layers have been clarified and has led to refinements as described in this CR.

Clauses affected: 5.3.1.1.2, 5.3.4, 5.3.5.18, 5.4.2

Other specs affected:

Other 3G core specifications	X	→ List of CRs:	TS 25.321 CR028, TS 25.322 CR 006, TS 25.331 CR042
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:


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5.3.1.1.2 Mapping between logical channels and transport channels

The following connections between logical channels and transport channels exist:

- SCCH is connected to SCH
- BCCH is connected to BCH and may also be connected to FACH
- PCCH is connected to PCH
- CCCH is connected to RACH and FACH
- SHCCH is connected to RACH and FACH
- DTCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, a CPCH (FDD only) or to USCH (TDD only)
- CTCH is connected to FACH~~. Whether it can be connected to DSCH or BCH is ffs.~~
- DCCH can be connected to either RACH and FACH, to RACH and DSCH, to DCH and DSCH, to a DCH, a CPCH (FDD only) to FAUSCH, CPCH (FDD only), or to USCH (TDD only).

5.3.4 Broadcast/Multicast Control – Services and functions

5.3.4.1 BMC Services

The BM-SAP provides an broadcast/multicast transmission service in the user plane on the radio interface for common user data in transparent or unacknowledged mode.

5.3.4.2 BMC Functions

- **Storage of ~~SMS~~ Cell Broadcast Messages**
  The BMC stores the ~~SMS~~ Cell Broadcast messages received over the CBC-RNC interface for scheduled transmission.
- **Traffic volume monitoring and radio resource request for CBS**
  At the UTRAN side, the BMC calculates the required transmission rate for Cell Broadcast Service based on the messages received over the CBC-RNC interface, and requests for appropriate CTCH/FACH resources from RRC.
- **Scheduling of BMC messages**
  The BMC receives scheduling information together with each Cell Broadcast message over the CBC-RNC-interface. Based on this scheduling information , at the UTRAN side, BMC generates schedule messages and schedules BMC message sequences accordingly. At the UE side, BMC evaluates the schedule messages and indicates scheduling parameters to RRC, which are used by RRC to configure the lower layers for CBS discontinuous reception.
- **Transmission of ~~SMS CB~~BMC messages to UE**
  This functions transmits the ~~SMS CB~~BMC messages (Scheduling and Cell Broadcast messages) ~~controlled by~~according to schedule ~~information~~.
- **Delivery of ~~SMS~~ Cell Broadcast messages to upper layer (NAS)**
  This functions delivers the received ~~SMS~~ Cell Broadcast messages to ~~the~~ upper layer (NAS) in the UE~~. Depending on the chosen RLC service~~ Only non-corrupted ~~SMS~~ Cell Broadcast messages are delivered. ~~(transparent mode) or not (unacknowledged mode).~~

5.3.5.18 Data flow for CTCH mapped to FACH

For CTCH, ~~transparent or~~ unacknowledged transmission mode on RLC is employed. A MAC header ~~may be~~is used for logical channel identification (CCCH, CTCH, DCCH, DTCH). When no MAC header is used, CTCH must be the only channel mapped to FACH. ~~If the transparent RLC transfer mode is applied, depending on whether the MAC header is needed or not, either the data flow Figure 7 or Figure 8 is applicable. If the unacknowledged RLC transfer mode is~~

~~applied, depending on whether the MAC header is needed or not, either~~ T~~t~~he data flow shown in ~~Figure 9 or~~ Figure 10 is applicable.

5.4.2 RRC functions

The Radio Resource Control (RRC) layer handles the control plane signalling of Layer 3 between the UEs and UTRAN. The RRC performs the following functions:

- **Broadcast of information provided by the non-access stratum (Core Network).** The RRC layer performs system information broadcasting from the network to all UEs. The system information is normally repeated on a regular basis. The RRC layer performs the scheduling, segmentation and repetition. This function supports broadcast of higher layer (above RRC) information. This information may be cell specific or not. As an example RRC may broadcast Core Network location service area information related to some specific cells.
- **Broadcast of information related to the access stratum.** The RRC layer performs system information broadcasting from the network to all Ues. The system information is normally repeated on a regular basis. The RRC layer performs the scheduling, segmentation and repetition. This function supports broadcast of typically cell-specific information.
- **Broadcast of ODMA relay node neighbour information.** The RRC layer performs probe information broadcasting to allow ODMA routeing information to be collected.
- **Establishment, re-establishment, maintenance and release of an RRC connection between the UE and UTRAN.** The establishment of an RRC connection is initiated by a request from higher layers at the UE side to establish the first Signalling Connection for the UE. The establishment of an RRC connection includes an optional cell re-selection, an admission control, and a layer 2 signalling link establishment. The release of an RRC connection can be initiated by a request from higher layers to release the last Signalling Connection for the UE or by the RRC layer itself in case of RRC connection failure. In case of connection loss, the UE requests re-establishment of the RRC connection. In case of RRC connection failure, RRC releases resources associated with the RRC connection.
- **Collating ODMA neighbour list and gradient information.** The ODMA relay node neighbour lists and their respective gradient information will be maintaining by the RRC.
- **Maintenance of number of ODMA relay node neighbours.** The RRC will adjust the broadcast powers used for probing messages to maintain the desired number of neighbours.
- **Establishment, maintenance and release of a route between ODMA relay nodes.** The establishment of an ODMA route and RRC connection based upon the routeing algorithm.
- **Interworking between the Gateway ODMA relay node and the UTRAN.** The RRC layer will control the interworking with the standard TDD or FDD communication link between the Gateway ODMA relay node and the UTRAN.
- **Establishment, reconfiguration and release of Radio Access Bearers.** The RRC layer can, on request from higher layers, perform the establishment, reconfiguration and release of radio access bearers in the user plane. A number of radio access bearers can be established to an UE at the same time. At establishment and reconfiguration, the RRC layer performs admission control and selects parameters describing the radio access bearer processing in layer 2 and layer 1, based on information from higher layers.
- **Assignment, reconfiguration and release of radio resources for the RRC connection.** The RRC layer handles the assignment of radio resources (e.g. codes, CPCH channels) needed for the RRC connection including needs from both the control and user plane. The RRC layer may reconfigure radio resources during an established RRC connection. This function includes coordination of the radio resource allocation between multiple radio bearers related to the same RRC connection. RRC controls the radio resources in the uplink and downlink such that UE and UTRAN can communicate using unbalanced radio resources (asymmetric uplink and downlink). RRC signals to the UE to indicate resource allocations for purposes of handover to GSM or other radio systems.
- **RRC connection mobility functions.** The RRC layer performs evaluation, decision and execution related to RRC connection mobility during an established RRC connection, such as handover, preparation of handover to GSM or other systems, cell re-selection and cell/paging area update procedures, based on e.g. measurements done by the UE**.**
- **Paging/notification.** The RRC layer can broadcast paging information from the network to selected UEs. Paging and notification can be requested by higher layers on the network side. The RRC layer can also initiate paging during an established RRC connection.

- **Routing of higher layer PDUs.** This function performs at the UE side routing of higher layer PDUs to the correct higher layer entity, at the UTRAN side to the correct RANAP entity.
- **Control of requested QoS**. This function shall ensure that the QoS requested for the radio access bearers can be met. This includes the allocation of a sufficient number of radio resources. The exact requirements on RRC to support this function are ffs.
- **UE measurement reporting and control of the reporting.** The measurements performed by the UE are controlled by the RRC layer, in terms of what to measure, when to measure and how to report, including both UMTS air interface and other systems. The RRC layer also performs the reporting of the measurements from the UE to the network.
- **Outer loop power control.** The RRC layer controls setting of the target of the closed loop power control.
- **Control of ciphering.** The RRC layer provides procedures for setting of ciphering (on/off) between the UE and UTRAN.
- **Slow DCA**. Allocation of preferred radio resources based on long-term decision criteria. It is applicable only in TDD mode.
- **Contention resolution**. The RRC handles reallocations and releases of radio resources in case of collisions indicated by lower layers in TDD mode. Applicability of contention resolution in FDD mode is ffs.
- **Arbitration of radio resources on uplink DCH**. This function controls the allocation of radio resources on uplink DCH on a fast basis, using a broadcast channel to send control information to all involved users. *[Note: This function is implemented in the CRNC. Details are ffs.]*
- **Initial cell selection and re-selection in idle mode.** Selection of the most suitable cell based on idle mode measurements and cell selection criteria.
- **Integrity protection.** This functions adds a Message Authentication Code (MAC-I) to those RRC messages that are considered sensitive and/or contain sensitive information. The mechanism how the MAC-I is calculated is described in [TS 33.105].

~~• **Scheduling of SMS CB messages**~~
~~The RRC receives scheduling information per SMS CB message and SMS CB DRX information per cell from the CBC-RNC interface. Based on this information the RRC schedules SMS CB message sequences.~~

~~Note: Whether this function is in the RRC or in the BMC is ffs.~~

- **Initial Configuration ~~of SMS CB channels~~for CBS**
This function performs the initial configuration of the BMC sublayer.~~uses the output of function "Scheduling of SMS CB messages" to determine the selection and configuration of SMS CB channels.~~
- **Allocation of radio resources for CBS**
This function allocates radio resources for CBS based on traffic volume requirements indicated by BMC. The radio resource allocation set by RRC (i.e. the schedule for mapping of CTCH onto FACH/S-CCPCH) is indicated to BMC to enable generation of schedule messages. The resource allocation for CBS shall be broadcast as system information.
- **Configuration ~~of for SMS CB~~CBS discontinuous reception**
This function configures the ~~PHY sublayer~~lower layers (L1, L2) of the UE when it ~~should~~ shall listen to ~~the configured « SMS CB channels ». It is~~ the resources allocated for CBS based on ~~currently received~~ scheduling information ~~from the peer RRC of RNC and the SMS CB history stored~~received from BMC.
- **Timing advance control.** The RRC controls the operation of timing advance. It is applicable only in TDD mode.

The following functions are regarded as further study items:

- **Arbitration of the radio resource allocation between the cells**. This function shall ensure optimal performance of the overall UTRAN capacity.

  [Note: Some clarification should be provided what exact requirements this function implies on the RRC protocol, beyond general radio resource optimization.]

- **Congestion control.** Further study item**.**

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25.301	CR	031r1	Current Version:	3.2.0

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

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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	X	UTRAN / Radio	X	Core Network	

Source: TSG-RAN WG2 **Date:** 1999-11-26

Subject: Definition of ciphering unit

Work item:

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

F	Correction		**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	X		Release 98	
D	Editorial modification			Release 99	X
				Release 00	

Reason for change: The current definition of ciphering unit in 25.301 is unclear. This CR proposes a clarification to the definition. It is proposed that the ciphering unit is based on the RLC PDU for AM and UM RLC services.

Clauses affected: 8.2.1

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:

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8 Ciphering

The ciphering architecture is specified in TS33.102.

8.1 Location of ciphering function in the UTRAN protocol architecture

The ciphering function is performed either in the RLC sub-layer or in the MAC sub-layer, according to the following rules~~-~~:

- If a logical channel is expected to be supported on common transport channel and has to be ciphered, it can not use the transparent mode of RLC (it should use the UM RLC mode instead).
- If a logical channel is using a non-transparent RLC mode (AM or UM), ciphering is performed in the RLC sub-layer.
- If a logical channel is using the transparent RLC mode, ciphering is performed in the MAC sub-layer (MAC-d entity).

According to this model, ciphering when applied is ~~always~~ performed in the SRNC and the UE, and the context needed for ciphering (CK, HFN, etc.) is only known in SRNC and the UE.

8.2 Input parameters to the ciphering algorithm

8.2.1 Overview

When ciphering is performed in the RLC sub-layer, it performs the encryption/decryption of ~~the data part of~~ the ciphering unit of an RLC PDU, based on XOR combining with a mask obtained as an output of the ciphering algorithm. For UM RLC, the ciphering unit is defined as the UMD PDU minus the first octet. The first octet comprises the sequence number used as LSB of the COUNT parameter. For AM RLC, the ciphering unit is defined as the AMD PDU minus the two first octets. These two octets comprises the sequence number used as LSB of the COUNT parameter.

When ciphering is performed in the MAC sub-layer, it performs the encryption/decryption of a MAC SDU (RLC PDU), based on XOR operation with a mask obtained as an output of the ciphering algorithm.

Requirements and interfaces to the generic algorithm are specified in TS33.105 and described in the following figure.

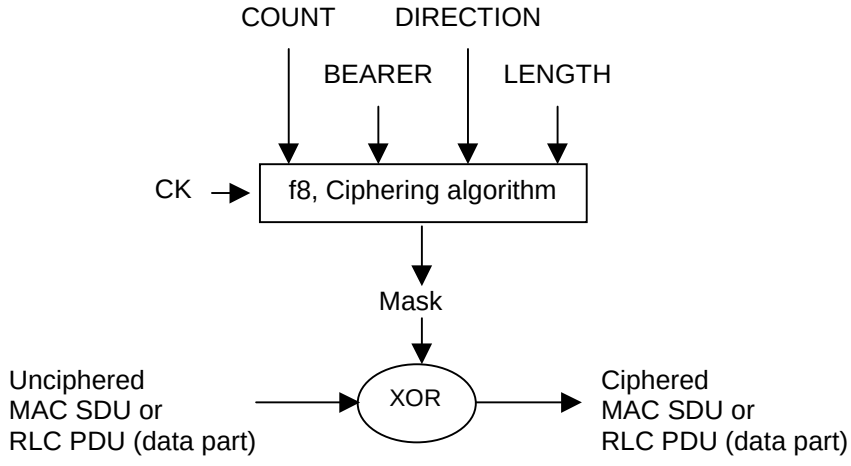

Figure 1 : Ciphering algorithm and parameters