TSG-RAN Working Group 2 (Radio layer 2 and Radio layer 3) ***TSGR2#6(99)719***

Sophia Antipolis 16th to 20th August 1999

Agenda Item: **4.2**

Source: **Editor**

Title: **TR 25.925 Radio Interface on Broadcast/Multicast Services V0.2.0**

Document for: **Approval**

The rearranging of the subchapters "Impact on UTRAN Functions" and "Radio Interface Requirement" and Chapter 6 "SMS CB Serive" was approved by email and is incorporated into the new revision V0.2.0

TR 25.925 V0.~~1~~2.0 (1999-06)

Technical Report

3rd Generation Partnership Project (3GPP); Technical Specification Group (TSG) RAN; Working Group 2 (WG2);

Radio Interface for Broadcast/Multicast Services

Reference
<Workitem> (<Shortfilename>.PDF)

Keywords
Digital cellular telecommunications system,
Universal Mobile Telecommunication System
(UMTS), UTRA, IMT-2000

3GPP

Postal address

Office address

Internet
secretariat@3gpp.org
Individual copies of this deliverable
can be downloaded from
http://www.3gpp.org

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present deliverable may have been declared to 3GPP and/or its organizational partners. The information pertaining to these essential IPRs, if any, is publicly available for **3GPP members and non-members, free of charge**. This can be found in the latest version of the 3GPP Technical Report:

[reference tbd.]

Pursuant to the 3GPP Interim IPR Policy, no investigation, including IPR searches, has been carried out by 3GPP. No guarantee can be given as to the existence of other IPRs not referenced in the [tbd.], which are, or may be, or may become, essential to the present document.

Foreword

This Technical Report has been produced by the 3GPP.

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

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 Indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the specification.

1 Scope

The present document shall provide a general overview on radio interface related aspects of broadcast/multicast services. Also in the scope of this report is the functional split between UTRAN nodes and the analysis of the potential impact on UTRAN related interfaces regarding broadcast/multicast services. This report covers stage 2 and stage 3 aspects.

This report is organized as follows: Chapter 4 gives an overview on the broadcast/multicast services and their requirements. Chapter 5 provides a common model and describes aspects common to all point-to-multipoint services. Chapters 6 - 10 are devoted to the different broadcast/multicast service categories. Each service specific chapter describes the requirements on the interfaces. In these subchapters the impacts on the interface functions and the protocol aspects are described. This TR covers only those items which are in the scope of 3GPP TSG RAN. Information from Technical Specifications or other documents are provided when it is necessary to understand the requirements described.

Table 1: Schedule of the broadcast/multicast services onto the UMTS phases and annual releases

Phase	**(Annual) Release**	**Broadcast/multicast serviee**
1	1999	SMS Cell Broadcast Service (GSM)
	2000	
	2001	

Note: A decision to map the services to phases/releases is required for all other broadcast/multicast services.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to a TS shall also be taken to refer to later versions published as an EN with the same number.

[1] 3GPP TS 22.100 “ UMTS Phase 1”

[2] 3GPP TS 22.101 “ UMTS Serive Principle”

[3] 3GPP TS 22.105 “Services and Service Capabilities”

[4] 3GPP TS 25.301 "Radio Interface Protocol Architecture"

[5] 3GPP TS 25.302 "Services provided by the Physical Layer"

[6] 3GPP TS 25.303 "UE Funtions and Interlayer Procedures in Conneted Mode"

[7] 3GPP TS 25.304 "UE Procedures in Idle Mode"

[8] 3GPP TS 25.321 "MAC Protolcol Specification

[9] 3GPP TS 25.322 "RLC Protolcol Specification

[8] 3GPP TS 25.331 "RRC Protolcol Specification

[9] GSM 02.03: "Digital cellular telecommunications system (Phase 2+); Principles of telecommunication services supported by a GSM Public Land Mobile Network (PLMN)".

[10] GSM 02.60: "GPRS Service description"

[11] GSM 03.41: "Digital cellular telecommunications system (Phase 2+); Man-Machine Interface (MMI) of the Mobile Station (MS)"

[12] GSM 03.61: "Digital cellular telecommunications system (Phase 2+); Support of Mobile Number Portability (MNP); Service description; Stage 1"

3 Definitions and Abbreviations

3.1 Definitions

~~1.2~~3.2 Abbreviations

CB	Cell Broadcast
IP	Internet Protocol
IP-M	IP Multicast
MDS	Multimedia Distribution Service
PTM	Point-to-Multipoint
PTM-G	PTM Group Call
PTM-M	PTM Multicast
SMS	Short Message Service
SMS-CB	SMS Cell Broadcast
UE	User Equipment
UMTS	Universal Mobile Telecommunication System
UTRAN	UMTS Terrestrial Radio Access Network

4 Overview of Point-to-multipoint Services and Requirements

It is agreed to have service continuity for GSM/GPRS point-to-multipoint services in UMTS ([1] and [2]). This means that the user gets the same service behaviour as he knows it form GSM or GPRS. The services are SMS Cell Broadcast [101] and Point-to-multipoint Multicast, Point-to-multipoint Group Call and IP Multicast [102].

Combined with the UMTS service classification given in [2] the service classification shown in Figure 1 could be used as a starting point. The figure contains the view in terms of Radio Access Bearer services and should not be applied for higher layers where other categories of services may exist. Future work may result in changes of Figure 1.

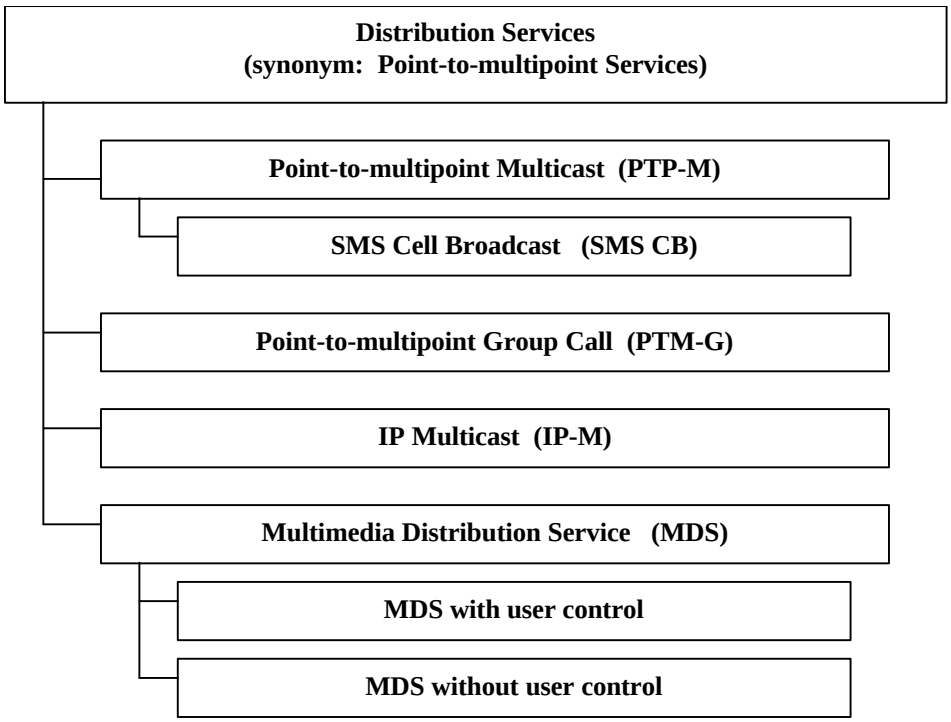

Figure 1: Structure of point-to-multipoint services

Tables 1 and 2 below summarize the service attributes defining the broadcast/multicast services. Table 3 allocates attributes of the Uu radio interface to the services. Table entries which are left empty, require further study.

Table 1: Bearer Service attributes ([3])

Attributes		Values
Information transfer attributes	1. Connection mode attribute	Connection oriented: CO (Circuit Switched base)
		Connectionless: CL (Packet Switched)
	2. Transfer type attribute	Constant bit rate
		Variable bit rate
		Available bit rate
		Unspecified bit rate
	3. Symmetry attribute	Unidirectional
		Bi-directional symmetric
		Bi-directional asymmetric
	4. Communication configuration attribute	Point-to-point
		Point-to-multipoint
	5. Information transfer rate attributes	(Continuous rage of values is possible)
		High bit rate
		Medium bit rate
		Low bit rate
Information quality attributes	1. Maximum transfer delay attribute	(Continuous rage of values is possible)
		Delay sensitive
		Delay insensitive
	2. Delay variation attribute	(Continuous rage of values is possible)
		Constant
		Variable
	3. Bit error ratio attribute	(Continuous rage of values is possible)
		Loss sensitive
		Loss insensitive
	4. Error characteristics attribute	Uniform
		Bursty

Table 2: Overview of Broadcast/Multicast Services (Part 1)

Attributes	SMS-CB	PTM Multicast (medium rate)	PTM Multicast (high rate)	PTM Group call	IP-multicast (Medium rate)	IP-multicast (Low rate)
Information transfer attributes						
1. Connection mode attribute	CL	CL	CL	CO	CL	CL
2. Transfer type attribute	Constant	Variable	Variable	Variable	Available	Available
3. Symmetry attribute	UNI	UNI	UNI	UNI BI ASYM MULTI	MULTI (UNI)	MULTI (UNI)
4. Communication configuration attribute	PTM	PTM	PTM	PTM	PTM	PTM
5. Information transfer rate attributes	Low	Medium	High	Low	Medium	Low
Information quality attributes						
1. Maximum transfer delay attribute	Delay insensitive	Delay insensitive	Delay sensitive	Delay sensitive	Delay insensitive	Delay insensitive
2. Delay variation attribute						
3. Bit error ratio attribute	Loss insensitive	Loss insensitive	Loss insensitive	Loss insensitive	Loss sensitive	Loss sensitive
4. Error characteristics attribute						
Defined in	GSM	GPRS	GPRS	GPRS	GPRS	GPRS

(Editor's note: Value MULTI is not defined in [3] yet. It is specified in [10])

Table 2: Overview of Broadcast/Multicast Services (Part 2)

Attributes	MDS without user control (high rate)	MDS without user control (medium rate)	MDS with user control (high rate)	MDS with user control (medium rate)	Messaging service (high rate)	Messaging service (medium rate)
Information transfer attributes						
1. Connection mode attribute						
2. Transfer type attribute						

3. Symmetry attribute						
4. Communication configuration attribute	PTM	PTM	PTM	PTM	PTM	PTM
5. Information transfer rate attributes	High	Medium	High	Medium	High	Medium
Information quality attributes						
1. Maximum transfer delay attribute						
2. Delay variation attribute						
3. Bit error ratio attribute						
4. Error characteristics attribute						
Defined in	UMTS	UMTS	UMTS	UMTS	UMTS	UMTS

Table 3: Radio Interface related attributes of broadcast/multicast services (part 1) [10]

Attributes	SMS-CB	PTM Multicast (medium rate)	PTM Multicast (high rate)	PTM Group call	IP-multicast (Medium rate)	IP-multicast (Low rate)
UE modes (ffs.)	(ffs.)					
Logical Channels	CTCH	CTCH	CTCH	CTCH	CTCH	CTCH
Necessity of separate control channel	No					
Transport Channels	FACH					
Physical Channels	Secondary CCPCH					
DRX Mode	Yes	Yes	Yes	No	Yes	Yes
Primary addressing	GEO area	Subsciber group	Subscriber group	Subscriber group	Subscriber group	Subscriber group
Secondary addressing	---	GEO area	GEO area	GEO area	---	---
Present subscribers known	No	No	No	Yes	Yes	Yes
Ciphering	No	No	No	Yes	Yes	Yes
Reliable delivery	No	No	No	Optional	Yes	Yes

Table 3: Radio Interface related attributes of broadcast/multicast services (part 2)

Attributes	MDS without user control (high rate)	MDS without user control (medium rate)	MDS with user control (high rate)	MDS with user control (medium rate)	Messaging service (high rate)	Messaging service (medium rate)
UE modes (ffs.)						
Logical Channels						
Necessity of separate control channel						
Transport Channels						
Physical Channels						
DRX Mode						
Primary addressing						

Secondary addressing						
Present subscribers known						
Ciphering						
Reliable delivery						

5 Common Model

The common Traffic Channel (CTCH) [4] is provided by the MAC sublayer for support of broadcast/multicast services. It is presently assumed that the CTCH can be used for all categories of broadcast/multicast services.

The present assumption (ffs.) for SMS-CB service is that the CTCH is mapped to a FACH transport channel. The FACH is also a candidate to be used for other multicast services. This possibility will be further investigated in this report.

6 SMS Cell Broadcast Service (GSM)

This chapter contains the requirements derived from GSM specifications of SMS Cell Broadcast Teleservice and the analysis regarding the radio interface Uu.

The main requirements for Release 99 are:

- service continuity (i.e. no degrade of the GSM SMS CB service as seen by users)
- the restrictions which are given in GSM does not remain any longer:
- the specification should be a basis for future broadcast/multicast service developments
- minimizing the power consumption by use of intelligent scheduling schemes for SMS CB messages (GSM SMS CB message discontinious reception CB-DRX should become mandatory).

The approach regarding 3G SMS CB service is top-down. It starts with protocol architecture followed by services and functions and closes with protocols.

In chapter 6.1 the impact on UTRAN functions are described. This chapter provides all necessary information on a network level which is necessary to derive the requirements for each interface involved and its service, functions and procedures. In general two network architectures are possible:

Case 1 which takes the existing GSM network architectur where a seperate node exists, called Cell Broadcast Center CBC and
Case 2 which integrates the SMS CB managing functions into the 3G Core Network.

Chapter 6.2 discusses the requirements on the radio interface. The main requirement is to find a radio interface architecture which is independent from the choosen network architecture Case1 or Case 2. Three possibilities are given:

R1 which introduce a new Layer 3 sublayer Broadcast/Multicast Control BMC above or beside RRC,
R2 which integrate the message sequencing of SMS CB messages into RRC and
R3 which splits this main function between RRC and MAC.

Pros and cons of these possible protocol architectures are discussed.

Further special radio requirements are listed in subchapters related to each radio link interface layer.

Chapter 6.3 is introduced to collect the requirements on the Iu (Case 2) or the interface to the external node CBC (Case 1).

Functions which are under scope of RAN are:

- Scheduling of SMS CB messages per cell
- Usage of transparent or unacknowledged (L2) services

Functions which are not under scope of RAN are:

- Mapping of geographical area onto cells

~~Functions which are not under scope of RAN are:~~

~~- Mapping of geographical area onto cells~~

~~Functions which are under scope of RAN are:~~

~~- Scheduling of SMS CB messages per cell~~

~~- Usage of transparent or unacknowledged (L2) services~~

~~1.1~~6.1 ~~Radio Interface Requirements~~Impact on Utran functions

First, a general remark on the network archtecture is given. Next, functions are described for the nodes (network elements) involved in SMS CB service management and transmission. Last, protocol architectures are discussed.

6.1.1 Network Architecture (Case 1 and Case 2)

SMS CB messages are user data and thus SMS CB messages should be part of the user plane in the protocol model.

Two cases will be discussed:

Case 1: The existing GSM network architecture remains. This means that the Cell Broadcast Center CBC (= node where SMS CB messages are managed) is not part of the 3G core network and there exists an external interface Ibm' connecting RNC and CBC. This interface is described in GSM 03.41 but is not required to be mandatory. Different implementations exists on the market.

Note 1: SA2 is requiring that interface Ibm' becomes mandatory within 3GPP (see S2-99440)

Note 2: Whether the specification of the interface between RNC and CBC is out of scope of 3GPP is ffs in SA WG2.

Note 3: SA2 discusses Case 1 to use in Phase 1 Release 1999. (S2-99440)

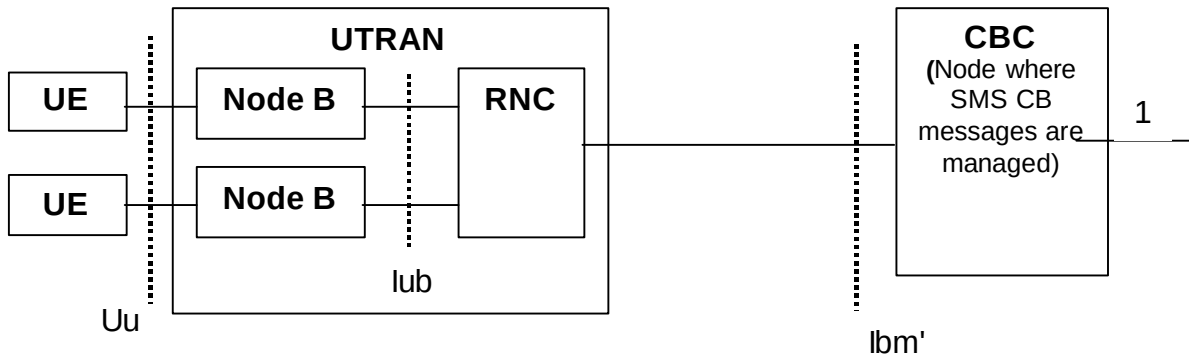

Figure 6.1: Architecture for SMS Cell Broadcast in UMTS for Case 1

Case 2: The SMS CB managing node is intergrated into the 3G core network CN. Thus the SMS CB messages are delivered over the Iu interface to the RNC and there exists another interface Ibm between the AN/CN and the SMS CB managing node CBC.

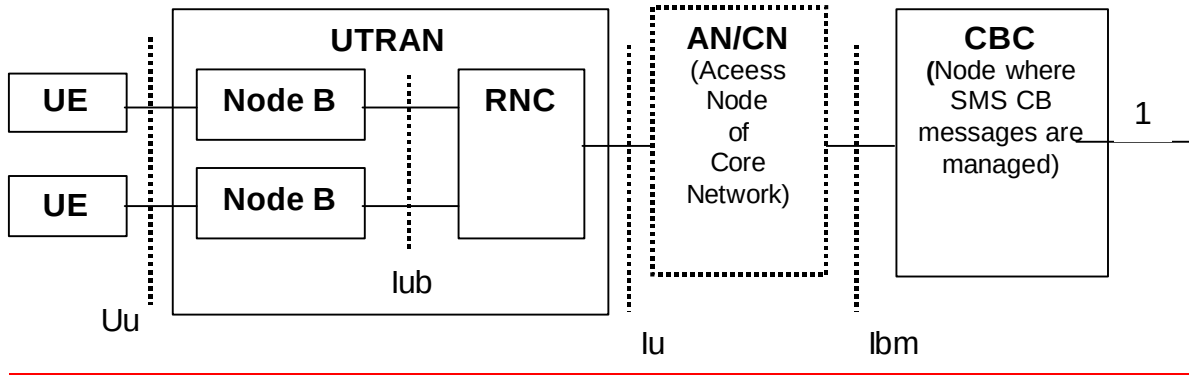

Figure 6.2: Architecture for SMS Cell Broadcast in UMTS for Case 2

Note: Case 2 is similiar to the network architecture proposed for GPRS PTM Multicast.

6.1.2 Functions and Operations

6.1.2.1 Management of SMS CB Messages

SMS CB messages are managed in an external node (**Case 1**, node is called Cell Broadcast Center CBC) or in a node of the 3GPP Core Network (**Case 2**). It comprises following functions.

SMS CB Management Function.
It assigns to each SMS CB message an SMS CB Message Identifier, a Serial Number, the used Data Coding Scheme, a Cell List evaluated from a geographical area, the Category, the Repetition Period and the Number Of Broadcast Requested. These parameters are:

SMS CB ID	SMS CB message identifier: Type of SMS CB message
Serial Number	Serial number: Each type of SMS CB message can vary. These variations are expressed by the serial number. The Serial Number consists of three information elements: **Geographical scope** (values: immediate cell wide, PLMN wide, LA wide, cell wide), **Message Code**, **Update Number**.
Data Coding Scheme	Data coding scheme used
Cell List	List of cells in which the SMS CB message should be broadcasted. A cell list may contain only one cell. On interface Ibm' (Case 1) or Iu (Case 2) it contains only cells controlled by one RNC.
Category	Category of the SMS CB message: HIGH:SMS CB message should be broadcast at the earlist opportunity NORMAL: SMS CB message should be broadcast within the associated RepitionPeriod BACKGROUND: SMS CB message with lowest transmission priority
Repition Period	Period of time after which broadcast of the SMS CB message should be repeated

Number Of Broadcast Requested Number of times the SMS CB message is to be broadcast
0: infinitely
1..n: finit number of repitions

SMS CB DRX Management Function.
Further cell related information regarding SMS CB discontinious reception (CB-DRX) is managed. This function is optional. The parameters used are:

DRX Schedule Period Indication of DRX schedule period length per cell. The values are:
NODRX: DRX not required
Length Of Schedule Period (unit: amount of CB slots where one and only one SMS CB message could be; the slots do not refer to PHY layer of the radio interface)

Reserved CB capacity Reserved capacity per cell for SMS CB Messages with Category=HIGH (unit: number of slots).

The number of slots remaining for SMS CB messages with Category=NORMAL or =BACKGROUND is equal to (DRX Schedule Period – Reserved CB Capacity)

The figure below describe the CB slot. Each CB slot can contain one and only one SMS CB message. A consecutive sequence of CB slots is defined as the scheduling period. Scheduling information is broadcasted indicating which CB slots contains "new" SMS CB messages or "old" SMS CB. A scheduling information should be broadcasted in time.

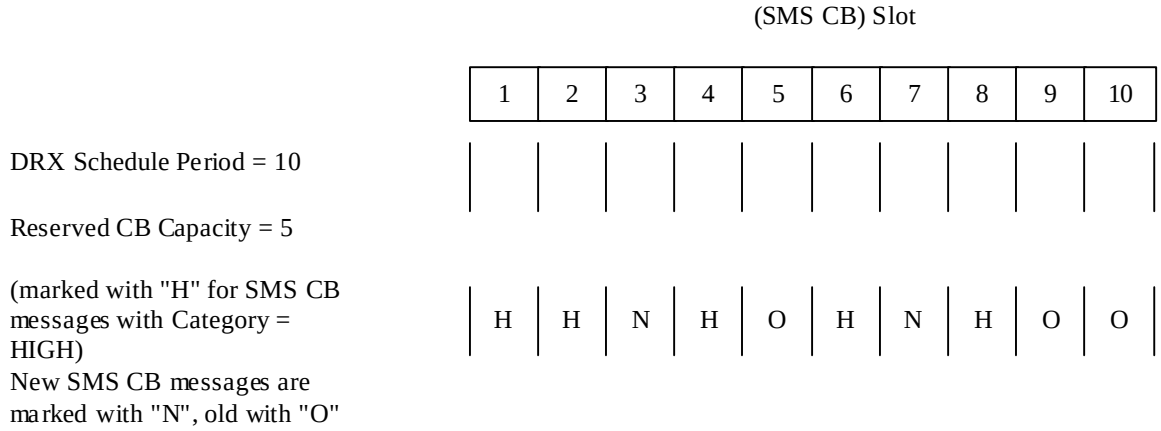

Figure 6.3: Example for SMS CB DRX scheme

Note: A SMS CB DRX managing function is implemented in the CBC in GSM. The necessity of this function should be discussed in SA1/SA2 when specifying the 3G SMS CB service. Thus this function may become obsolete.

Mapping of geographical area onto cells
Each SMS CB message is specified for a geographical area. This geographical area has to be mapped onto the cells of the radio network covering the geographical area. When the set of cells is determined, it is partitioned into the subsets controlled by one RNC. The output of this function is a set R(SMS) = {S(RNC1),..,S(RNCn)}of sets of cells each consisting of cells controlled by one RNC.

Note 1: At the NAS-AS boundary SA2 has defined an primitiv parameter "geographical area" sent from NAS to AS (e.g. when requesting transmission of system information). This implies that the function " Mapping of geographical area onto cells" becomes a RNC function.

Note 2: The association to RNCs may be a function of the Access Nodes (2-step association) when applying Case 2.

Transmission of SMS CB messages to determined Access Nodes
This is only applicable for Case 2.
Based on the output of the function "Mapping of geographical area onto cells" the Access Nodes of the CN are determined contolling the RNCs for which the cell lists are generated. SMS CB messages are sent together with its control information (see Table 6.1 below).

6.1.2.2 Processing and transmission of SMS CB messages and control information

Following operations are necessary on the interface between RNC and "core network" side. These operations are described in GSM 03.41 by the primitives usable on this interface. This is applicable for both Cases 1 and 2.

WRITE (CN-side → RNC; req, ind)
A new SMS CB Message has to be sent the first time.

REPLACE (CN-side → RNC; req, ind)
A new revision of an already existing SMS CB Message should be sent (the new Serial Number replaces the old Serial Number).

KILL (CN-side → RNC; req, ind)
A existing SMS CB Message is deleted.

REPORT (RNC → CN-side; res, conf)
This is the response on WRITE, REQUEST or KILL.

STATUS-LOAD-QUERY (CN-side ↔ RNC; req, ind, res, conf)
With this operation the CN-side requests the actual CB load of indicated cells.

STATUS-MESSAGE-QUERY (CN-side ↔ RNC; req, ind, res, conf)
With this operation the CN-side requests the actual SMS CB Message status regarding indicated cells.

REJECT (RNC → CN-side; res, conf)
In case of error situations this is responded with this operation.

RESTART-INDICATION (RNC → CN-side; req, ind)
Indication that a CB restart has taken place.

RESET (CN-side → RNC; req, ind)
RNC sets indicated cells into a CB-idle state.

FAILURE-INDICATION (RNC → CN-side; req, ind)
RNC indicates a failure situation.

SET-DRX (CN-side → RNC; req, ind, res, conf)
Activation or deactivation of CB discontinious receptions.

These operations imply functions in the CN-sided node (Case 1: CBC; Case 2: AN/CN) and the RNC, Node B and UE.

6.1.2.2.1 Functions of CN-sided node:

Transport of SMS CB Messages and its associated schedule information to RNC
The CN-sided node transports SMS CB Messages together with its associated schedule information to RNC. Table 6.1 shows the content; the definitons are given above.

Table 6.1: Information as it is sent to RNC for further management

SMS CB Message ID
old Serial Number (optional)
new Serial Number
Data Coding Scheme
Cell List
Category
Repetition Period
Number Of Broadcast Requested
SMS CB Message

Transport of cell related SMS CB DRX information to RNC

The CN-sided node transports cell related SMS CB DRX information to RNC. Table 6.2 shows the content; the definitions are given above.

Table 6.2: Cell related information as it is sent to RNC for further management

DRX Schedule Period
Reserved CB Capacity

In Case 2 the AN/CN works as an relay node between RNC and the SMS CB managing node.

In Case 1 no relaying is necessary.

6.1.2.2.2 Functions of RNC :

Configuration management of SMS CB capacity
The RNC receives the SMS CB Messages with its associated schedule information and cell related information on interface 2.

If it includes a cell in the Cell List for which up-to-now no SMS CB Message is mapped the SMS CB transmission capability has to be activated and some capacity shall be configured and to be signalled to all UEs by boadcasting it as system information. The capacity needed per cell is variable. If a fixed capacity is configured it must be choosen on the worst scenario and thus capacity may be wasted.

Scheduling of the SMS CB Messages

Note: Scheduling of SMS CB Messages is above the scheduling of individual SMS CB Messages on TrCH (MAC layer for the radio interface).

Each SMS CB Message has associated scheduling information which is used by the function as input to schedule (generate) SMS CB sequences per cell. If SMS CB DRX is applied the cell related CB DRX information has to be taken into account by this funciton.

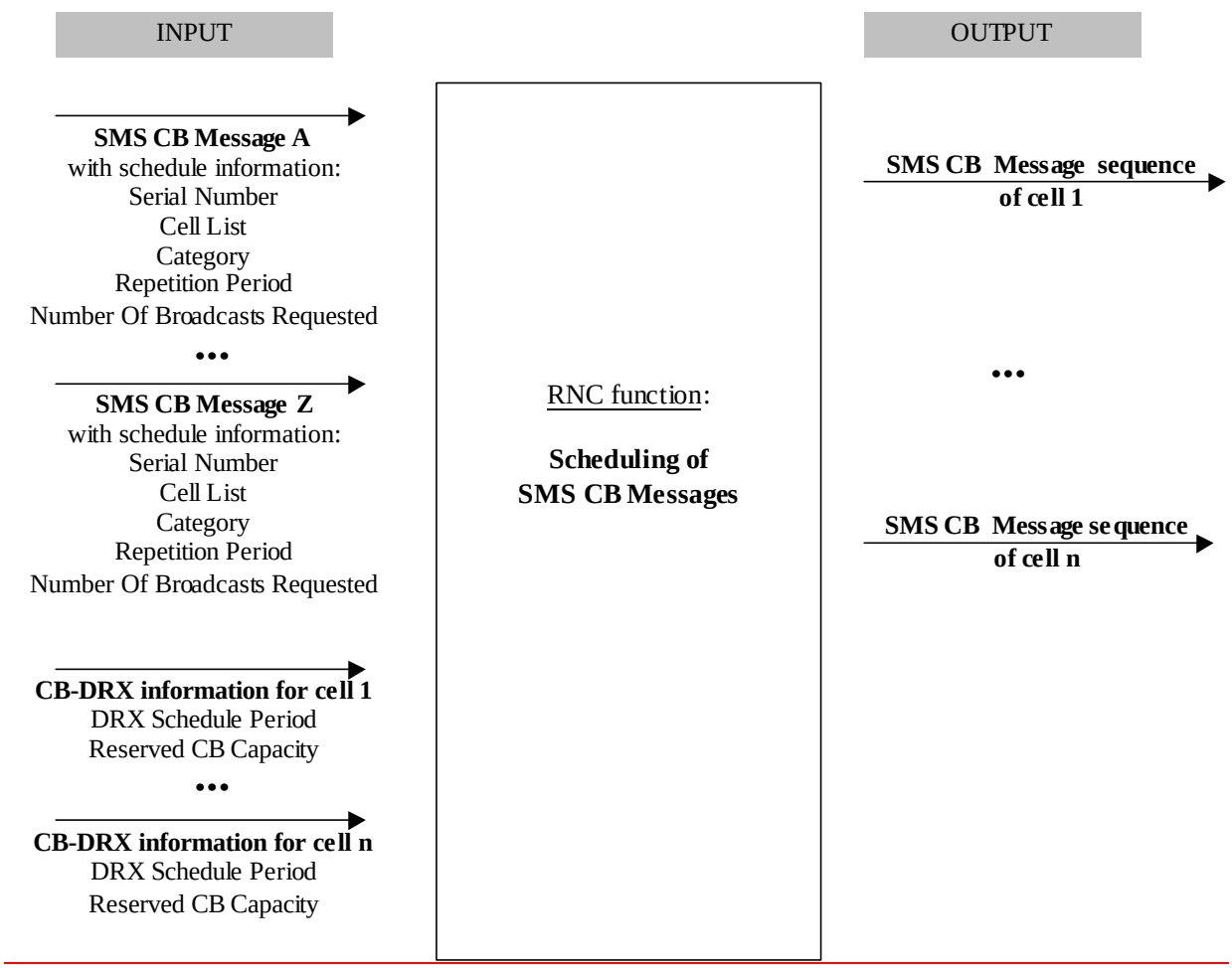

Figure 645: RNC-.function: Schedule of SMS CB messages

A very simple excample is given in the figure below. SMS CB messages arrive from CBC (Case 1 is choosen). These messages contain a Cell List indicating the cell where the SMS CB message should be sent one time (Repetition Period is choosen to 1). The SMS CB message sequence is shown on the bottom of the RNC-box.

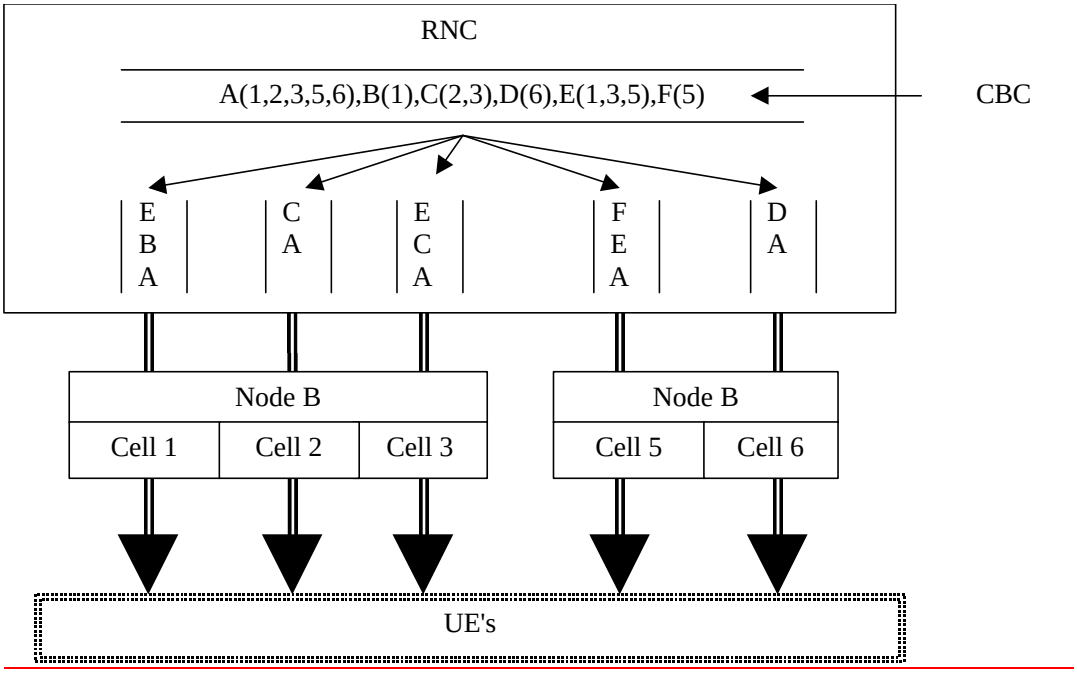

Figure 6.5: Example of SMS CB message sequences (Repetition Period = 1)

The SMS CB Message scheduling is implementation dependend. But the signalling of scheduling information has to be standardised.

Transmision of SMS CB messages to UE
Transmission takes only place in the downlink. SMS CB messages are indicated as common traffic and should use the appropriate logical traffic channel CTCH. In release 99 only TrCH = FACH is mapped. Whether an exclusive or a shared FACH is configured should be discussed.

Different locations are possible where the SMS CB traffic one the radio interface (one SMS CB sequence per cell) is generated.

SMS CB Flow control
In the lower layers of the radio interface or on the interface(s) to CBC overload situations may occur. This function gives methods to react appropriate. One action may be to increase transmission capacity temporarily. If the RNC could not resolve the situation alone the SMS CB managing node should be informed to support.

6.1.2.2.3 Functions of NodeB

Overflow detection
The physical layer (of the radio interface) should have the possibility to signal overflow conditions to the configuring entity and to the transmitting source.

No other SMS CB specific function is seen if TrCH = FACH is choosen only.

Note: To put some scheduling function parts into Node B may be an option, but this would increase the Node B complexity and split the scheduling function (see above) unnecessarily.

6.1.2.2.4 Functions of UE :

Reception and listening of SMS Cell Broadcast message on interface 4 (Uu)
The UE receives SMS Cell Broadcast messages on interface Uu. The SMS CB messages are delivered in the sequence as received to the NAS. Corrupted SMS CB messages may be discarded (UA service of RLC would become applicable).

When scheduling information is received the UE listen only to "new" SMS CB messages. What a "new" SMS CB message is in a concrete situation has to be defined. It should use the Serial Number and its information elements, especially the Geographical Scope representing mobility aspects.

6.1.3 UTRAN architecture for Case 1 and Case 2

For the further discussion few protocol architectures are shown. The aim is to find a radio interface protocol architecture that is independend of the Cases 1 and 2. Figure 6.6 shows Case 1 and Figure 6.7 shows Case 2 where the radio interface is marked as a black box. In the 3G specification process it seems possible to have a common Radio interface architecture.

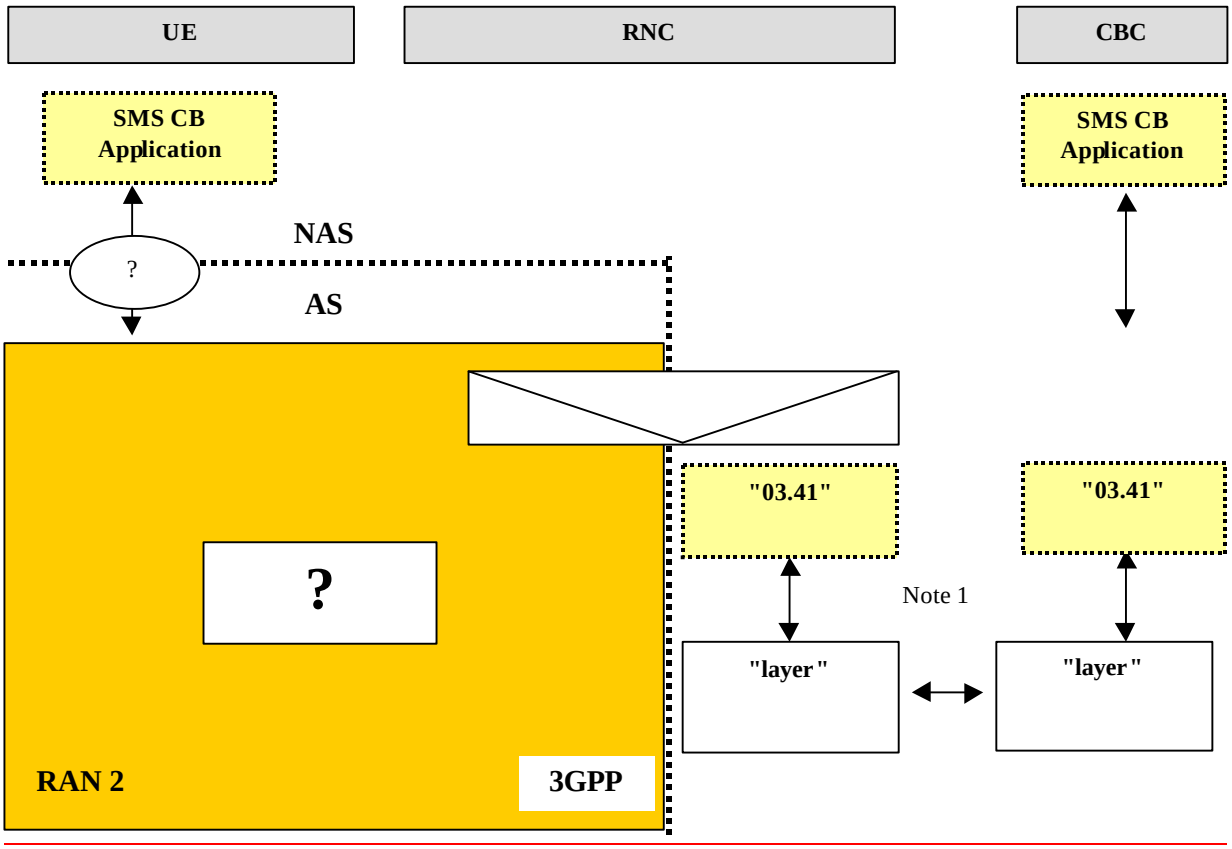

Figure 6.6: Protocol Architecture applicable for Case 1

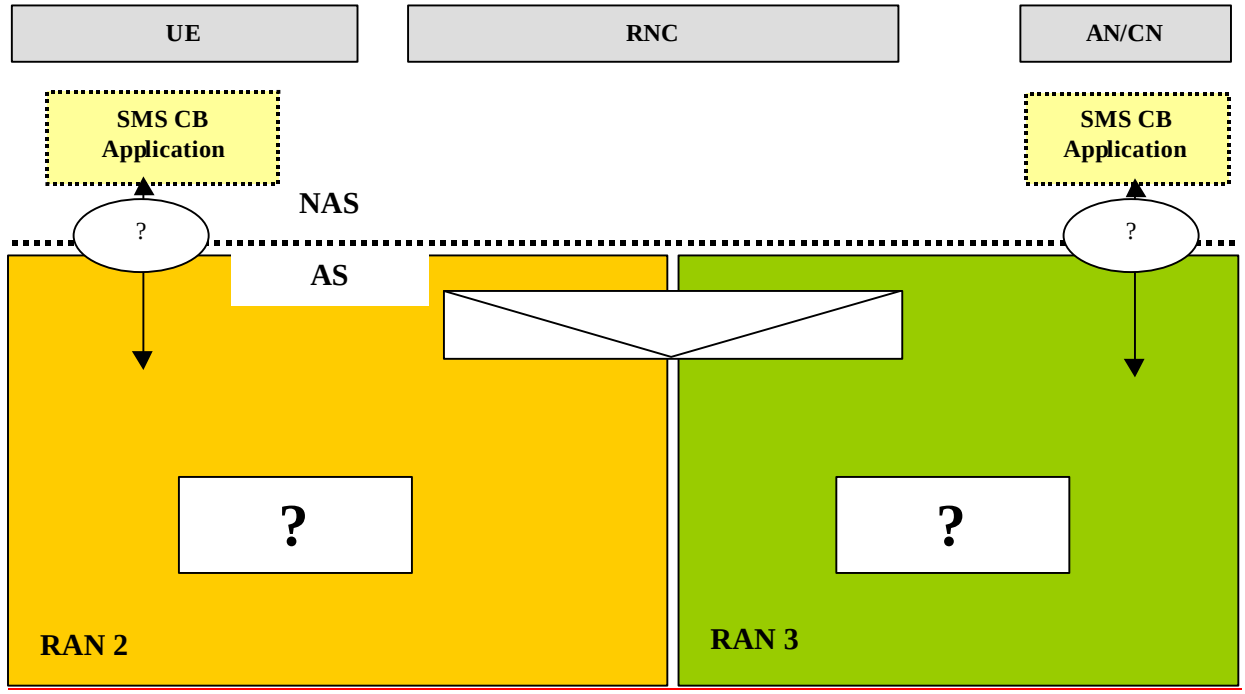

Figure 6.7: Protocol Architecture applicable for Case 2

In Case 1 one and only one Cell Broadcast Center CBC is connected to a RNC. There may be more than one CBC implemented.

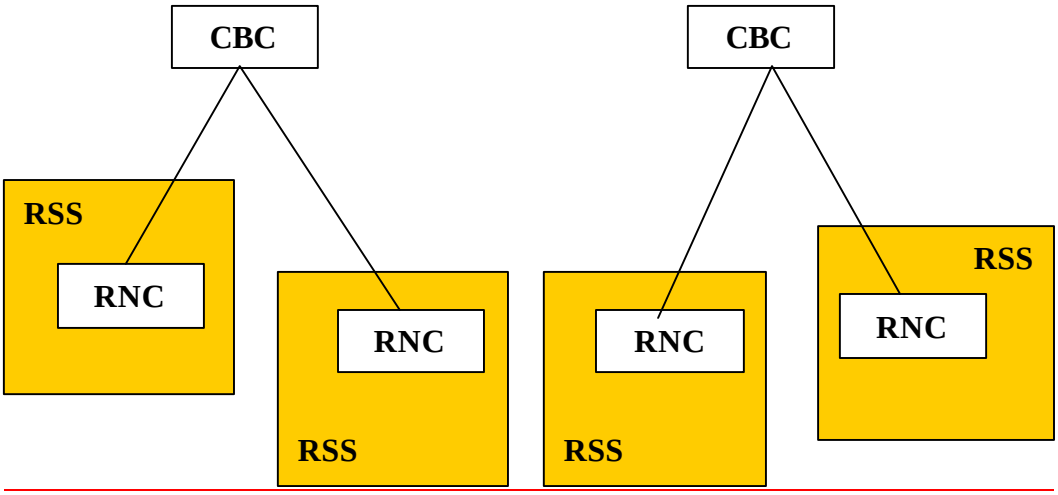

Figure 6.9: Network architecture for Case 1

~~1.2~~6.2 ~~Impact on UTRAN functions~~Radio Interface Requirements

The transmission of SMS CB messages from RNC to UEs via Node B and its controlled cells is in the scope of RAN WG2.

Many possibilities exist to locate the RNC functions as described in chapter 6.1.

R1: New L3 sublayer BMC

R2: RRC solution

R3: RRC/MAC solution

In the next subchapters these possibilities are described and compared.

6.2.1 Case R1: New L3 sublayer BMC

A new L3 sublayer Broadcast/Multicast Control BMC above RRC is introduced and the RNC functions are split between BMC and RRC.

BMC comprises the RNC-function "Scheduling SMS CB messages" and "Transmission of SMS CB messages to UE" and partly "Configuration Management of SMS CB Capacity"SMS CB Flow Control".

The RRC contains "Configuration Management of SMS CB Capacity" and partly "SMS CB Flow Control".

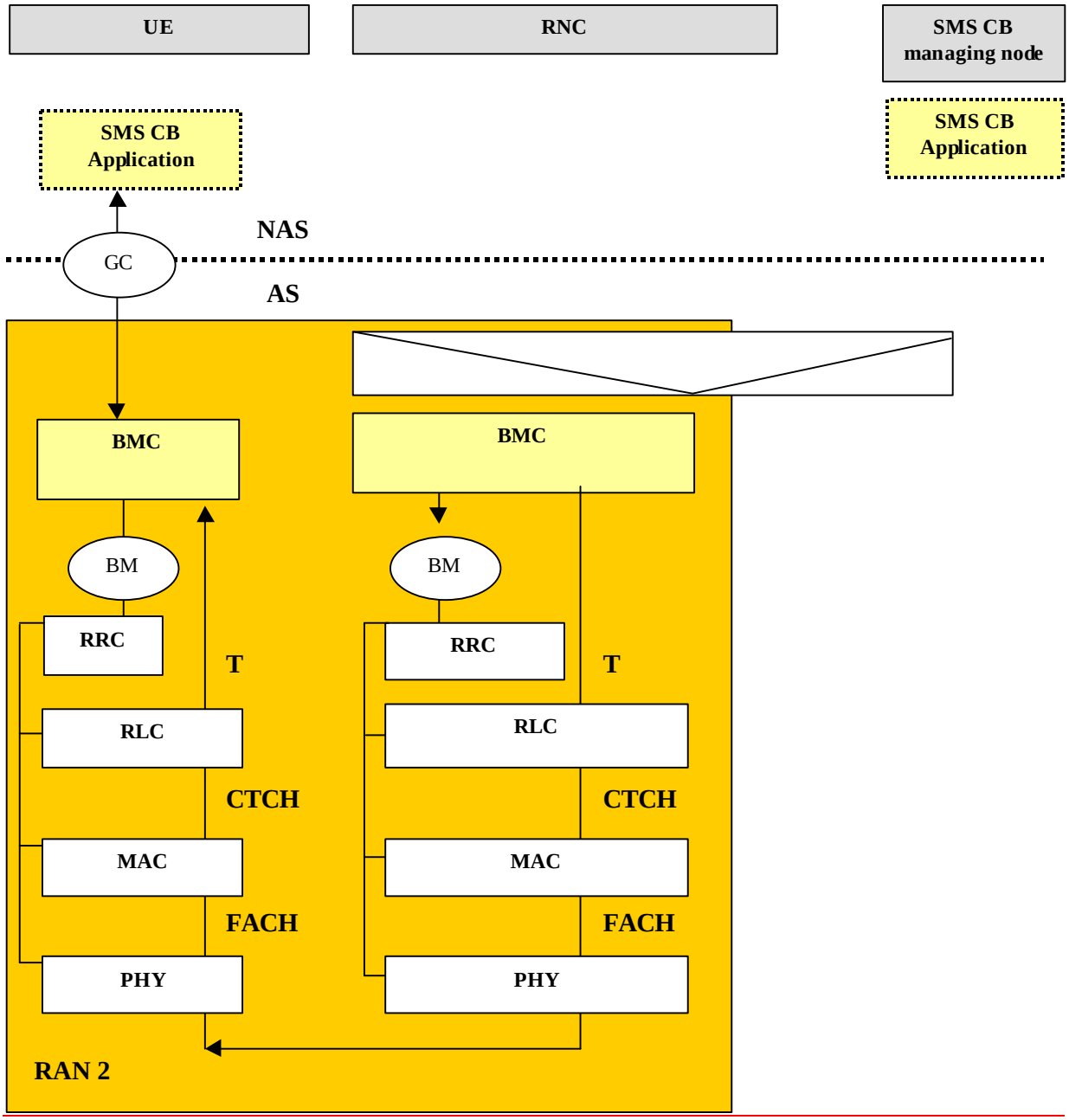

Figure 6.9: Protocol Architecture applicable for Case R1

6.2.2 Case R2: RRC solution

The functions "Configuration of SMS CB Capacity", "Scheduling of SMS CB messages, "SMS CB Flow Control" and part of "Transmittion of SMS CB messages to UE" reside in the RRC. BMC (broadcast/multicast control entity) comprises of these functions.

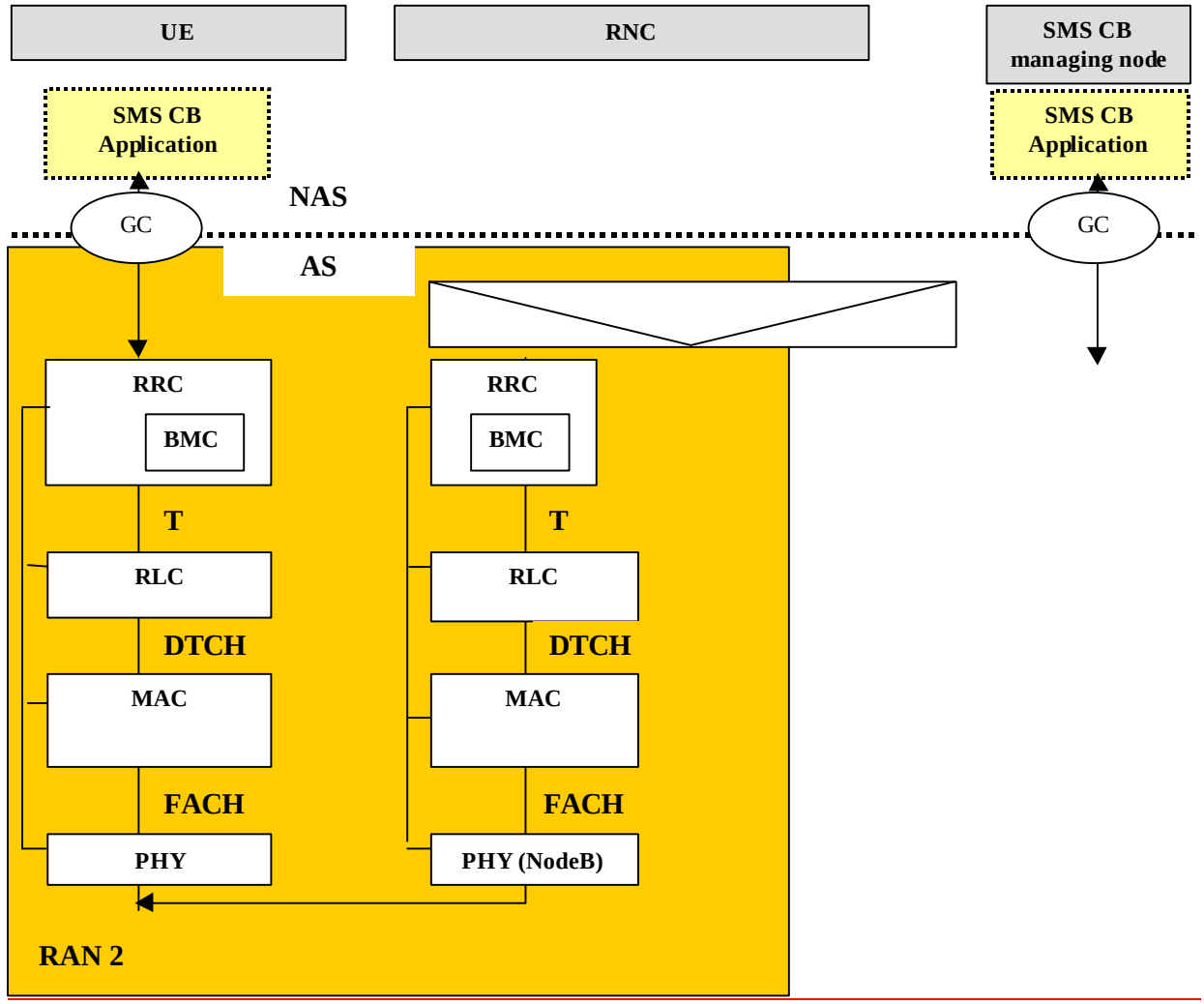

Figure 6.10: Protocol Architecture applicable for Case R2

6.2.3 Case R3: RRC/MAC solution

The RNC function "Scheduling of SMS CB messages" and "Transmission of SMS CB messages to UE" reside in the MAC sublayer entity MACbm. "Configuration of SMS CB Capacity" and "SMS CB Flow Control" reside in RRC sublayer entity BMC (broadcast/multicast control).

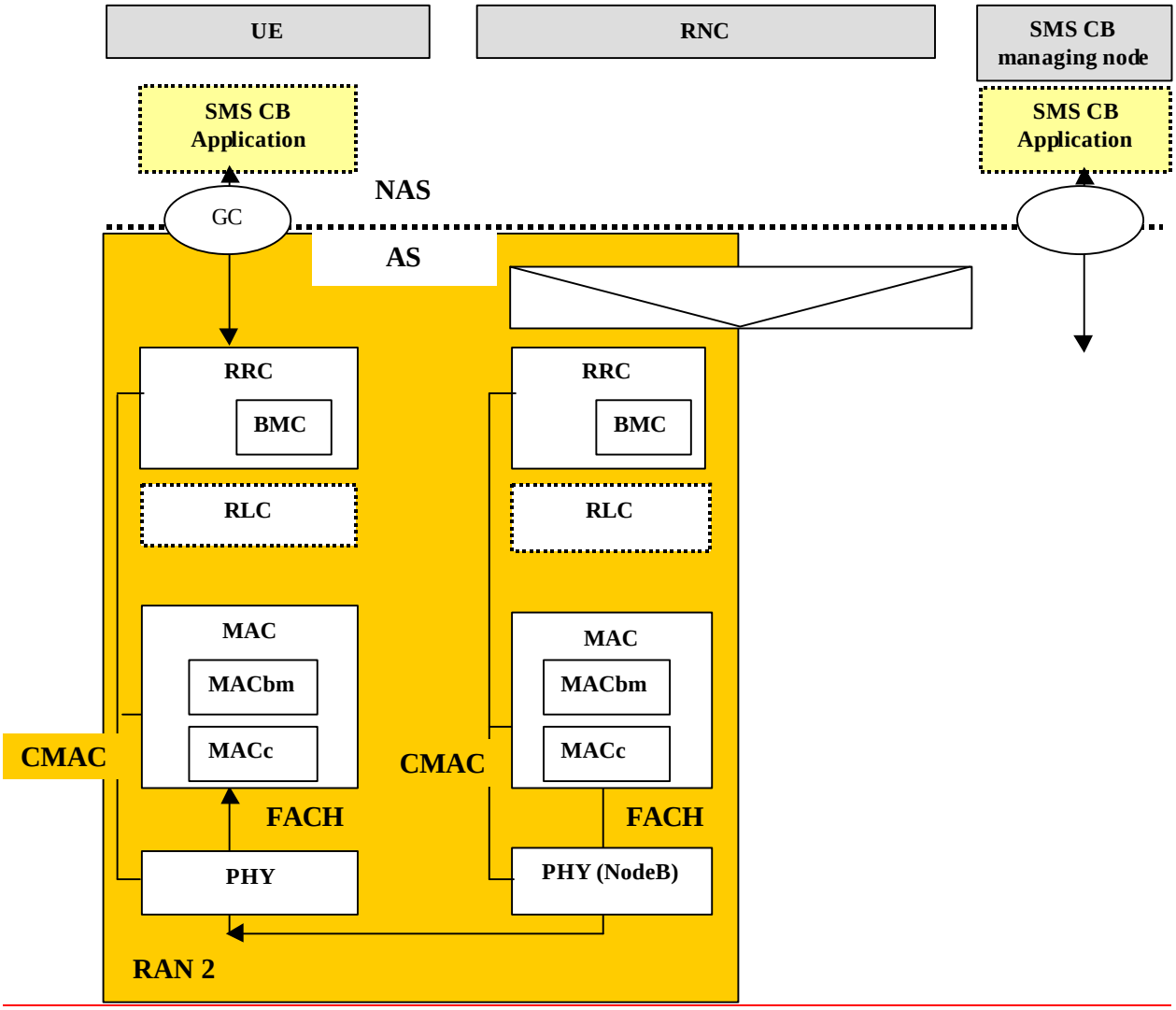

Figure 6.11: Protocol Architecture applicable for Case R3

6.2.4 Comparision of R1, R2 and R3

All three solutions are compatible with Case 1 and Case 2. The relay within RNC between the Uu Interface and the CN-sided Interface is not part of the standardisation.

Table 6.3: Comparision of Case R1, R2, R3

R1: New L3 sublayer BMC	**R2: RRC solution**	**R3: RRC/MAC solution**
Best, because each SMS CB function is concentrated into one layer and the lower layer services are used as they should be. BMC is part of the AS and SMS CB application can use its services via GC SAP, because the concept of Radio Access Bearer is fully usable.	Second best, because RRC could be with some extensions serve for SMS CB, but it is not defined in the user plane and transmits user traffic via CTCH	Third best, because SMS CB scheduling function is very close to other scheduling functions, but there is a bottom-up relation for SMS CB configuration and flow control, but still there are some functionalities needed within RRC to distribute SMS CB information to MAC, but the logical traffic flow do not use CTCH, but future evolutions are restricted by this architecture, **but MAC has no segmentation and assambly function that is necessary for huge SMS CB messages**.

6.2.5 When should the UE receive SMS CB messages ?

The UE should have the capability to receive SMS CB messages whenever it is possible. This capability may be depended on the UE class, the UE mode, etc..

Note:
In GSM the reception of SMS CB messages is restricted to CS domain Idle Mode. The terminal stays the most time (about 95 %) in this mode.

Tabel 6.4: UE reception capability in different RRC-modes

Mode of UE ([5])		**Requirements**
IDLE		The UE listen to the channels reserved for SMS Cell Broadcast of the selected cell. DRX is applicable.
CONNECTING		(ffs)
CONNECTED: **URA CONNECTED**		The UE listen to the channels reserved for SMS Cell Broadcast of the selected cell. DRX is applicable.
CONNECTED: **CELL CONNECTED**	**PCH**	(ffs)
	RACH/FACH	(ffs)
	RACH/DSCH	Not applicable for Release 99.(ffs for future releases)
	DCH/DCH	(ffs)
	DCH/DCH+DSCH	(ffs)

Note: For further analysis.

A minimum overall capacity about 20 kbps is required on the radio interface at the start of UMTS. Higher bit rates are expected in the future when the text messages are combined with other media like audio and video.

6.2.6 RRC

6.2.6.1 SMS CB capacity configuration

The RRC is responsible for configuration of SMS CB capacity. Any request from upper layers or indication from lower layers have to be sent to RRC which decides whether more or less SMS CB capacity could be provided.

Which transport channels should be used ?

Only common transport channel in the downlink are applicable.

A minimum overall capacity about 20 kbps is required on the radio interface in Release 99. Higher bit rates are expected in the future when the text messages are combined with other media like audio and video.

Table6. 5 : Comparision of Common TrCH regarding SMS CB service

Attribute	**BCH**	**FACH**	**PCH**	**DSCH**
Direction	DL	DL	DL	DL
Broadcast capability	Yes, required	Yes, possible (1)	Yes, required	Yes, possible (1)
Dynamic rate capability	No, fixed rate (16 kbps)	Yes, change every 10 ms possible	? (1)	? (1)
DRX	Possible	Possible	Possible	? (1)
Associated with	-	-	-	DCH or DSCH Control Channel, only combination (DSCH,DSCHCCH) makes sense
Slow power control	-	Possible	-	Possible
Type of data (1)	control data	control and user data	control data	user data
Open for future expansions	multiple BCH instances	dynamic configuration, one or more FACH instances	?	dynamic configuration,

Remarks :

(1) This attribute is not specified in S2.02 v0.3.0.

The TrCH type FACH is choosen for Release 1999. In future releases other TrCH may be good candidates to carry SMS CB messages.

6.2.6.2 SMS CB system information

Whether SMS CB transmission capability is available or not and the configuration of the SMS CB resources should be broadcasted as system control information. The RRC of the UE configures its local resources upon the received SBS CB system information. How to transmit the SMS CB system information depends on the choosen BCCH scheme.

6.2.7 RLC

The RLC gets the SMS CB message from higher layer as one piece and segments it if appropriate and delivers it to MAC via the CTCH SAP. The segmentation depends on the configured resources.

Note: SMS CB message is derived from GSM 03.41 section 9.3 Message Format on BTS-MS Interface.

The RLC SDU for SMS CB message has following format:

Serial Number	**1 octet**
	2
SMS CB Message ID	3
	4
Data Coding Scheme	5
SMS CB Message	7

Figure 6.12: SMS CB message format (RLC SDU)

6.2.8 MAC

6.2.8.1 MAC Scheduling

The MAC scheduling differs regarding the cases described in chapter 6.2.1. For Release 1999 only the FACH is choosen as TrCH. Thus the logical channel CTCH is mapped onto FACH only.

On the FACH four types of data can be sent: Common control data (CCCH), common traffic data (CTCH) such as SMS CB messages, dedicated control data (DCCH) and dedicated traffic data (DTCH).

Following cases should be discussed:

Case S1: A FACH instance is used exlusively for CTCH data.

Case S2: A FACH instance is used for CTCH and other control and/or traffic data.

6.2.8.2 Discontinious Reception (DRX)

When applying SMS CB DRX it should be harmonized with other DRX schemes (for example: Paging DRX).

6.2.8.2.1 Method 1 (GSM adapted method)

With method 1 an inband DRX scheme is choosen.

With Tdoc R2-99427 a GSM-based method is proposed:

For allowing UE to receive the SMS cell broadcast in DRX mode, it is necessary to inform the UE when individual SMS CB messages are transmitted in a cell. For that purpose, we propose a Schedule message in similar way to GSM, which is changed slightly for UMTS radio interface. The complete reading of Schedule message allows the UE to enter DRX mode. When the UE reads the Schedule message, it can know which message is new and where it is during the schedule period. If there are new messages during the scheduled period and those SMS CB messages are of interest to the UE, UE reads those frames which are indicated by the Schedule message.

SMS CB transmission is shown in figure 1. Unscheduled schedule message has the information about message identifiers and the location of newly updated SMS CBs, and the location of next Schedule message.

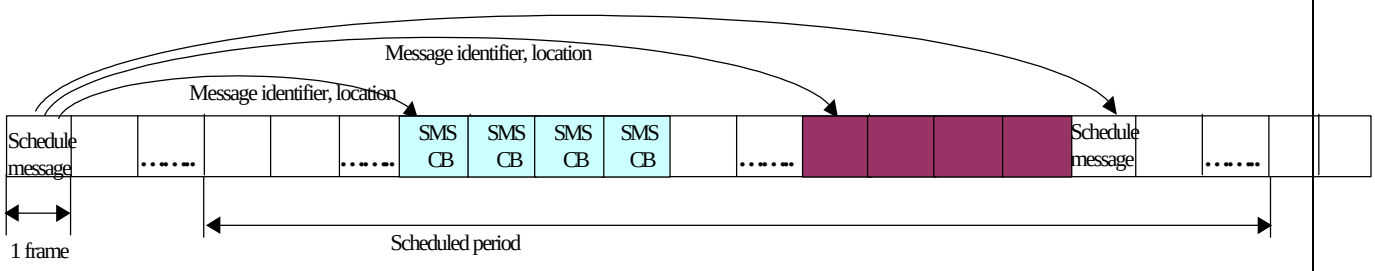

Figure 6.13 SMS CB transmission scenario

Length Indicator
Begin Frame of Schedule Period
End Frame of Schedule Period
New SMS CB Message Indicator (1)
...
New SMS CB Message Indicator (n)
Next SMS CB Schedule Message Indicator

Figure 6.14: SMS CB Schedule Message

Information Elements:

Length indicator	It indicates the length of the SMS CB Schedule message. By using it , SMS CB Schedule message can be extended in consecutive frames.
Begin Frame of Scheduled Period	It indicates the frame number of the start frame of schedule period.
End Frame of Scheduled Period	It indicates the frame number of the end frame of schedule period.
New SMS CB Message Indicator	It points to a new SMS CB message and consists of the SMS CB Message ID and the frame number where the SMS CB message starts.
Next SMS CB Schedule Message Indicator	It points to the next SMS CB Schedule message and consists the frame number where this message starts.

Note: The transmission of old SMS CB messages is left open.

6.2.8.3 Flow Control

<Note: Input required.>

6.3 Requirements on the Core Network Interface

In this chapter both Cases 1 and 2 are covered as described in chapter 6.1. The AS-part is under the responsibility of RAN WG 3 and the NAS-Part of CN1. Messaging between CN and UE is under responsibility of T2 SWG3.

The two Cases are repeated in Figure 6.15 and 6.16 below.

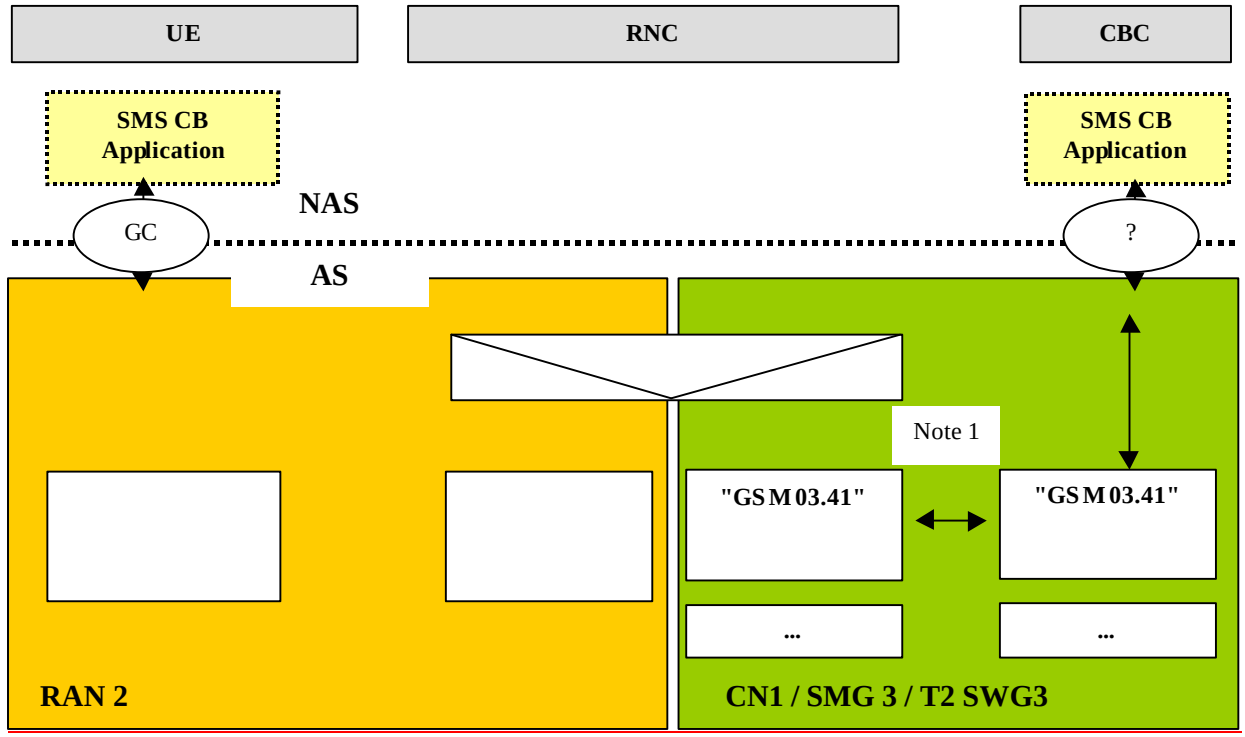

Figure 6.15: Protocol Architecture applicable for Case 1

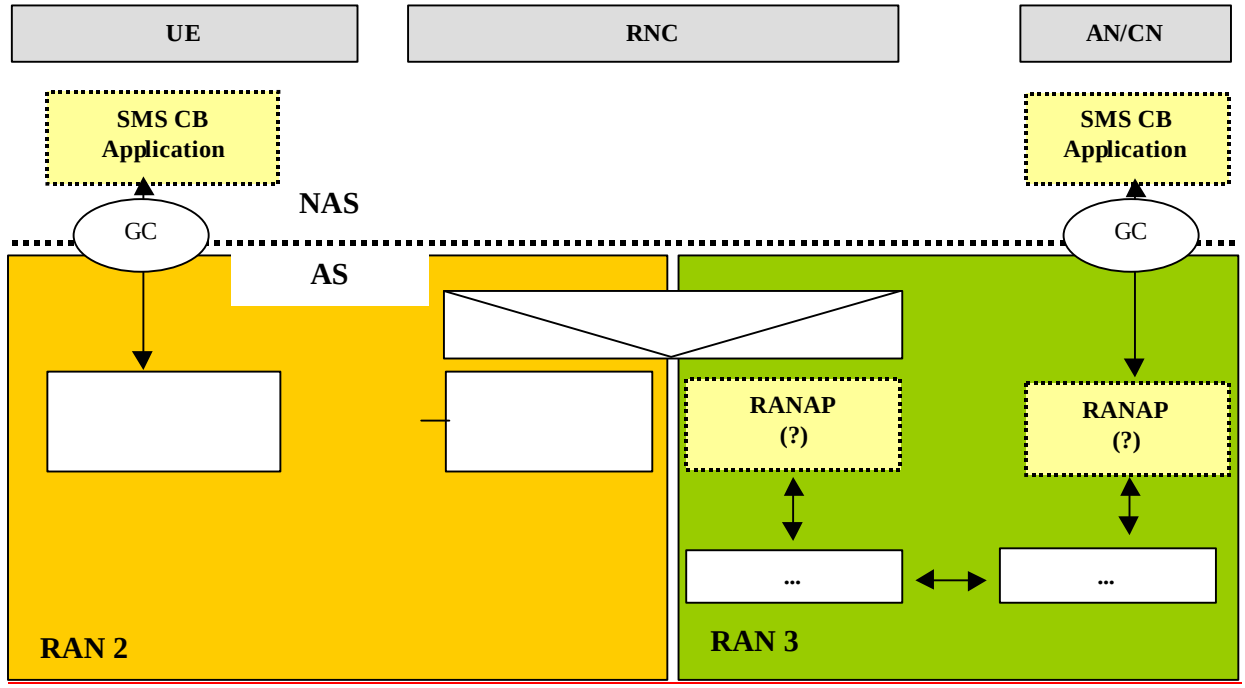

Figure 6.16: Protocol Architecture applicable for Case 2

7 PTM-Multicast Service (GPRS)

This chapter contains the requirements derived from GPRS specifications of Point-to-multipoint Multicast service and the analysis regarding the UMTS radio interface Uu.

Note:
The specification of the PTM-Multicast service is part of the work item "GPRS – Point-To-Multipoint Services" of GSM Phase 2+ Release 1999.

~~1.1~~7.1 ~~Radio Interface Requirements~~Impact on UTRAN Functions

~~1.2~~7.2 ~~Impact on UTRAN Functions~~Radio Interface Requirements

8 PTM-Group Call Service (GPRS)

This chapter contains the requirements derived from GPRS specifications of Point-to-multipoint Group Call service and the analysis regarding the UMTS radio interface Uu.

Note:
The specification of the PTM-Group Call service is part of the work item “GPRS – Point-To-Multipoint Services” of GSM Phase 2+ Release 1999.

~~1.1~~8.1 ~~Radio Interface Requirements~~Impact on UTRAN Functions

~~1.2~~8.2 ~~Impact on UTRAN Functions~~Radio Interface Requirements

9 IP Multicast Service (GPRS)

This chapter contains the requirements derived from GPRS specifications of IP Multicast service and the analysis regarding the UMTS radio interface Uu.

Note:
The specification of the IP-Multicast service is part of the work item “GPRS – Point-To-Multipoint Services” of GSM Phase 2+ Release 1999.

~~1.1~~9.1 ~~Radio Interface Requirements~~Impact on UTRAN Functions

~~1.2~~9.2 ~~Impact on UTRAN Functions~~Radio Interface Requirements

10 Multimedia Distribution Service (UMTS)

This chapter contains the requirements derived from UMTS Technical Specifications and the analysis regarding the radio interface Uu.

(Editor’s Note:
RAN WG2 has sent a Liaison statement to SA WG1 and WG2 requesting stage 1 and stage 2 specification of UMTS multicast services and describing the relation to SMS services. A reply is expected. Information is needed about the questions: In which annual release the UMTS Multicast services will be part? What are the requirements for the UMTS system and the protocols?)

~~1.1~~10.1 ~~Radio Interface Requirements~~Impact on UTRAN Functions

~~1.2~~10.2 ~~Impact on UTRAN Functions~~Radio Interface Requirements

11 Annex A: Functions related to MDS (ffs.)

Previous WG2 Input documents:

R2-99075 (LGIC), R2-99076 (LGIC), R2-99218 (LGIC), R2-99219 (LGIC)

Input documents not presented yet:

R2-99077 (LGIC)

Related WG2 Output documents:

R2-99189 (TSG RAN WG2) LS to SA WG1 and SA WG2 on Multicast

(Editor's note: The following text is taken from R2-99075 and should give a first overview of functions which should be analysed for MDS. Already made decisions are incorporated.)

Functions which should be analysed are listed below:

RRC functions:

Variable Rate Support

Dynamic Code usage

Dynamic Scheduling

QoS Support (e.g. repetition time)

(LGIC, R2-99075, for information)

RLC functions:

Unacknowledged multicast data transfer

Multicast Delivery

(LGIC, R2-99075, for information)

MAC functions:

Support fo multiple CTCH

Mapping and multiplexing/demultiplexing between CTCH and transport channels

Scheduling among CTCH

Support of dynamic rate change using TFCS

(LGIC, R2-99075, for information)

New types of transport channels are not required.

L1 functions:

Transmission of messages containing multicast data to specific groups of UEs. This service includes provision of the location function necessary to deliver mulitcast messages to a mobile, which is in idle or slotted mode.

DTX (discontinious transmission)

DRX (discontinious reception)

Support of multicast data transmission with multi-code

(LGIC, R2-99075, for information)

History

Document history		
Date	**Version**	**Comment**
May 1999	0.0.1	Skeleton without scope
June 1999	0.0.2	Inclusion of scope and document structure as agreed at TSG RAN WG2 meeting #4, Berlin, 25-28 May 1999, distributed for e-mail approval
June 1999	0.1.0	RAN WG 2 approved version with editoral changes and addition of subchapter x.2 (Impact on UTRAN Functions), x service specific chapters 6 to 10
June 1999	0.1.0	Noted by TSG-RAN
August 1999	0.2.0	Exchange of subchapters "Impact on UTRAN Functions" and "Radio Interface Requirements. Incorporation of chapter 6 "SMS CB Service".

Rapporteur for TR 25.925 is:

Peter Krischan
Mannesmann Mobilfunk GmbH

Tel. : +49 211 533 2835
Fax : +49 211 533 2834
Email : peter.krischan@d2privat.de

This document is written in Microsoft Word 97.