ETSI TS 101 376-4-13 V3.5.1 (2017-03)

TECHNICAL SPECIFICATION

GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 13: Radio Resource Control (RRC) protocol; Iu Mode; GMR-1 3G 44.118

Reference
RTS/SES-00425

Keywords
3G, GMPRS, GMR, GPRS, GSM, GSO, MES, mobile, MSS, radio, satellite, S-PCN

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Contents

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Foreword

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Version 3.m.n

where:

- the third digit (n) is incremented when editorial only changes have been incorporated in the specification;
- the second digit (m) is incremented for all other types of changes, i.e. technical enhancements, corrections, updates, etc.

The present document is part 4, sub-part 13 of a multi-part deliverable covering the GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service, as identified below:

Part 1: "General specifications":

Part 2: "Service specifications";

Part 3: "Network specifications";

Part 4: "Radio interface protocol specifications":

Sub-part 1: "Mobile Earth Station-Gateway Station System (MES-GSS) Interface; GMR-1 04.001";

Sub-part 2: "GMR-1 Satellite Network Access Reference Configuration; GMR-1 04.002";

Sub-part 3: "Channel Structures and Access Capabilities; GMR-1 04.003";

Sub-part 4: "Layer 1 General Requirements; GMR-1 04.004";

Sub-part 5: "Data Link Layer General Aspects; GMR-1 04.005";

Sub-part 6: "Mobile earth Station-Gateway Station Interface Data Link Layer Specifications; GMR-1 04.006";

Sub-part 7: "Mobile Radio Interface Signalling Layer 3 General Aspects; GMR-1 3G 24.007";

Sub-part 8: "Mobile Radio Interface Layer 3 Specifications; GMR-1 3G 44.008";

Sub-part 9: "Performance Requirements on the Mobile Radio Interface; GMR-1 04.013";

Sub-part 10: "Rate Adaptation on the Access Terminal-Gateway Station Subsystem (MES-GSS) Interface; GMR-1 04.021";

Sub-part 11: "Radio Link Protocol (RLP) for Data Services; GMR-1 04.022";

Sub-part 12: "Mobile Earth Station (MES) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol; GMR-1 3G 44.060";

Sub-part 13: "Radio Resource Control (RRC) protocol; Iu Mode; GMR-1 3G 44.118";

Sub-part 14: "Mobile Earth Station (MES) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol; Iu Mode; GMR-1 3G 44.160";

Sub-part 15: "Packet Data Convergence Protocol (PDCP) specification; GMR-1 3G 25.323";

Part 5: "Radio interface physical layer specifications";

Part 6: "Speech coding specifications";

Part 7: "Terminal adaptor specifications".

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Introduction

GMR stands for GEO (Geostationary Earth Orbit) Mobile Radio interface, which is used for Mobile Satellite Services (MSS) utilizing geostationary satellite(s). GMR is derived from the terrestrial digital cellular standard GSM and supports access to GSM core networks.

The present document is part of the GMR Release 3 specifications. Release 3 specifications are identified in the title and can also be identified by the version number:

- Release 1 specifications have a GMR 1 prefix in the title and a version number starting with "1" (V1.x.x).
- Release 2 specifications have a GMPRS 1 prefix in the title and a version number starting with "2" (V2.x.x).
- Release 3 specifications have a GMR-1 3G prefix in the title and a version number starting with "3" (V3.x.x).

The GMR release 1 specifications introduce the GEO-Mobile Radio interface specifications for circuit mode Mobile Satellite Services (MSS) utilizing geostationary satellite(s). GMR release 1 is derived from the terrestrial digital cellular standard GSM (phase 2) and it supports access to GSM core networks.

The GMR release 2 specifications add packet mode services to GMR release 1. The GMR release 2 specifications introduce the GEO-Mobile Packet Radio Service (GMPRS). GMPRS is derived from the terrestrial digital cellular standard GPRS (included in GSM Phase 2+) and it supports access to GSM/GPRS core networks.

The GMR release 3 specifications evolve packet mode services of GMR release 2 to 3rd generation UMTS compatible services. The GMR release 3 specifications introduce the GEO-Mobile Radio Third Generation (GMR-1 3G) service. Where applicable, GMR-1 3G is derived from the terrestrial digital cellular standard 3GPP and it supports access to 3GPP core networks.

Due to the differences between terrestrial and satellite channels, some modifications to the GSM or 3GPP standard are necessary. Some GSM and 3GPP specifications are directly applicable, whereas others are applicable with modifications. Similarly, some GSM and 3GPP specifications do not apply, while some GMR specifications have no corresponding GSM or 3GPP specification.

Since GMR is derived from GSM and 3GPP, the organization of the GMR specifications closely follows that of GSM or 3GPP as appropriate. The GMR numbers have been designed to correspond to the GSM and 3GPP numbering system. All GMR specifications are allocated a unique GMR number. This GMR number has a different prefix for Release 2 and Release 3 specifications as follows:

- Release 1: GMR n xx.zyy.
- Release 2: GMPRS n xx.zyy.
- Release 3: GMR-1 3G xx.zyy.

where:

- xx.0yy (z = 0) is used for GMR specifications that have a corresponding GSM or 3GPP specification. In this case, the numbers xx and yy correspond to the GSM or 3GPP numbering scheme.
- xx.2yy (z = 2) is used for GMR specifications that do not correspond to a GSM or 3GPP specification. In this case, only the number xx corresponds to the GSM or 3GPP numbering scheme and the number yy is allocated by GMR.
- n denotes the first (n = 1) or second (n = 2) family of GMR specifications.

A GMR system is defined by the combination of a family of GMR specifications and GSM and 3GPP specifications as follows:

- If a GMR specification exists it takes precedence over the corresponding GSM or 3GPP specification (if any). This precedence rule applies to any references in the corresponding GSM or 3GPP specifications.

NOTE: Any references to GSM or 3GPP specifications within the GMR specifications are not subject to this precedence rule. For example, a GMR specification may contain specific references to the corresponding GSM or 3GPP specification.

- If a GMR specification does not exist, the corresponding GSM or 3GPP specification may or may not apply. The applicability of the GSM or 3GPP specifications is defined in ETSI TS 101 376-1-2 [5].

1 Scope

1.1 General

The present document specifies the procedures used at the radio interface (Reference Point GMR-1 Um, see ETSI TS 124 002 [30]) for Radio Resource management. The Radio Resource Control Protocol (RRC) is specified. RRC is the Radio Resource control plane protocol for Radio Resource management that is used when a MES is operating in Iu mode.

When the notations for "further study" or "FS" or "FFS" are present in the present document they mean that the indicated text is not a normative portion of the present document.

These procedures are defined in terms of messages exchanged over the control channels of the radio interface. The control channels are described in ETSI TS 101 376-4-3 [3].

The structured functions and procedures of this protocol and the relationship with other layers and entities are described in general terms in ETSI TS 124 007 [17] and ETSI TS 101 376-4-7 [4].

1.2 Scope of the present document

The procedures currently described in the present document are for radio resource management for circuit switched and GPRS services.

ETSI TS 101 376-4-12 [13] and ETSI TS 101 376-4-14 [14] contains procedures for radio link control and medium access control (RLC/MAC) of packet data physical channels.

ETSI TS 101 376-4-8 [7] contains the procedures for CN protocols.

NOTE: "layer 3" includes the functions and protocols described in the present document. The terms "data link layer" and "layer 2" are used interchangeably to refer to the layer immediately below layer 3.

1.3 Application to the interface structures

The layer 3 procedures apply to the interface structures defined in ETSI TS 101 376-4-3 [3]. ETSI TS 101 376-4-7 [4] gives the general description of layer 3 including procedures, messages format and error handling.

1.4 Structure of layer 3 procedures

A building block method is used to describe the layer 3 procedures.

The basic building blocks are "elementary procedures" provided by the protocol control entities of the three sublayers, i.e. radio resource management, mobility management and connection management sublayer.

Complete layer 3 transactions consist of specific sequences of elementary procedures. The term "structured procedure" is used for these sequences.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference/.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest release and the latest version of that document up to and including Release 7.

In the case of a reference to a GMR-1 3G document, a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] ETSI TS 101 376-1-1: "GEO-Mobile Radio Interface Specifications (Release 2) General Packet Radio Service; Part 1: General specifications; Sub-part 1: Abbreviations and acronyms; GMPRS-1 01.004".

NOTE: This is a reference to a GMR-1 Release 2 specification. See the introduction for more details.

[2] ETSI TS 101 376-3-3: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 3: Network specifications; Sub-part 3: Numbering, addressing and identification; GMR-1 3G 23.003".

[3] ETSI TS 101 376-4-3: "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 3: Channel Structures and Access Capabilities; GMR-1 04.003".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

[4] ETSI TS 101 376-4-7: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 7: Mobile Radio Interface Signalling Layer 3 General Aspects; GMR-1 3G 24.007".

[5] ETSI TS 101 376-1-2: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 1: General specifications; Sub-part 2: Introduction to the GMR-1 family; GMR-1 3G 41.201".

[6] ETSI TS 101 376-4-6: "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 6: Mobile earth Station-Gateway Station Interface Data Link Layer Specifications; GMR-1 04.006".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

[7] ETSI TS 101 376-4-8: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 8: Mobile Radio Interface Layer 3 Specifications; GMR-1 3G 44.008".

[8] ETSI TS 101 376-5-2: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 2: Multiplexing and Multiple Access; Stage 2 Service Description; GMR-1 3G 45.002".

[9] ETSI TS 101 376-5-6: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 6: Radio Subsystem Link Control; GMR-1 3G 45.008".

[10] ETSI TS 101 376-5-7: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 7: Radio Subsystem Synchronization; GMR-1 3G 45.010".

[11] ETSI TS 101 376-5-5: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 5: Radio Transmission and Reception; GMR-1 3G 45.005".

[12] ETSI TS 101 376-3-10: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 3: Network specifications; Sub-part 10: Functions related to Mobile Earth Station (MES) in idle mode; GMR-1 3G 43.022".

[13] ETSI TS 101 376-4-12: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 12: Mobile Earth Station (MES) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol; GMR-1 3G 44.060".

[14] ETSI TS 101 376-4-14: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 14: Mobile Earth Station (MES) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol; Iu Mode; GMR-1 3G 44.160".

[15] ETSI TS 101 376-3-23: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 3: Network specifications; Sub-part 23: Radio Access Network; Overall description - Stage 2; GMR-1 3G 43.051".

[16] ETSI TS 101 376-3-22: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 3: Network specifications; Sub-part 22: Overall description of the GMPRS radio interface; Stage 2; GMR-1 3G 43.064".

[17] ETSI TS 124 007 (Release 7): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Mobile radio interface signalling layer 3; General Aspects (3GPP TS 24.007 Release 7)".

[18] ETSI TS 123 101 (Release 7): "Universal Mobile Telecommunications System (UMTS); General UMTS Architecture (3GPP TS 23.101 Release 7)".

[19] ETSI TS 123 110 (Release 7): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); UMTS Access Stratum Services and Functions (3GPP TS 23.110 Release 7)".

[20] ETSI TR 121 905 (Release 7): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Vocabulary for 3GPP Specifications (3GPP TR 21.905 Release 7)".

[21] ETSI TS 125 331 (Release 7): "Universal Mobile Telecommunications System (UMTS); Radio Resource Control (RRC); Protocol specification (3GPP TS 25.331 Release 7)".

[22] ETSI TS 131 102 (Release 7): "Universal Mobile Telecommunications System (UMTS); LTE; Characteristics of the Universal Subscriber Identity Module (USIM) application (3GPP TS 31.102 Release 7)".

[23] ETSI TS 133 102 (Release 7): "Universal Mobile Telecommunications System (UMTS); 3G security; Security architecture (3GPP TS 33.102 Release 7)".

[24] ETSI TS 101 376-4-15: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 15: Packet Data Convergence Protocol (PDCP) specification; GMR-1 3G 25.323".

[25] ETSI TS 125 306: "Universal Mobile Telecommunications System (UMTS); UE Radio Access capabilities (3GPP TS 25.306)".

[26] Void.

[27] Void.

[28] ETSI TS 125 413 (Release 7): "Universal Mobile Telecommunications System (UMTS); UTRAN Iu interface Radio Access Network Application Part (RANAP) signalling (3GPP TS 25.413 Release 7)".

[29] ETSI TS 144 031 (Release 7): "Digital cellular telecommunications system (Phase 2+); Location Services (LCS); Mobile Station (MS) - Serving Mobile Location Centre (SMLC) Radio Resource LCS Protocol (RRLP) (3GPP TS 44.031 Release 7)".

[30] ETSI TS 124 002 (Release 7): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); GSM-UMTS Public Land Mobile Network (PLMN) Access Reference Configuration (3GPP TS 24.002 Release 7)".

[31] ETSI TS 124 008 (Release 7): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 (3GPP TS 24.008 Release 7)".

[32] Federal Information Processing Standards: "Specification for the Advanced Encryption Standard (AES)".

NOTE: Available at Publication 197; November 26, 2001 "Specification for the ADVANCED ENCRYPTION STANDARD (AES)".

[33] IETF RFC 5903 (June 2010): "Elliptic Curve Groups modulo a Prime (ECP Groups) for IKE and IKEv2", Fu D. and J. Solinas.

[34] IETF RFC 6234 (May 2011):"US Secure Hash Algorithm (SHA and SHA-based HMAC and HKDF)", D.Eastlake 3rd and T. Hansen.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference/.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[i.1] TIA/EIA/IS-833: "G3G CDMA-MC to GSM-MAP".

[i.2] TIA/EIA/IS-2000.5: "Upper Layer (Layer 3) Standard for cdma2000® Spread Spectrum Systems (2000)".

[i.3] Void.

[i.4] ETSI TS 144 004 (Release 7): "Digital cellular telecommunications system (Phase 2+); Layer 1; General Requirements (3GPP TS 44.004 Release 7)".

[i.5] IETF RFC 3095: "RObust Header Compression (ROHC): Framework and four profiles: RTP, UDP, ESP, and uncompressed".

[i.6] IETF RFC 2507: "IP Header Compression".

[i.7] TIA/EIA/IS-834: "G3G CDMA-DS to ANSI/TIA/EIA-41".

[i.8] "CSN.1 Specification, Version 2.0.

NOTE: Described in ETSI TS 124 007 (Release 7): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Mobile radio interface signalling layer 3; General Aspects (3GPP TS 24.007 Release 7)".

3 Definitions, abbreviations, random value and specification notations

3.1 Definitions

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

A/Gb mode: mode of operation of the MES when connected to the Core Network via GERAN and the A and/or Gb interfaces

Access Stratum (AS): Defined in ETSI TS 123 101 [18].

Elliptic Curve Groups modulo a Prime(ECP): Defined in IETF RFC 5903 [33].

GERAN: GMR-1 BSS that supports Iu-Mode of operation

GERAN Cell: satellite spotbeam

NOTE: Also see ETSI TS 101 376-3-10 [12].

Iu mode: mode of operation of the MES when connected to the Core Network via GERAN or UTRAN and the Iu interface

NOTE: The network modes of operation for GERAN *Iu mode* are:

NMO I: The network has a Gs interface. The network sends CS paging and PS paging messages for an attached MES via the SGSN and the Iu-ps interface to GERAN Iu. Paging co-ordination is achieved at the SGSN thanks to the Gs interface. GERAN Iu pages the MES on CCCCH. MES can initiate combined procedures according to its capabilities.

NMO II: The network has no Gs interface. For an attached MES, the network sends CS paging messages, via the MSC plus the Iu-cs interface, and sends PS paging messages, via the SGSN plus the Iu-ps interface to GERAN Iu. GERAN Iu performs paging co-ordination and pages the MES on CCCH. MESs cannot initiate combined procedures.

Non Access Stratum (NAS): Defined in ETSI TR 121 905 [20].

RR idle: Defined in ETSI TS 101 376-4-8 [7].

RR: Radio Resource control plane protocol for radio resource management that is used when a MES is operating in A/Gb mode

RRC: Radio Resource control plane protocol for radio resource management that is used when a MES is operating in Iu mode

RRC-Connected mode: mode of operation when the MES has an established RRC connection

RRC Connection: point-to-point bi-directional connection between RRC peer entities in the MES and the GERAN characterized by the allocation of a G-RNTI

NOTE: An MES has either zero or one RRC connection.

RRC-Idle mode: mode of operation when the MES has no established RRC connection

Inter-mode handover: transfer of the connection, under the control of the network, between the MES and GERAN Iu mode to/from GERAN A/Gb mode

Inter-RAT handover: transfer of the connection, under the control of the network, between the MES and two different radio access technologies (e.g. UMTS to GERAN Iu mode)

R: Retransmission number

NOTE: R = 0 for first transmission, R = 1 for first retransmission, …, R = n for the n^{th} retransmission. When there is no retransmission, R = 0 always.

RLC/MAC block: protocol data unit exchanged between RLC/MAC entities, see ETSI TS 101 376-4-12 [13]

RR packet idle mode: Defined in ETSI TS 101 376-4-12 [13].

RR packet transfer mode: Defined in ETSI TS 101 376-4-12 [13].

The network modes of operation for GERAN *Iu mode* are:

NMO I: the network has a Gs interface. The network sends CS paging and PS paging messages for an attached MES via the SGSN and the Iu-ps interface to GERAN Iu. Paging co-ordination is achieved at the SGSN thanks to the Gs interface. GERAN Iu pages the MES on CCCCH. MES can initiate combined procedures according to its capabilities.

NMO II: the network has no Gs interface. For an attached MES, the network sends CS paging messages, via the MSC plus the Iu-cs interface, and sends PS paging messages, via the SGSN plus the Iu-ps interface to GERAN Iu. GERAN Iu performs paging co-ordination and pages the MES on CCCH. MESs cannot initiate combined procedures.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in GMPRS-1 01.004 [1] apply.

3.3 Void

3.4 Specification Notations

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

Procedure When referring to an elementary procedure in the specification the Procedure Name is written with the first letters in each word in upper case characters followed by the word "procedure", e.g. RRC Establishment procedure.

Message When referring to a message in the specification the MESSAGE NAME is written with all letters in upper case characters followed by the word "message", e.g. CELL UPDATE message.

IE When referring to an information element (IE) in the specification the *Information Element Name* is written with the first letters in each word in upper case characters and all letters in Italic font preceded by the abbreviation "IE", e.g. IE "*Initial MES Identity"*.

Value of an IE When referring to the value of an information element (IE) in the specification the "Value" is written as it is specified in clause 9.2 enclosed by quotation marks, e.g. "Abstract Syntax Error (Reject)" or "Geographical Coordinates".

4 RRC Functions and Services provided to upper layers

4.1 RRC Functions

RRC performs following functions. A more detailed description of the functions can be found in ETSI TS 101 376-3-23 [15].

- Broadcast of information provided by the Non-Access stratum (Core Network).

- Broadcast of information related to the access stratum.
- Establishment, re-establishment, maintenance and release of an RRC connection between the MES and GERAN.
- Establishment, reconfiguration and release of Radio Bearers.
- Assignment, reconfiguration and release of radio resources for the RRC connection.
- RRC connection mobility functions.
- Release of signalling connections.
- Paging/notification.
- Listening to BCCH.
- Routing of higher layer PDUs.
- Control of requested QoS.
- MES measurement reporting and control of the reporting.
- Power control.
- Control of ciphering.
- Integrity protection.
- Support for Location Services.
- Timing advance control.

4.2 RRC Services provided to upper layers

The RRC offers the following services to upper layers (NAS), a description and primitives of these services are provided in ETSI TS 101 376-3-23 [15] and ETSI TS 123 110 [19].

- General Control.
- Notification.
- Dedicated control.

The RRC layer provides the MES GERAN portion of signalling connections to the upper layers to support the exchange of upper layer's information flow. The signalling connection is used between the MES and the core network to transfer upper layer information. For each core network domain, at most one signalling connection may exist at the same time. The RRC layer maps the signalling connections for one MES on a single RRC connection. For the upper layer data transfer on signalling connections, the RRC layer supports the discrimination between two different classes, named "High priority" (corresponding to "SAPI 0" when using RR) and "Low priority" (corresponding to "SAPI 3").

5 Services expected from lower layers

5.1 Services required from layer 2 and physical layers

RRC uses RLC/MAC as layer 2 in the control plane, except for operation on the BCCH, where the data link layer as specified in ETSI TS 101 376-4-6 [6] is used (see ETSI TS 101 376-3-23 [15]).

5.2 Signalling Radio Bearers

The Radio Bearers used for transferring signalling messages are called Signalling Radio Bearers (SRBs). In the present document a single radio bearer is used for all signalling purposes. The SRBs are defined as:

- SRB1 - Not used in GMR-1 3G.
- SRB2 - This SRB operates in RLC acknowledged mode. This SRB is used to carry RRC signalling performed in support of Access Stratum specific needs as well carry high and low priority Non Access Stratum (NAS) signalling to support NAS specific needs. The MES as well the network shall prioritize the transmission of messages on SRB2 in following order of decreasing priority:
    - RRC signalling messages.
    - High priority NAS signalling messages.
    - Low priority NAS signalling messages.
- SRB3 - Not used in GMR-1 3G. Services provided by SRB3 for carrying high priority NAS signalling are provided by SRB2.
- SRB4 - Not used in GMR-1 3G. Services provided by SRB4 for carrying low priority NAS signalling are provided by SRB2.

6 RRC Protocol modes and states

6.1 General

An overall picture of the transitions RRC states and modes is in figure 6.1.1. The RRC modes are RRC-Idle mode and RRC-Connected mode. RRC-Connected mode consists of three different RRC states RRC-Cell_Shared, RRC-Cell_Dedicated and RRC-GRA_PCH.

RR Group receive mode and RR Group transmit Mode are not described in figure 6.1.1.

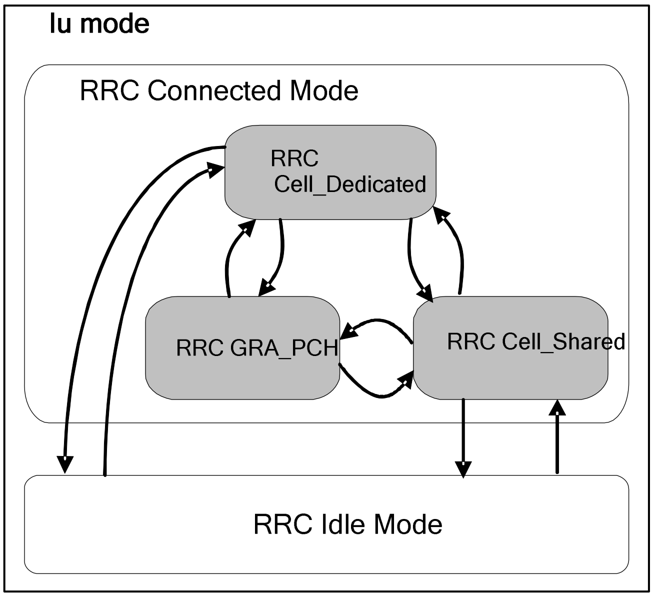

Figure 6.1.1: Transitions between RRC states and modes

6.2 Relation between Iu mode and A/Gb mode

6.2.1 Handover between Iu and A/Gb modes

Not supported in GMR-1 3G.

6.2.2 Cell reselection between Iu and A/Gb mode

Not supported in GMR-1 3G.

6.2a Relation between GERAN Iu mode RRC and UTRA RRC

6.2a.1 Handover between GERAN Iu mode and UTRAN

When a handover which results in change from GERAN *Iu mode* (i.e. RRC-Cell_Dedicated state) to UTRAN is performed, the UTRAN RRC connected mode of operation shall be entered.

When a handover which results in change from UTRAN (i.e. from the UTRA RRC Cell_DCH state) to GERAN *Iu mode* is performed, the RRC-Cell_Dedicated state shall be entered.

6.2a.2 Cell reselection between GERAN Iu mode and UTRAN

Cell reselection in this clause refers to aborting the operation in the old cell and switching to the new selected cell.

When a cell reselection which results in change from GERAN *Iu mode* to UTRAN is performed, when the MES is in RRC-Idle mode, the Idle mode of operation shall be entered.

When a cell reselection which results in change from GERAN *Iu mode* to UTRAN is performed, when the MES is in GERAN RRC-Cell_Shared state, the MES shall enter the RRC idle mode, establish an RRC connection and enter the UTRAN RRC CELL_FACH state.

When a cell reselection which results in change from GERAN *Iu mode* to UTRAN is performed, when the MES is in GERAN RRC-GRA_PCH state, the MES shall enter the RRC idle mode, establish an RRC connection and enter the UTRAN RRC CELL FACH state. If the GRA identity which the MES had been assigned to in GERAN is not present in the list of URA identities broadcast in the UTRAN cell, the MES shall initiate the UTRAN URA update procedure. If the URA update is rejected by UTRAN, the MES shall release the RRC connection according to the URA update failure case and enter Idle mode.

When a cell reselection which results in change from UTRAN to GERAN *Iu mode* is performed, the MES shall release the RRC connection and enter RRC Idle mode in GERAN *Iu mode*.

When a cell reselection which results in change from UTRAN to GERAN *Iu mode* is performed, when the MES is in UTRAN RRC-Cell_FACH or Cell_PCH state, the MES shall release the RRC connection and enter RRC Idle mode in GERAN *Iu mode*.

6.3 RR modes of operation

The RR modes of operation are described in ETSI TS 101 376-3-22 [16].

6.4 RRC modes and states

6.4.1 RRC-Idle Mode

6.4.1.1 General

After power on having selected the *Iu mode*, the MES enters RRC-Idle mode. The MES stays in RRC-Idle mode until a successful establishment of a RRC Connection. In RRC-Idle mode the connection of the MES is closed on all layers of the access stratum. In RRC-Idle mode the MES is identified by Non-Access stratum identities such as IMSI, TMSI and P-TMSI. In addition, the GERAN has no own information about the individual MESs in RRC-Idle mode, and it can only address e.g. all MESs in a cell (broadcasting) or all MESs monitoring a paging occasion. An MES in RRC-Idle mode shall perform periodic position measurements and update the network based on the parameters and procedures described in ETSI TS 101 376-4-8 [7].

6.4.1.2 Transition from RRC-Idle Mode to RRC-Connected mode

The transition to the RRC-Connected mode from the RRC-Idle mode can only be initiated by the MES by transmitting a request for an RRC Connection. The event is triggered by a request from upper layers in the MES. When transitioning to RRC-Connected mode from RRC-Idle mode, RRC shall indicate to the lower layers to access the network using RACH. If the MES entered the RRC-Idle mode due to RRC Connection reject with the Pause Timer included, it shall wait for the time specified in the Pause Timer parameter before attempting to access the network using RACH.

At RRC connection establishment the MES is assigned a GERAN radio network temporary identity (G-RNTI) to be used as MES identity on both common control channels and traffic channels.

When the MES receives a message from the network that confirms the RRC connection establishment, the MES enters the RRC-Connected mode. The RRC-Connected mode is characterized by three states: RRC-Cell_Shared, RRC-Cell_Dedicated and RRC-GRA_PCH.

6.4.2 RRC-Connected mode: RRC-Cell_Shared state

6.4.2.1 General

RRC-Cell_Shared state is characterized by:

- no dedicated channel (DCH) is allocated to the MES, except in the case of a temporarily assigned DCH (see ETSI TS 101 376-4-12 [13]);
- the position of the MES is known by GERAN on cell level according to the cell where the MES last made a cell update.

In RRC-Cell_Shared state the MES shall perform the following actions:

1> initiate a Cell Update procedure on cell change to *Iu mode* in another GERAN or UTRAN cell;

1> transmit signalling messages and user data in the uplink and/or the downlink using PDTCH when the MES is assigned use of those resources;

1> the management of radio resources within the cell is handled at MAC level;

1> use G-RNTI assigned in the current cell as the MES identity.

NOTE: In that state, if the network wants to initiate any activity, no paging request is required to be sent. The network can directly allocate radio resources to the MES.

6.4.2.2 Transition from RRC-Cell_Shared state to RRC-Idle Mode

The transition to RRC-Idle Mode is realized through the release of the RRC connection.

6.4.2.3 Transition from RRC-Cell_Shared state to RRC-Cell_Dedicated state

The transition from RRC-Cell_Shared state to RRC-Cell_Dedicated state occurs when a DCH is allocated to the MES.

6.4.2.4 Transition from RRC-Cell_Shared state to RRC-GRA_PCH state

The transition occurs when GERAN orders the MES to move to RRC-GRA_PCH state via explicit signalling or implicitly.

When transition to RRC-GRA_PCH state is triggered via explicit signalling, the mobile earth station shall abort any TBF in progress by immediately ceasing to decode the downlink, ceasing to transmit on the uplink, stopping all RLC/MAC timers prior to moving to RRC-GRA_PCH state.

The mobile earth station shall implicitly transition to RRC-GRA_PCH state when all TBFs including that setup for signalling radio bearers (SRB2) and user radio bearers (RB5+) are normally released without an associated RRC connection release.

6.4.2.5 Radio resource allocation tasks

RRC is in this state responsible for allocating dedicated physical channels, which causes the MES to enter the RRC-Cell_Dedicated state. MAC is responsible for allocating/reallocating/releasing shared physical channels (PDCH) (see ETSI TS 101 376-4-14 [14]). This allocation of the PDTCHs by MAC is done according to the QoS class of the radio bearer and multislot capability of the MES. The RRC provides the MAC with QoS class and indication of the MES multislot capability.

6.4.2.6 RRC connection mobility tasks

In RRC-Cell_Shared state the MES shall initiate a GRA Update procedure when:

1> a new GERAN cell has been selected and the MES operates in *Iu mode*; or

1> a UTRAN cell has been selected;

1> when T305 in the MES expires and the MES is operating in *Iu mode*.

6.4.2.7 MES measurements

MAC is responsible for measurement reporting, using the procedures defined in ETSI TS 101 376-4-12 [13].

6.4.3 RRC-Connected mode: RRC-Cell_Dedicated state

6.4.3.1 General

RRC-Cell_Dedicated state is characterized by:

- the MES is assigned one or more dedicated physical channels (see ETSI TS 101 376-3-23 [15]) in the uplink and downlink, which it can use anytime. Furthermore, the MES may be assigned one or more shared physical channels;
- the position of the MES is known by GERAN on cell level.

In RRC-Cell_Dedicated state the MES shall perform the following actions:

1> perform necessary procedures for measurement reporting;

1> listen to neighbouring cells for neighbouring cell measurements (see ETSI TS 101 376-5-6 [9]);

1> perform a handover procedure of the dedicated physical channels on cell change of another GERAN or UTRAN cell;

1> transmit signalling message in the uplink using available signalling radio bearers.

6.4.3.2 Transition from RRC-Cell_Dedicated state to RRC-Cell_Shared state

The transition occurs when all the dedicated physical channels are released; and:

1> shared physical channels exist; or

1> no shared physical channels exist and the network indicates transition to the RRC-Cell_Shared state.

6.4.3.3 Transition from RRC-Cell_Dedicated state to RRC-Idle Mode

The transition to RRC-Idle mode is realized through the release of the RRC connection.

6.4.3.4 Transition from RRC-Cell_Dedicated state to RRC-GRA_PCH state

The transition occurs when GERAN orders the MES to move to the RRC-GRA_PCH state via explicit signalling.

When such a signalling is received, the MES shall release all the allocated dedicated physical channel(s) and, if any, all the shared physical channels, prior to moving to RRC-GRA_PCH state.

6.4.3.5 Radio resource allocation tasks

RRC is responsible for allocating new dedicated physical channels, while MAC or RRC are responsible for allocation of new shared physical channels depending on the MAC control state. RRC is also responsible for intra-cell handovers of dedicated physical channels.

6.4.3.6 RRC connection mobility tasks

RRC connection mobility tasks are realized in RRC-Cell_Dedicated state using RRC handover procedures.

6.4.3.7 MES measurements

MES measurement results are signalled using RRC measurement procedures.

6.4.4 RRC-Connected mode: RRC-GRA_PCH state

6.4.4.1 General

The RRC-GRA_PCH state is characterized by:

- no physical channel is allocated to the MES;
- the MES may use DRX for monitoring a CCCH;
- no uplink activity is possible;
- the location of the MES is known on GERAN Registration area level.

In this state the MES performs the following actions:

1> monitor the paging occasions according to the DRX cycle and receive paging information on the CCCH;

1> listen to the BCCH control channel of the serving cell for the decoding of system information messages;

1> initiate a GRA Update procedure on detection of a new GERAN registration area;

1> initiate periodic GRA update on PCCCH or CCCH. PCCCH shall be used only if packet control channel resources (based on the last carrier used successfully to complete a TBF, see ETSI TS 101 376-4-12 [13]) are available in the cell. If packet channel resources are not available, the MES shall perform the GRA update on the CCCH, as defined in ETSI TS 101 376-4-8 [7]. Availability of packet channel resources is indicated in system information;

1> perform GPS position determination and reporting as specified in ETSI TS 101 376-4-8 [7]. Note that ETSI TS 101 376-4-8 [7] refers to IDLE mode procedure. The same procedure is to be executed in the RRC-GRA_PCH state.

If the MES wants to request resources to initiate user activity and packet control channel resources are not available (based on the last carrier used successfully to complete a TBF), the MES shall make a request by sending a Cell Update message on the CCCH within the GRA in which the MES is located.

If the network wants to initiate any activity, it shall make a paging request on the CCCH logical channel within the GRA in which the MES is located.

GRA updating is initiated by the MES, which, upon the detection of the new GERAN registration area, sends the network the registration area update information to the new cell. Any activity causes a transition to either the RRC-Cell_Shared state or the RRC-Cell_Dedicated state, depending on the activity.

6.4.4.2 Transition from RRC-GRA_PCH state to RRC-Cell_Shared state

The transition can occur due to GRA update, cell update or answer to paging. If there has been a cell change since last GRA update, the MES has to do immediately a cell update except when GRA update is initiated.

6.4.4.3 Transition from RRC-GRA_PCH state to RRC-Cell_Dedicated state

When the MES is in RRC-GRA_PCH state, the MES may request a radio resource to answer to a paging message or to perform a GRA/Cell Update procedure. The network may choose to allocate a dedicated resource in which case the MES enters RRC-Cell_Dedicated state.

6.4.4.4 Radio resource allocation tasks

No radio resource allocation tasks are executed within this state. In case of transition to RRC-Cell_Shared state is needed, the MAC is responsible for allocating the shared physical channels. In case of transition to RRC-Cell_Dedicated state is needed, the RRC is responsible for allocating the dedicated physical channel.

6.4.4.5 RRC connection mobility tasks

In the RRC-GRA_PCH state the location of a MES is known on GERAN Registration area level.

In this state, the MES mobility is performed through Cell Reselection procedures. The MES shall perform cell reselection and upon selecting a new GERAN cell belonging to a GRA which does not match the GRA used by the MES, the MES shall move to RRC-Cell_Shared state and initiate a GRA update towards the network. After the GRA Update procedure has been performed, the MES shall change its state back to RRC-GRA PCH state if neither the MES nor the network has any more data to transmit.

In RRC-GRA_PCH state the MES shall initiate:

1> a GRA Update procedure when a new GERAN cell has been selected that does not belong to the current registration area and the MES operates in Iu mode; or

1> a GRA Update procedure when T305 in the MES expires and the MES is operating in Iu mode; or

1> a URA Update procedure when a UTRAN cell has been selected that does not belong to the current registration area (see ETSI TS 125 331 [21]).

6.4.4.6 MES measurements

The MES monitors the broadcast channels on its own and neighbouring cells and identifies the need for GRA updating. No measurement reports are sent to the network in this state.

6.4.4.7 Transfer and update of system information

The MES shall listen to the BCCH to acquire a valid system information.

7 Radio Resource Control procedures

7.1 General

After the reception of a message which invoked a procedure, the MES shall be prepared to receive and act on another message which invokes the second procedure. Whether this second invocation of a procedure (transaction) is accepted or rejected by the MES is specified in the clauses that specifies the procedure. On receiving a message the MES shall first apply integrity check as appropriate and then proceed with error handling as specified in clauses 8 and 9 before continuing on with the procedure as specified in the relevant clause. The RRC entity in the MES shall consider PDUs to have been transmitted when they are submitted to the lower layers. If the RRC entity in the MES submits a message for transmission using AM RLC, it shall consider the message successfully transmitted when GERAN reception of all relevant PDUs is acknowledged by RLC.

7.2 Change of channels in case of handover

7.2.1 Change of channel serving SRB1

Not supported in GMR-1 3G.

7.2.2 Change of channel serving SRB2

The RLC procedures for acknowledged mode, described in ETSI TS 101 376-4-14 [14], provide delivery of received messages to the upper layers in the order they were originally transmitted, provide protection against message loss, but do not provide protection against message duplication. SRB2 is used by RRC procedures as well as RRC messages carrying upper layer (NAS) signalling.

When changing channel, the RRC layer will request the RLC layer to suspend operation on SRB2 before the MES leaves the old channel. When the channel change has been completed, the RRC layer station will request the RLC layer to resume operation on SRB2. The RLC layer suspend/resume procedures are described in ETSI TS 101 376-4-14 [14].

It may happen that the RLC layer duplicates a message, if it has been transmitted but not yet completely acknowledged within the RLC layer, before the MES leaves the old channel. However, the RRC layer controls the channels change in such a way that duplication of RRC messages does not occur. RRC however does not ensure that NAS messages are not duplicated. If these NAS messages are sensitive to message duplication, the upper layer protocol should define its own protection mechanism.

7.2.3 Change of channel serving SRB3

Not supported in GMR-1 3G.

7.2.4 Change of channel serving SRB4

Not supported in GMR-1 3G.

7.3 System information broadcasting

7.3.1 General

The purpose of this procedure is to broadcast SYSTEM INFORMATION (SI) messages from the GERAN to MESs in a cell.

GERAN is required to broadcast SI messages on BCCH as specified in ETSI TS 101 376-4-8 [7].

7.3.2 Broadcast of Iu mode specific System Information

See ETSI TS 101 376-4-8 [7].

7.4 Paging procedure

7.4.1 General

The GERAN will start a Paging Request procedure to trigger:

1> an Initial Direct Transfer procedure for CN originated paging; or

1> a Cell Update procedure for GERAN initiated paging.

Paging is done by the GERAN on the CCCH when the MES is in RRC-Idle mode and RCC-GRA_PCH state.

7.4.2 Paging initiation in RRC-Idle mode, or RRC-GRA_PCH state

7.4.2.1 General

The paging initiation in RRC-Idle mode, or RRC-GRA_PCH state is done by sending a PAGING REQUEST service primitive to the GERAN MAC layer.

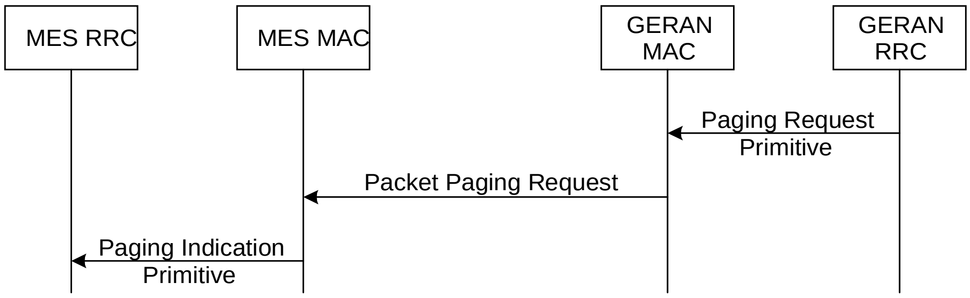

Figure 7.4.2.1.1: Paging Request procedure

This procedure is used to initiate transmission of paging information by the GERAN MAC to an MES in RRC-Idle mode or RRC-GRA_PCH state. Upper layers in the network may request paging, to e.g. establish a signalling connection between a MES and the CN. The GERAN may initiate paging of an MES in RRC-GRA_PCH state to trigger a Cell Update procedure in order to establish a signalling connection between the network and this MES.

An MES may use Discontinuous Reception (DRX) to reduce its power consumption. An MES in non-DRX mode monitors all paging blocks on the monitored CCCH. An MES in DRX mode needs only to monitor the blocks corresponding to its paging group in order to reduce its battery consumption, see ETSI TS 101 376-5-2 [8].

7.4.2.2 Initiation

GERAN RRC initiates the Paging procedure by transmitting a PAGING REQUEST service primitive to the GERAN MAC sublayer.

The GERAN shall set the IEs in the PAGING service primitive as follows:

1> if the Paging procedure was initiated by the CN;

2> if the MES is in RRC-GRA_PCH state; then:

3> the *MES Identity* IE shall be set to G-RNTI;

3> the *Paging Record Type Identifier* IE shall be set to the value determined by the MES identity received in the CN paging request;

3> the *CN Domain identity* IE shall be set to the value received in the CN paging request;

3> if a value for Paging Cause is received from the CN, then the GERAN RRC shall:

4> set the *Paging Cause* IE in the PAGING service primitive to the value received in the CN paging request;

3> if no value for Paging Cause is received from the CN then the GERAN RRC shall:

4> set the *Paging Cause* IE in the PAGING service primitive to the value "Terminating - cause unknown";

2> if the MES is in RRC-Idle mode then:

3> the *MES Identity* IE shall be set to the value received from the CN;

3> the *CN Domain Identity* IE shall be set to the value received in the CN paging request;

3> if a value for Paging Cause is received from the CN then the GERAN RRC shall:

4> set the *Paging Cause* IE in the PAGING service primitive to the value received in the CN paging request;

3> if no value for Paging Cause is received from the CN then the GERAN RRC shall:

4> set the *Paging Cause* IE in the PAGING service primitive to the value "Terminating - cause unknown";

1> if the Paging procedure was initiated by the GERAN, the GERAN RRC shall:

2> set the *MES Identity* IE to G-RNTI; and

2> the procedure ends.

If the Paging procedure is initiated by the GERAN, the GERAN shall indicate this to the MES by the absence of any information in the PAGING message other than the G-RNTI IE.

7.4.2.3 Reception of a PAGING INDICATION service primitive

The MES RRC in RRC-Idle mode or RRC-GRA_PCH state shall receive the paging information in a PAGING INDICATION service primitive from the MES MAC layer.

If the MES is in RRC-Idle mode, for each MES paged in the PAGING INDICATION service primitive, the MES shall:

1> if the *MES Identity* IE is present in the message and it is a CN identity;

2> compare the *MES Identity* IE with all of its allocated CN MES identities;

2> if one match is found:

3> forward the *MES Identity* IE, the *CN Domain Identity* IE and the *Paging cause* IE to upper layers; and

3> ignore any other paging information that may be present in the PAGING service primitive;

1> otherwise:

2> ignore the PAGING service primitive.

If the MES is in RRC-GRA_PCH state, for each MES paged in the PAGING INDICATION service primitive, the GERAN RRC shall:

1> if the *MES Identity* IE is a GERAN identity; and:

2> if this G-RNTI is the same as the G-RNTI allocated to the MES:

3> if paging request contains page info with CN domain identity:

4> forward the *MES identity* IE, the *CN Domain Identity* IE and the *Paging Cause IE* to upper layers;

3> otherwise:

4> initiate the Cell Update procedure with the cause "paging response" as defined in clause 7.8; and

4> forward the *CN Domain Identity* IE if present, the *Paging Record Type Identifier* IE if present and the *Paging cause* IE if present to upper layers; and

3> ignore any other paging information that may be present in the primitive;

1> otherwise:

2> ignore the Paging primitive.

7.4.3 Paging initiation in RRC-Cell_Dedicated state

Dedicated Paging is not supported in GMR-1 3G.

7.4.4 Abnormal cases

If the MES receives a DEDICATED PAGING REQUEST message, which contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE, the MES shall perform procedure specific error handling as follows:

1> transmit an RRC STATUS message on the uplink SRB2;

1> include the IE "*Identification of Received Message*";

1> set the IE "*Received Message Type*" to DEDICATED PAGING REQUEST;

1> include the *Protocol Error Information* IE and set the content to the value of the variable PROTOCOL_ERROR_INFORMATION;

1> if the RRC STATUS message has been submitted to lower layers for transmission:

2> continue with any ongoing processes and procedures as if the invalid DEDICATED PAGING REQUEST message was not received.

7.5 RRC Connection management procedures

7.5.1 RRC connection establishment

7.5.1.0 Signalling flow

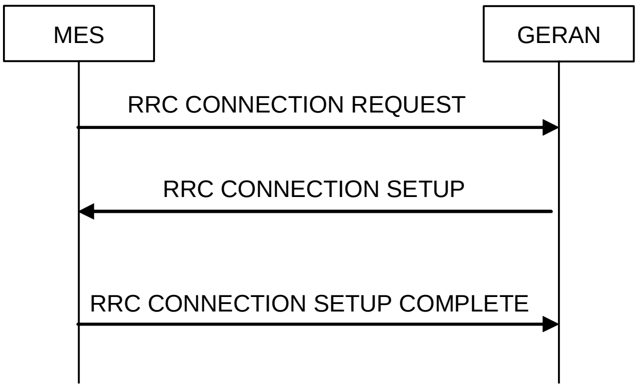

Figure 7.5.1.0.1: RRC Connection Establishment, network accepts RRC connection

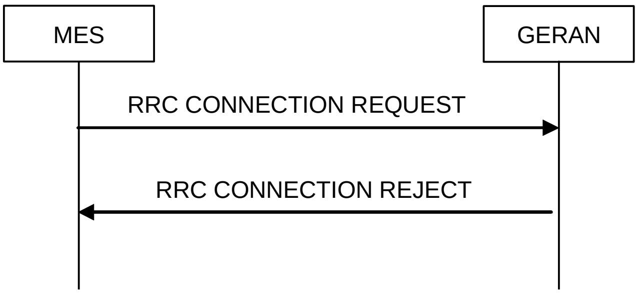

Figure 7.5.1.0.2: RRC Connection Establishment, network rejects RRC connection

7.5.1.1 General

The purpose of this procedure is to establish an RRC connection.

7.5.1.2 Initiation

The MES shall initiate the procedure when upper layers in the MES requests the establishment of a signalling connection and the MES is in RRC-Idle mode (no RRC connection exists), as specified in clause 7.17.

Upon initiation of the procedure, the MES shall:

1> set the variable PROTOCOL_ERROR_INDICATOR to FALSE;

1> if the USIM is present:

2> set the value of "THRESHOLD" in the variable "START_THRESHOLD" by the 20 MSBs of the value stored in the USIM (see ETSI TS 131 102 [22]) for the maximum value of START for each CN Domain;

1> if the SIM is present:

2> set the value of "THRESHOLD" in the variable "START_THRESHOLD" to the default value in ETSI TS 133 102 [23] for each CN Domain;

1> set the contents of the RRC CONNECTION REQUEST message according to clause 7.5.1.3;

1> submit the RRC CONNECTION REQUEST message for transmission on the uplink CCCH;

1> if the RLC sub-layer indicates a link failure to the RRC layer:

2> enter RRC-Idle mode;

2> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

2> consider the RRC Connection Establishment procedure to be unsuccessful;

2> the procedure ends.

7.5.1.3 RRC CONNECTION REQUEST message contents to set

The MES shall, in the transmitted RRC CONNECTION REQUEST message on CCCH:

1> set the IE "*Establishment Cause*" to the value of the variable ESTABLISHMENT_CAUSE.

7.5.1.4 Reception of an RRC CONNECTION REQUEST message by the GERAN

Upon receiving an RRC CONNECTION REQUEST message, the GERAN shall either:

1> submit an RRC CONNECTION SETUP message to the lower layers for transmission on the downlink SRB2; or

1> submit an RRC CONNECTION REJECT message on the downlink CCCH. In the RRC CONNECTION REJECT message, the GERAN may direct the MES to another GERAN cell. After the RRC CONNECTION REJECT message has been sent, all context information for the MES may be deleted in GERAN.

7.5.1.5 T300 timeout

If the MES has not yet received an RRC CONNECTION SETUP message with the value of the IE "*Initial MES Identity*" equal to the value of the variable INITIAL_MES_IDENTITY and if cell re-selection or expiry of timer T300 occurs the MES shall:

1> check the value of V300; and

2> if V300 is equal to or smaller than N300:

3> set the IEs in the RRC CONNECTION REQUEST message according to clause 7.5.1.3;

3> submit a new RRC CONNECTION REQUEST message to lower layers for transmission on the uplink SRB2;

3> increment counter V300;

3> if the RLC sub-layer indicates to the RRC layer a successful transmission of the RRC CONNECTION REQUEST message:

4> restart timer T300;

3> if the RLC sub-layer indicates a link failure to the RRC layer:

4> enter RRC-Idle mode;

4> perform the actions specified in clauses 6 and 7.18;

4> consider the RRC Connection Establishment procedure to be unsuccessful;

4> the procedure ends;

2> if V300 is greater than N300:

3> enter RRC-Idle mode;

3> consider the procedure to be unsuccessful;

3> other actions the MES shall perform when MES is in RRC-Idle mode are specified in clause 6;

3> the procedure ends.

7.5.1.6 Abortion of RRC connection establishment

If the MES has not yet entered GERAN RRC-Connected mode and the RRC Connection Establishment is to be aborted as specified in clause 7.17.1.4, the MES shall:

1> consider the procedure to be unsuccessful;

1> perform the actions when MES is in RRC-Idle mode as specified in clauses 6 and 7.18.

The procedure ends.

7.5.1.7 Reception of an RRC CONNECTION SETUP message by the MES

On receipt of an RRC CONNECTION SETUP message, the MES shall:

1> act upon all received information elements as specified in clause 7.19;

1> Stop timer T300;

1> enter in RRC-Connected mode according to clause 7.19;

1> submit an RRC CONNECTION SETUP COMPLETE message to the lower layers on the uplink SRB2 after successful state transition, with the contents set as specified below:

2> set the IE "*RRC Transaction Identifier*" to:

3> the value of "RRC transaction identifier" in the entry for the RRC CONNECTION SETUP message in the table "Accepted transactions" in the variable TRANSACTIONS; and

3> clear that entry;

2> set the IE "*Initial MES Identity"* in the variable INITIAL_MES_IDENTITY according to clause 7.18;

2> if the USIM or SIM is present:

3> set the "START" for each CN domain in the IE "*START List*" in the RRC CONNECTION SETUP COMPLETE message with the corresponding START value that is stored in the USIM (see ETSI TS 131 102 [22]) if present, or as stored in the MES if the SIM is present; and then

3> set the START value stored in the USIM (see ETSI TS 131 102 [22]) if present, and as stored in the MES if the SIM is present, for any CN domain to the value "THRESHOLD" of the variable START_THRESHOLD;

2> if neither the USIM nor SIM is present:

3> set the "START" for each CN domain in the IE "*START List*" in the RRC CONNECTION SETUP message to zero;

3> set the value of "THRESHOLD" in the variable "START_THRESHOLD" to the default value as specified in ETSI TS 133 102 [23];

2> retrieve its GERAN *Iu mode* MES radio access capability information elements from variable the MES_CAPABILITY_REQUESTED; and then

2> include this in IE "*MES GERAN Iu mode Radio Access Capability*", in the RRC CONNECTION SETUP COMPLETE message;

2> retrieve its inter-RAT specific MES and UE radio access capability information elements from the variable MES_CAPABILITY_REQUESTED; and then

2> include this in structure "*Inter-RAT MES Radio Access Capability*";

2> If a valid current GPS position (see ETSI TS 101 376-4-8 [7]) was included in RRC CONNECTION REQUEST message transmitted on CCCH:

3> then include "*MES GPS Position IE"* and "*Time Stamp IE*";

2> else, the MES shall not include "*MES GPS Position IE"* or "*Time Stamp IE*". Specifically the MES shall not initiate any procedures for GPS position calculation. The RRC CONNECTION SETUP COMPLETE message is submitted to lower layers for transmission;

1> if the RLC sub-layer indicates to the RRC layer a successful transmission of the RRC CONNECTION SETUP COMPLETE message the MES shall:

2> if the MES has entered RRC-Cell_Shared state:

3> start timer T305 using its initial value if periodical update has been configured by T305 in the IE "*MES Timers and Constants in Connected mode*" set to any other value than "infinity" the variable TIMERS_AND_CONSTANTS;

2> store the contents of the variable MES_CAPABILITY_REQUESTED into the variable MES_CAPABILITY_TRANSFERRED;

2> initialize variables upon entering RRC-Connected mode as specified in clause 10.4;

2> consider the procedure to be successful;

2> and the procedure ends;

1> else, the RLC sub-layer indicates to the RRC layer a link failure condition. The MES shall:

2> enter RRC-Idle mode;

2> perform the actions specified in clauses 6 and 7.18;

2> consider the RRC Connection Establishment procedure to be unsuccessful;

2> the procedure ends.

7.5.1.8 Cell re-selection

1> if the MES performs cell re-selection; or

1> if the MES will be in the RRC-Cell_Shared state at the conclusion of this procedure; and

1> if the contents of the variable G_RNTI is empty;

1> after having received an RRC CONNECTION SETUP message; and

1> before the RRC CONNECTION SETUP COMPLETE message is delivered to lower layers for transmission.

The MES shall:

1> clear the entry for the RRC CONNECTION SETUP message in the table "Accepted transactions" in the variable TRANSACTIONS;

1> set the IEs in the RRC CONNECTION REQUEST message according to clause 7.5.1.3;

1> submit a new RRC CONNECTION REQUEST message to the lower layers for transmission on CCCH;

1> set counter V300 to 1; and

1> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message on RACH:

2> start timer T300;

1> if the RLC sub-layer indicates a link failure to the RRC layer:

2> enter RRC-Idle mode;

2> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

2> consider the RRC Connection Establishment procedure to be unsuccessful;

2> the procedure ends.

7.5.1.9 Invalid RRC CONNECTION SETUP message

If the MES receives an RRC CONNECTION SETUP message and the RRC CONNECTION SETUP message contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MES shall perform procedure specific error handling as follows:

1> clear the entry for the RRC CONNECTION SETUP message in the table "Rejected transactions" in the variable TRANSACTIONS and proceed as below;

1> if V300 is equal to or smaller than N300:

2> set the variable PROTOCOL_ERROR_INDICATOR to TRUE;

2> set the IEs in the RRC CONNECTION REQUEST message according to clause 7.5.1.3;

2> submit a new RRC CONNECTION REQUEST message to the lower layers for transmission on the uplink SRB2;

2> increment counter V300; and

2> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

3> restart timer T300;

2> if the RLC sub-layer indicates a link failure to the RRC layer:

3> enter RRC-Idle mode;

3> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

3> consider the RRC Connection Establishment procedure to be unsuccessful;

3> the procedure ends.

1> if V300 is greater than N300:

2> enter RRC-Idle mode;

2> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

2> consider the RRC Establishment procedure to be unsuccessful;

2> the procedure ends.

7.5.1.10 Reception of an RRC CONNECTION REJECT message by the MES

When the MES receives an RRC CONNECTION REJECT message on the CCCH, the MES shall:

1> enter RRC-Idle mode;

1> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

1> consider the RRC Connection Establishment procedure to be unsuccessful;

1> procedure ends.

7.5.1.11 Invalid RRC CONNECTION REJECT message

If the MES receives an RRC CONNECTION REJECT message which contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MES shall perform procedure specific error handling as follows.

The MES shall:

1> if the IE "*Pause Timer*" is not equal to "0":

2> if V300 is equal to or smaller than N300:

3> set the IEs in the RRC CONNECTION REQUEST message according to clause 7.5.1.3;

3> then submit a new RRC CONNECTION REQUEST message to the lower layers for transmission on the uplink SRB2;

3> increment counter V300; and

3> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

4> restart timer T300;

3> if the RLC sub-layer indicates a link failure to the RRC layer:

4> enter RRC-Idle mode;

4> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

4> consider the RRC Connection Establishment procedure to be unsuccessful;

4> the procedure ends;

2> if V300 is greater than N300:

3> enter RRC-Idle mode;

3> perform the actions specified in clause 6 when entering RRC-Idle mode;

3> consider the RRC Establishment procedure to be unsuccessful;

3> the procedure ends;

1> if the IE "*Pause Timer*" is equal to "0":

2> enter RRC-Idle mode;

2> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

2> consider the RRC Establishment procedure to be unsuccessful;

2> the procedure ends.

7.5.2 RRC connection release

7.5.2.0 Signalling flow

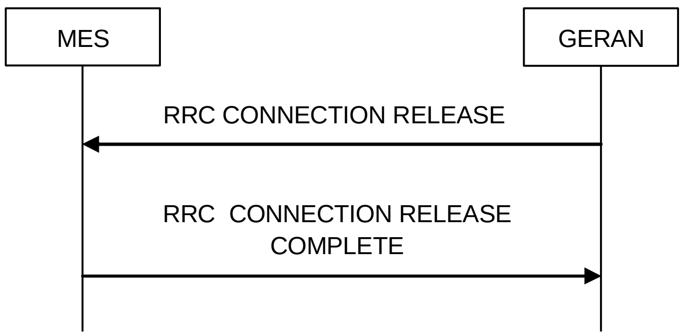

Figure 7.5.2.0.1: RRC Connection Release procedure

7.5.2.1 General

The purpose of this procedure is to release the RRC connection and all radio bearers between the MES and the GERAN. By doing so, all established signalling connections will be released.

7.5.2.2 Initiation

When the MES is in state RRC-Cell_Dedicated state or RRC-Cell_Shared state, the GERAN may at anytime initiate an RRC connection release by transmitting an RRC CONNECTION RELEASE message using SRB2.

7.5.2.3 Reception of an RRC CONNECTION RELEASE message by the MES

The MES shall receive and act on an RRC CONNECTION RELEASE message in states RRC-Cell_Dedicated state and RRC-Cell_Shared state. Furthermore this procedure can interrupt any ongoing procedures with the MES in the above listed states.

When the MES receives the RRC CONNECTION RELEASE message, it shall:

1> in state RRC-Cell_Dedicated state:

 2> set the IE "*RRC Transaction Identifier*" in the RRC CONNECTION RELEASE COMPLETE message to the value of "RRC transaction identifier" in the entry for the RRC CONNECTION RELEASE message in the table "Accepted transactions" in the variable TRANSACTIONS; and

 2> submit an RRC CONNECTION RELEASE COMPLETE message to the lower layers for transmission the SRB2 to the GERAN;

1> in state RRC-Cell_Shared state:

 2> set the IE "RRC *Transaction Identifier*" in the RRC CONNECTION RELEASE COMPLETE message tothe value of "RRC transaction identifier" in the entry for the RRC CONNECTION RELEASE message in the table "Accepted transactions" in the variable TRANSACTIONS; and

 2> submit an RRC CONNECTION RELEASE COMPLETE message to the lower layers for transmission using the SRB2;

1> when the successful delivery of the RRC CONNECTION RELEASE COMPLETE message has been confirmed by the lower layers:

 2> locally release all temporary block flows (see ETSI TS 101 376-4-14 [14]) and associated radio resources; and

 2> indicate the release of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers; and

 2> clear any entry for the RRC CONNECTION RELEASE message in the tables "Accepted transactions" and "Rejected transactions" in the variable TRANSACTIONS;

 2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

 2> clear the variable ESTABLISHED_RABS;

 2> pass the value of the IE "*Release Cause*" received in the RRC CONNECTION RELEASE message to upper layers:

  3> if the Release Cause is set to "Directed Signalling Connection Establishment":

   4> then MES shall also pass the new RAI to upper layers. The new RAI information shall be formed using the NAS System Information GSM-MAP IE present in RRC CONNECTION RELEASE message;

 2> enter RRC-Idle mode;

2> perform the actions specified in clauses 7.18 and 6 when entering RRC-Idle mode from RRC-Connected mode;

2> and the procedure ends.

7.5.2.4 Invalid RRC CONNECTION RELEASE message

If the RRC CONNECTION RELEASE message contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, and if the "protocol error cause" in PROTOCOL_ERROR_INFORMATION is set to any cause value except "CSN.1 violation or encoding error", the MES shall perform procedure specific error handling as follows.

The MES shall:

1> ignore any IE(s) causing the error but treat the rest of the RRC CONNECTION RELEASE message as normal according to clause 7.5.2.3, with an addition of the following actions;

1> set the IE "*RRC Transaction Identifier*" in the RRC CONNECTION RELEASE COMPLETE message to the value of "RRC transaction identifier" in the entry for the RRC CONNECTION RELEASE message in the table "Rejected transactions" in the variable TRANSACTIONS; and

1> include the IE "*Error Indication*" in the RRC CONNECTION RELEASE COMPLETE message with:

2> the IE "*Failure Cause*" set to the cause value "Protocol error"; and

2> the IE "*Protocol Error Information*" set to the value of the variable PROTOCOL_ERROR_INFORMATION.

7.5.2.5 Cell re-selection or radio link failure

If the MES performs cell re-selection or the radio link failure criteria in clause 7.18 is met at any time during the RRC connection release procedure and the MES has not yet entered idle mode, the MES shall:

1> if radio link failure occurred (RRC-Cell_Dedicated state):

2> release all its radio resources;

2> indicate the release of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> enter RRC-Idle mode;

2> perform the actions specified in clauses 6 and 7.18 when entering RRC-Idle mode from RRC-Connected mode;

2> and the procedure ends.

7.5.2.6 Reception of an RRC CONNECTION RELEASE COMPLETE message by GERAN

When GERAN receives an RRC CONNECTION RELEASE COMPLETE message from the MES, it shall:

1> acknowledge RRC CONNECTION RELEASE COMPLETE message (see ETSI TS 101 376-4-14 [14]);

1> optionally, start an implementation dependent, timer to supervise the release of radio resources;

1> on expiry of the implementation dependent timer (if used), release all MES dedicated resources and the procedure ends on the GERAN side.

When the optional implementation dependent timer is used, the network shall acknowledge any RRC CONNECTION RELEASE COMPLETE messages retransmitted from the MES.

7.5.2.7 Unsuccessful transmission of the RRC CONNECTION RELEASE COMPLETE message, acknowledged mode transmission

When RLC does not succeed in transmitting the RRC CONNECTION RELEASE COMPLETE message, the MES shall:

1> release all its radio resources;

1> indicate the release of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

1> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

1> clear the variable ESTABLISHED_RABS;

1> enter RRC-Idle mode;

1> perform the actions specified in clauses 6 and 7.18 when entering RRC-Idle mode from RRC-Connected mode;

1> and the procedure ends.

7.5.2.8 Detection of loss of dedicated physical channel by GERAN in RRC-Cell_Dedicated state

If the release is performed from the state RRC-Cell_Dedicated state, and GERAN detects loss of the dedicated basic physical channel according to clause 7.18, GERAN may release all MES dedicated resources, even if no RRC CONNECTION RELEASE COMPLETE message has been received.

7.5.2.9 Failure to receive RRC CONNECTION RELEASE COMPLETE message by GERAN

If GERAN does not receive any RRC CONNECTION RELEASE COMPLETE message, it shall release all MES dedicated resources.

7.6 Transmission of MES capability information

7.6.1 General

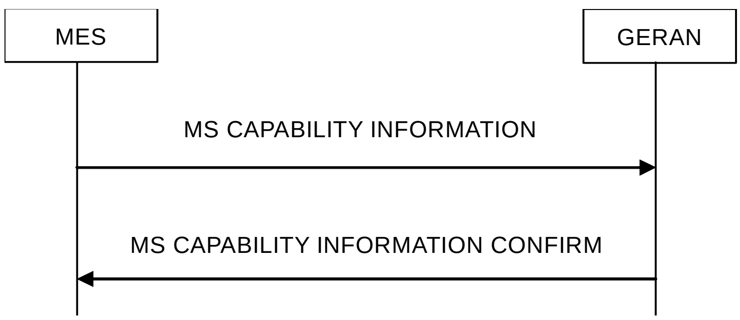

Figure 7.6.1.1: Transmission of MES capability information, normal flow

The MES Capability Update procedure is used by the MES to convey MES specific capability information to the GERAN.

7.6.2 Initiation

The MES shall initiate the MES Capability Update procedure in the following situations:

1> the MES receives a MES CAPABILITY ENQUIRY message from the GERAN;

1> while in RRC-Connected mode the MES capabilities change compared to those stored in the variable MES_CAPABILITY_TRANSFERRED.

If the MES CAPABILITY INFORMATION message is sent in response to a MES CAPABILITY ENQUIRY message, the MES shall:

1> include the IE "*RRC Transaction Identifier*"; and

1> set it to the value of "RRC Transaction Identifier" in the entry for the MES CAPABILITY ENQUIRY message in the table "Accepted transactions" in the variable TRANSACTIONS;

1> retrieve the GERAN *Iu mode* radio access capability information elements from variable MES_CAPABILITY_REQUESTED; and

1> include this in IE "*MES GERAN Iu mode Radio Access Capability*", provided this IE is included in variable MES_CAPABILITY_REQUESTED;

1> retrieve its inter-RAT and inter-mode specific MES radio access capability information elements from variable MES_CAPABILITY_REQUESTED; and

1> include this in IE "*MES GERAN A/Gb mode Radio Access Capability*", IE "*UE UTRAN Radio Access Capability*", IE "*UE UTRAN Predefined Configuration Status Information*" and in IE "*UE CDMA2000 Radio Access Capability*", provided this IE is included in variable MES_CAPABILITY_REQUESTED.

In the present document, the MES is required to maintain only GERAN Iu Mode radio access capability. In MES CAPABILITY INFORMATION the MES shall signal non availability of all radio capabilities except GERAN Iu mode radio access capability.

If the MES CAPABILITY INFORMATION message is sent because one or more of the MES capabilities change compared to those stored in the variable MES_CAPABILITY_TRANSFERRED while in RRC-Connected mode, the MES shall include the information elements associated with the capabilities that have changed in the MES CAPABILITY INFORMATION message.

If the MES is in RRC-GRA_PCH state, it shall first perform a Cell Update procedure using the cause "Uplink Data Transmission", see clause 7.8.

The MES RRC shall submit the MES CAPABILITY INFORMATION message to the lower layers for transmission on the uplink using SRB2. The MES RRC shall:

1> set counter V304 to 1;

1> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

  2> start timer T304;

1> if the RLC sub-layer indicates a link failure to the RRC layer:

  2> enter RRC-Idle mode;

  2> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

  2> consider the MES Capability Update procedure to be unsuccessful;

  2> the procedure ends.

7.6.3 Reception of an MES CAPABILITY INFORMATION message by the GERAN

Upon reception of a MES CAPABILITY INFORMATION message, the GERAN should transmit a MES CAPABILITY INFORMATION CONFIRM message on the downlink SRB2. After the MES CAPABILITY INFORMATION CONFIRM message has been submitted to the lower layers for transmission, the procedure is complete.

In GMR-1 3G, the network shall ignore all radio capability information except for GERAN *Iu mode* radio access capability.

7.6.4 Reception of the MES CAPABILITY INFORMATION CONFIRM message by the MES

Upon reception of a MES CAPABILITY INFORMATION CONFIRM message, the MES shall:

1> stop timer T304;

1> if there is an entry for the MES CAPABILITY ENQUIRY message present in the table "Accepted transactions" in the variable TRANSACTIONS:

  2> clear that entry;

1> update its variable MES_CAPABILITY_TRANSFERRED with the MES capabilities it has last transmitted to the GERAN during the current RRC connection;

1> clear the variable MES_CAPABILITY_REQUESTED;

1> and the procedure ends.

7.6.5 Invalid MES CAPABILITY INFORMATION CONFIRM message

If the MES receives a MES CAPABILITY INFORMATION CONFIRM message, which contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MES shall perform procedure specific error handling as follows:

1> stop timer T304;

1> transmit an RRC STATUS message on the uplink using SRB2;

1> include the IE "*Identification of Received Message";* and

1> set the IE "*Received Message Type*" to MES CAPABILITY INFORMATION CONFIRM; and

1> set the IE "*RRC Transaction Identifier*" to the value of "RRC transaction identifier" in the entry for the MES CAPABILITY INFORMATION CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS; and

1> clear that entry;

1> include the IE "*Protocol Error Information*" with contents set to the value of the variable PROTOCOL_ERROR_INFORMATION;

1> when the RRC STATUS message has been submitted to lower layers for transmission:

  2> restart timer T304 and continue with any ongoing procedures or processes as if the invalid MES CAPABILITY INFORMATION CONFIRM message has not been received.

7.6.6 T304 timeout

Upon expiry of timer T304, the MES shall check the value of V304 and:

1> if V304 is smaller than or equal to N304:

2> prior to retransmitting the MES CAPABILITY INFORMATION message:

3> if the IE "*Status*" in the variable INTEGRITY_PROTECTION_INFO has the value "Started":

4> include the same IEs as in the last unsuccessful attempt of this message, except for the IE "*Integrity Check Info*", which is modified as follows:

5> increment the "Uplink RRC Message sequence number" for signalling radio bearer RB2 in the variable INTEGRITY_PROTECTION_INFO by one;

5> set the IE "*RRC Message Sequence Number*" in the IE "*Integrity Check Info*" by the value of the "Uplink RRC Message sequence number" for signalling radio bearer RB2 in the variable INTEGRITY_PROTECTION_INFO in this message;

5> recalculate the IE "*Message Authentication Code*" in the IE "*Integrity Check Info*" in this message, in accordance with clause 7.18;

3> else:

4> include the same IEs as in the last unsuccessful attempt of this message;

2> send the MES CAPABILITY INFORMATION message on SRB2;

2> restart timer T304;

2> increment counter V304.

1> if V304 is greater than N304:

2> initiate the Cell Update procedure as specified in clause 7.8 using the cause "radio link failure".

7.7 MES capability enquiry

7.7.1 General

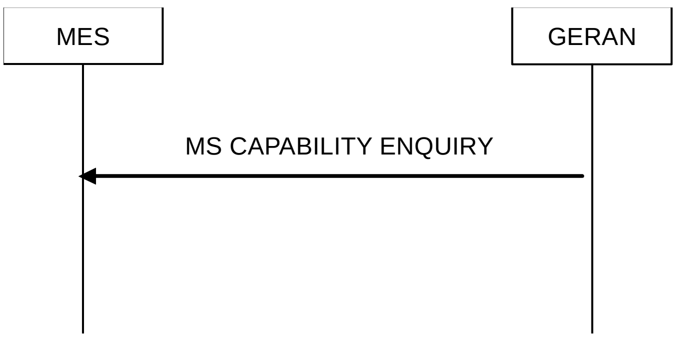

Figure 7.7.1.1: MES Capability Enquiry procedure, normal flow

The MES Capability Enquiry procedure can be used to request the MES to transmit its capability information related to any radio access network that is supported by the MES. For a multi-RAT MES this procedure allows in addition to request UTRAN predefined configuration status information.

7.7.2 Initiation

The MES Capability Enquiry procedure is initiated by the GERAN by transmitting a MES CAPABILITY ENQUIRY message using SRB2.

7.7.3 Reception of an MES CAPABILITY ENQUIRY message by the MES

Upon reception of an MES CAPABILITY ENQUIRY message, the MES shall act on the received information elements as specified in clauses 7.19 and 7.18 and initiate the transmission of MES Capability Information procedure, which is specified in clause 7.6.

7.7.4 Invalid MES CAPABILITY ENQUIRY message

If the MES receives a MES CAPABILITY ENQUIRY message, which contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MES shall perform procedure specific error handling as follows:

1> transmit an RRC STATUS message on the uplink using SRB2;

1> include the IE "*Identification of Received Message";* and

1> set the IE "*Received Message Type*" to MES CAPABILITY ENQUIRY; and

1> set the IE "*RRC Transaction Identifier*" to the value of "RRC transaction identifier" in the entry for the MES CAPABILITY ENQUIRY message in the table "Rejected transactions" in the variable TRANSACTIONS; and

1> clear that entry;

1> include the IE "*Protocol Error Information*" with contents set to the value of the variable PROTOCOL_ERROR_INFORMATION;

1> when the RRC STATUS message has been submitted to lower layers for transmission:

  2> continue with the ongoing processes and procedures as if the invalid MES CAPABILITY ENQUIRY message has not been received.

7.8 RRC Connection mobility procedures

7.8.1 Cell Update procedures

7.8.1.0 Signalling flows

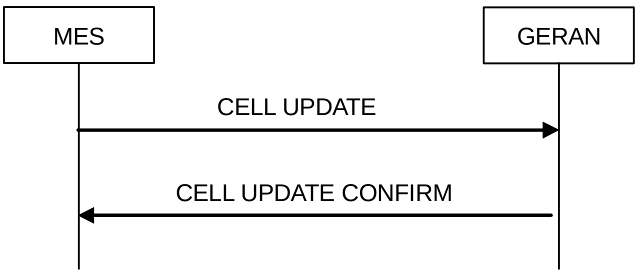

Figure 7.8.1.0.1: Cell Update procedure, basic flow

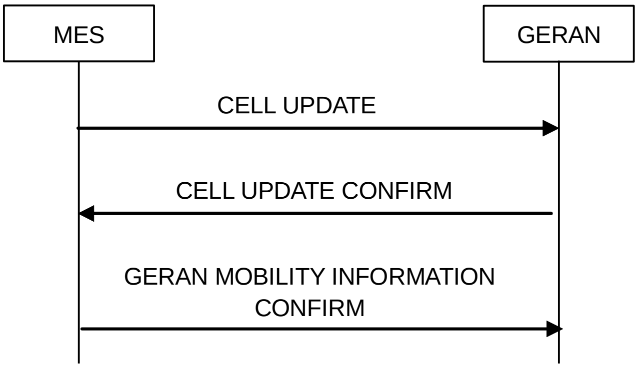

Figure 7.8.1.0.2: Cell Update procedure with update of GERAN mobility information

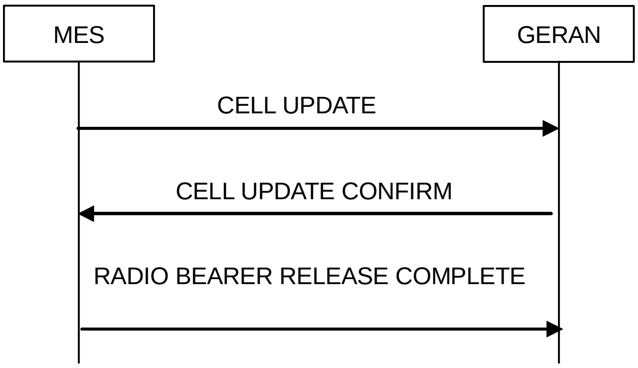

Figure 7.8.1.0.3: Cell Update procedure with radio bearer release

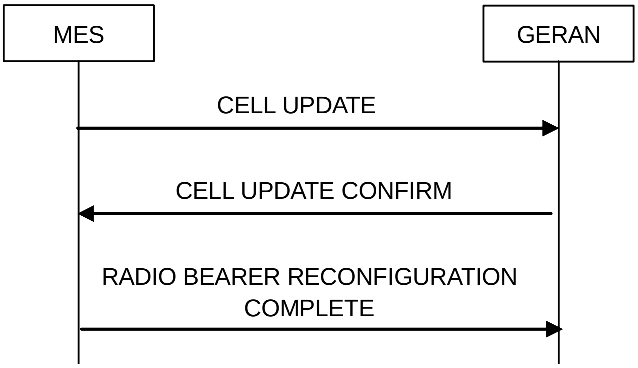

Figure 7.8.1.0.4: Cell Update procedure with radio bearer reconfiguration

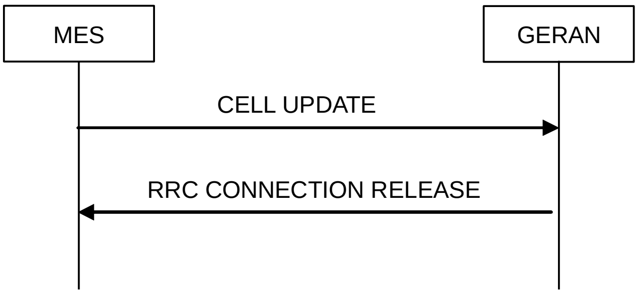

Figure 7.8.1.0.5: Cell Update procedure, failure case

7.8.1.1 General

In GMR-1 3G, the Cell Update procedure is optimized to reduce the round trip message exchanges. A Cell Update is requested on CCCH or PCCCH.

The Cell Update procedures serve several main purposes:

- to request uplink data transmission while in RRC-GRA_PCH state;
- to notify GERAN on reception of GERAN originated paging while in RRC-GRA_PCH state;
- to notify GERAN of an RLC unrecoverable error (see ETSI TS 101 376-4-14 [14]) on an AM or UM RLC entity;
- to act on a radio link failure or notification of invalid RLC/MAC control message in the RRC-Cell_Dedicated state;
- to act on the transmission failure of the MES CAPABILITY INFORMATION message.

The Cell Update procedures may:

- include an update of mobility related information in the MES;
- cause a state transition from RRC-GRA_PCH state to RRC-Idle mode.

The Cell Update procedure may also include:

- a re-establish of layer 2, AM and UM RLC entities;
- a radio bearer release, or radio bearer reconfiguration;
- a DCH assignment.

7.8.1.2 Initiation

A MES shall initiate the Cell Update procedure in the following cases:

1> Uplink data transmission:

 2> if the MES is in RRC-GRA_PCH state; and

 2> if the MES has uplink signalling or data to transmit triggered by the initiation of a voice call;

  3> perform cell update using the cause "RRC Cell Update/initiating conversational call".

 2> if the MES has uplink signalling or data to transmit except a GRA UPDATE message;

  3> perform cell update using the cause "RRC Cell Update/uplink data transmission".

1> Paging response:

 2> if the criteria for performing cell update with the cause specified above in the current clause is not met; and

 2> if the MES in RRC-GRA_PCH state receives paging information from the lower layers fulfilling the conditions for initiating a Cell Update procedure specified in clause 7.4:

  3> perform cell update using the cause "RRC Cell Update/paging response".

1> Radio link failure:

 2> if none of the criteria for performing cell update with the causes specified above in the current clause is met; and

  3> if the MES is in RRC-Cell_Dedicated state; and the criteria for radio link failure is met as specified in clause 7.18; or

  3> if the criteria for radio link failure is met as specified in clause 7.18 the transmission of the MES CAPABILITY INFORMATION message fails as specified in clause 7.6.6:

   4> perform cell update using the cause "RRC Cell Update/radio link failure".

1> RLC unrecoverable error:

2> if none of the criteria for performing cell update with the causes specified above in the current clause is met; and

2> if the MES detects an RLC unrecoverable error (see ETSI TS 101 376-4-14 [14]) in an AM or UM RLC entity:

3> perform cell update using the cause "RRC Cell Update/Unrecoverable error".

When initiating the Cell Update procedure, the MES shall:

1> stop timer T305;

1> if the MES is in RRC-Cell_Dedicated state:

2> in the variable RB_TIMER_INDICATOR, set the IE "*T314 Expired*" and the IE "*T315 Expired*" to FALSE;

2> if the stored values of the timer T314 and timer T315 are both equal to zero, or if the stored value of the timer T314 is equal to zero and there are no radio bearers associated with any radio access bearers for which in the variable ESTABLISHED_RABS the value of the IE "*Re-establishment timer*" is set to "useT315":

3> release all its radio resources;

3> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

3> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

3> clear the variable ESTABLISHED_RABS;

3> enter RRC-Idle mode;

3> perform other actions when entering RRC-Idle mode from RRC-Connected mode as specified in clauses 6 and 7.18;

3> and the procedure ends;

2> if the stored value of the timer T314 is equal to zero:

3> release all radio bearers, associated with any radio access bearers for which in the variable ESTABLISHED_RABS the value of the IE "*Re-establishment Timer*" is set to "useT314";

3> in the variable RB_TIMER_INDICATOR set the IE "T314 expired" to TRUE;

2> if the stored value of the timer T315 is equal to zero:

3> release all radio bearers associated with any radio access bearers for which in the variable ESTABLISHED_RABS the value of the IE "*Re-establishment Timer*" is set to "useT315";

3> in the variable RB_TIMER_INDICATOR set the IE "T315 expired" to TRUE;

2> if the stored value of the timer T314 is greater than zero:

3> if there are radio bearers associated with any radio access bearers for which in the variable ESTABLISHED_RABS the value of the IE "*Re-establishment Timer*" is set to "useT314":

4> start timer T314;

2> if the stored value of the timer T315 is greater than zero:

3> if there are radio bearers associated with any radio access bearers for which in the variable ESTABLISHED_RABS the value of the IE "*Re-establishment timer*" is set to "useT315":

4> start timer T315;

2> for the released radio bearer(s):

3> delete the information about the radio bearer from the variable ESTABLISHED_RABS;

3> when all radio bearers belonging to the same radio access bearer have been released:

4> indicate local end release of the radio access bearer to upper layers using the CN domain identity together with the RAB identity stored in the variable ESTABLISHED_RABS;

4> delete all information about the radio access bearer from the variable ESTABLISHED_RABS;

2> set the variable ORDERED_RECONFIGURATION to FALSE;

1> set the variables PROTOCOL_ERROR_INDICATOR, FAILURE_INDICATOR, UNSUPPORTED_CONFIGURATION and INVALID_CONFIGURATION to FALSE;

1> set the variable CELL_UPDATE_STARTED to TRUE;

1> in case of a Cell Update procedure:

2> set the contents of the CELL UPDATE message according to clause 7.8.1.3;

2> submit the CELL UPDATE message for transmission on the CCCH or PCCCH;

2> configure RLC entity handling SRB2 to assemble only the very first upper layer PDU received from GERAN;

NOTE: The very first upper PDU expected on SRB2 is an un-ciphered (but integrity protected if security mode procedure was successfully completed previously) CELL UPDATE CONFIRM or RRC CONNECTION RELEASE message.

1> set counter V302 to 1;

1> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

2> start timer T302;

2> while waiting for receipt of CELL UPDATE CONFIRM message on SRB2, the MES shall discard RLC PDUs received on all other radio bearers;

1> if the RLC sub-layer indicates a link failure to the RRC layer:

2> enter RRC-Idle mode;

2> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

2> consider the Cell Update procedure to be unsuccessful;

2> the procedure ends.

7.8.1.3 CELL UPDATE message contents to set

For initiating a Cell Update procedure the MES shall set the IEs in the CHANNEL REQUEST TYPE3 (see ETSI TS 101 376-4-8 [7]) or PACKET CHANNEL REQUEST TYPE2 (see ETSI TS 101 376-4-12 [13]) message as follows:

1> set the "*Establishment Cause*" corresponding to the cause specified in clause 7.8.1.2 that is valid when the Cell Update procedure was requested from lower layers;

1> set the "*S-RNTI*" to the value of the S-RNTI (see clause 10.9.1);

1> if Cell Update procedure is being initiated in response to request from upper layers for data transmission, then include the corresponding RB Id;

1> if Cell Update procedure is being initiated as a result of RLC unrecoverable error, then set RB Id to that of the RLC entity on which the error occurred;

1> if the value of the variable PROTOCOL_ERROR_INDICATOR is TRUE:

2> set the "*Establishment Cause*" to RRC Cell Update/Unrecoverable error;

1> if the value of the variable FAILURE_INDICATOR is TRUE:

2> set the "*Establishment Cause*" to RRC Cell Update/Unrecoverable error;

1> if an unrecoverable error (see ETSI TS 101 376-4-14 [14]) in any of the AM or UM RLC entities for the signalling radio bearers or user radio bearers are detected:

2> set the "*Establishment Cause*" to RRC Cell Update/Unrecoverable error;

1> Transmit a CHANNEL REQUEST TYPE3 or PACKET CHANNEL REQUEST TYPE2 as specified in ETSI TS 101 376-4-8 [7] and ETSI TS 101 376-4-14 [14].

7.8.1.4 Reception of an CELL UPDATE message by the GERAN

When the GERAN receives a CELL UPDATE message, the GERAN shall:

1> in case the procedure was triggered by reception of a CHANNEL REQUEST TYPE3 or PACKET CHANNEL REQUEST TYPE2 message requesting a Cell Update procedure:

2> if SBSS relocation was performed:

3> transmit a CELL UPDATE CONFIRM message on the downlink SRB2;

2> if SBSS relocation was not performed:

3> generate a new STARTn value;

3> initialize HFN component of all radio bearers with STARTn value;

3> apply integrity protection for CELL UPDATE CONFIRM message using STARTn;

3> transmit a un-ciphered CELL UPDATE CONFIRM message on the SRB2 with STARTn;

CELL UPDATE CONFIRM shall always be transmitted or retransmitted in un-ciphered mode.

3> optionally set the IE "*RLC re-establish indicator (RB2, RB3 and RB4)*" and/or the IE "*RLC re-establish indicator (RB5 and upwards*)" to TRUE to request a RLC re-establishment in the MES, in which case the corresponding RLC entities shall also be re-established in GERAN; or

3> apply the security mode configuration (keys) from the most recent, successful security mode procedure for all uplink and downlink radio bearers using STARTn;

3> if the IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info*", at which time the ciphering configuration shall be applied, was included for signalling radio bearer used to carry CELL UPDATE CONFIRM:

4> at the RLC Sequence number present in the IE "*RB Downlink Ciphering Activation Time Info*", start transmission of SRB RLC PDUs with security mode configuration;

3> if the IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info"* was not included for signalling radio bearer used to carry CELL UPDATE CONFIRM:

4> start transmission of SRB RLC PDUs with security mode configuration at the next RLC sequence number (modulo sequence number space);

3> if there is upper layer PDUs awaiting transmission for User Radio bearers (for which network has allocated radio resources):

4> after the last RLC PDU carrying CELL UPDATE CONFIRM is transmitted, start transmission of URB RLC PDUs with security mode configuration at RLC sequence number 0 (for Non-transparent mode Radio Bearers) or the next TDMA frame (for Transparent mode Radio Bearers):

After the last RLC PDU carrying CELL UPDATE CONFIRM, the GERAN shall be prepared to receive RLC PDU from all radio bearers with security mode configuration (keys) that was established by the most recent successful security mode procedure.

1> initiate an RRC Connection Release procedure (see clause 7.5.2) by transmitting an RRC CONNECTION RELEASE message on the SRB2. In particular GERAN shall:

2> if the CELL UPDATE message was sent because of an unrecoverable error in SRB2, SRB3 or SRB4:

3> the GERAN may initiate an RRC Connection Release procedure (clause 7.5.2) by transmitting an RRC CONNECTION RELEASE message on the SRB2. If RRC CONNECTION RELEASE is integrity protected, the network shall generate STARTn and use this for integrity protection.

7.8.1.5 Reception of the CELL UPDATE CONFIRM message by the MES

When the MES receives a CELL UPDATE CONFIRM message the MES shall:

1> stop timer T302;

1> configure RLC entity handling SRB2 to resume assemble of all subsequence upper layer PDU received from GERAN;

1> in case of a Cell Update procedure and the CELL UPDATE CONFIRM message:

2> include one of the RB information elements (*RB Information to Release list*, *RB Information to Reconfigure list*, *RB Information to Be Affected list*); and/or

2> include the IE "*DCH Description*" and structure "Network Response Times"; and

2> if the variable ORDERED_RECONFIGURATION is set to FALSE:

3> set the variable ORDERED_RECONFIGURATION to TRUE;

1> act upon all received information elements as specified in clause 7.19 unless specified otherwise in the following;

2> if the field "*RLC Re-establish indicator SRB2-4*" in the CELL UPDATE CONFIRM message is set to one:

3> if the struct "Downlink counter synchronization info" is not included in the CELL UPDATE CONFIRM message:

4> discard any RRC messages queued to the RLC-MAC layer that have not yet been transmitted to the network;

4> re-establish the RLC entities for signalling radio bearer SRB2, signalling radio bearer SRB3 and signalling radio bearer SRB4 (if established);

3> if the value of the IE "*Status*" in the variable CIPHERING_STATUS of the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN is set to "Started":

4> set the HFN component of the respective COUNT-C values for AM RLC entities SRB2, SRB3 and SRB4 (if established) equal to the STARTn IE included in CELL UPDATE CONFIRM message;

2> if the field "*RLC re-establish indicator RB5+*" in the CELL UPDATE CONFIRM message is set to one:

3> for radio bearers with RB identity larger than 4:

4> if the struct "Downlink counter synchronization info" is not included in the CELL UPDATE CONFIRM message:

5> re-establish the AM RLC entities;

4> if the value of the IE "*Status*" in the variable CIPHERING_STATUS of the CN domain as indicated in the IE "*CN Domain Identity*" in the IE "*RAB Info*" in the variable ESTABLISHED_RABS is set to "Started":

5> set the HFN component of the respective COUNT-C values for AM RLC entities equal to the STARTn value included in the received CELL UPDATE CONFIRM message for the CN domain;

1> if the CELL UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*" or contained the IE "*Integrity Protection Mode Info*":

2> set the IE "*Status*" in the variable SECURITY_MODIFICATION for all the CN domains in the variable SECURITY_MODIFICATION to "Affected";

1> enter a state according to clause 7.19 applied on the CELL UPDATE CONFIRM message.

If Cell Update Confirm message contains the "RB Priority" for a given RB, the MES shall use the value when prioritizing multiple RB traffic on an assigned Dedicated Channel (DCH).

If the MES after state transition enters RRC-GRA_PCH state, it shall:

1> start the timer T305 using its initial value if timer T305 is not running and periodical update has been configured by T305 in the IE "*MES Timers and Constants in Connected mode*" set to any other value than "infinity".

If the MES, after state transition, enters RRC-Cell_Dedicated or RRC-Cell_Shared state, it shall:

1> if the CELL UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*":

2> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

1> if the CELL UPDATE CONFIRM message contained the IE "*Integrity Protection Mode Info*":

2> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

1> apply the security mode configuration (keys) from the most recent, successful security mode procedure for all uplink and downlink radio bearers using STARTn (see clause7.19.4.11) supplied by the GERAN;

1> transmit a response message, on SRB2, per clause 7.8.1.6 to the GERAN;

The sequence number of RLC PDU transmitted by MES on SRB2 with security configuration shall start at 0.

1> resume data transmission on any suspended radio bearer and signalling radio bearer mapped on RLC-AM or RLC-UM or RLC-TM with security configuration that established by the most recent successful, security mode procedure;

The sequence number of RLC.PDU transmitted by MES on RLC-AM and RLC-UM with security configuration shall start at 0. For RLC-TM the activation time shall be the next uplink TDMA frame following the receipt of CELL UPDATE CONFIRM.

The MES shall resume transmission of data on SRBs and URBs on successful processing of CELL UPDATE CONFIRM message without waiting for a layer 2 acknowledgment of response message (if any) sent to the GERAN.

1> in case of a Cell Update procedure:

2> set the IE "*RRC Transaction Identifier*" in any response message transmitted below to the value of "RRC transaction identifier" in the entry for the CELL UPDATE CONFIRM message in the table "Accepted transactions" in the variable TRANSACTIONS; and

2> clear that entry;

1> if the variable PDCP_SN_INFO is non-empty:

2> include the IE "*RB with PDCP Information List*" in any response message transmitted below and set it to the value of the variable PDCP_SN_INFO;

1> if the variable ORDERED_RECONFIGURATION is set to TRUE caused by the received CELL UPDATE CONFIRM message in case of a cell update procedure:

2> set the variable ORDERED_RECONFIGURATION to FALSE;

1> clear the variable PDCP_SN_INFO;

1> in case of a Cell Update procedure:

2> clear the entry for the CELL UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

If the "*MAC Slot Allocation"* field in CELL UPDATE CONFIRM message is set to all zeros for some radio bearers, the MES shall:

1> set up the radio bearers without establishing the corresponding TBF (i.e. TBF released and no resources assigned).

The procedure ends.

7.8.1.6 Transmission of a response message to GERAN

If the CELL UPDATE CONFIRM message:

- includes the IE "RB Information to Release List":

the MES shall:

1> transmit a RADIO BEARER RELEASE COMPLETE as response message using SRB2.

If the CELL UPDATE CONFIRM message:

- does not include the IE "*RB Information to Release List*"; and

- includes the IE "*RB Information to Reconfigure List*";

the MES shall:

1> transmit a RADIO BEARER RECONFIGURATION COMPLETE as response message using SRB2.

If the CELL UPDATE CONFIRM message:

- does not include the IE "*RB Information to Release list"*; and

- does not include the IE "*RB Information to Be Affected list"*; and

- includes the IE "*RB Information to Setup list"*; and

the MES shall:

1> transmit a RADIO BEARER SETUP COMPLETE as response message on SRB2.

If the CELL UPDATE CONFIRM message:

- does not include RB Information Elements (*RB Information to Release list, RB Information to Reconfigure list, RB Information to Be Setup list)*; and
- includes the IE "*New G-RNTI*"; or
- includes the struct "Downlink Counter Synchronization Info" and the IE "*New G-RNTI*":

the MES shall:

1> transmit a GERAN MOBILITY INFORMATION CONFIRM as response message on the SRB2.

If the CELL UPDATE CONFIRM message:

- does not include RB Information Elements (*RB Information to Release list, RB Information to Reconfigure list, RB Information to Be Setup list*); and
- does not include "*CN Information Info*"; and
- does not include the IE "*Ciphering Mode Info*"; and
- does not include the IE "*Integrity Protection Mode Info*"; and
- does not include the IE "*New G-RNTI*":

the MES shall:

1> transmit no response message.

If the new state is RRC-Cell_Dedicated or RRC-Cell_Shared state, the response message shall be transmitted using the new configuration after the state transition, and the MES shall:

1> if the structure "*Downlink Counter Synchronization Info*" was included in the received CELL UPDATE CONFIRM message:

  2> when RLC has confirmed the successful transmission of the response message:

    3> if the variable PDCP_SN_INFO is empty:

      4> configure the RLC entity for all AM and UM radio bearers and AM and UM signalling radio bearers except SRB2 to "continue";

    3> else:

      4> configure the RLC entity for signalling radio bearers SRB1, SRB3 and SRB4 to "continue";

      4> configure the RLC entity for UM and AM radio bearers for which the IE "*PDCP SN Info*" is not included to "continue";

    3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the corresponding CN domain;

    3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN;

    3> set the remaining bits of the HFN component of the COUNT-C values of all UM RLC entities to zero;

    3> set the remaining bits of the HFN component of the COUNT-C values of all AM RLC entities to zero, for those bearers to which RLC entities where re-established;

3> if the IE "*PDCP Context Relocation Info*" is not present:

4> re-initialize the PDCP header compression entities of each radio bearer in the variable ESTABLISHED_RABS as specified in ETSI TS 101 376-4-15 [24];

3> if the IE "*PDCP Context Relocation Info"* is present:

4> perform the actions as specified in clause 7.19;

1> if the variable PDCP_SN_INFO is empty:

2> if the CELL UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*":

3> when RLC has confirmed the successful transmission of the response message:

4> continue with the remainder of the procedure;

2> if the CELL UPDATE CONFIRM message did not contain the IE "*Ciphering Mode Info*":

3> when RLC has been requested to transmit the response message;

4> continue with the remainder of the procedure;

1> if the variable PDCP_SN_INFO non-empty:

2> when RLC has confirmed the successful transmission of the response message:

3> for each radio bearer in the variable PDCP_SN_INFO:

4> if the IE "*RB Started*" in the variable ESTABLISHED_RABS is set to "started":

5> configure the RLC entity for that radio bearer to "continue";

3> continue with the remainder of the procedure.

If the new RRC state is RRC-GRA_PCH state, the response message shall be transmitted in RRC-Cell_Shared state, and the MES shall:

1> when RLC has confirmed the successful transmission of the response message:

2> if the IE "*Downlink Counter Synchronization Info*" was included in the received CELL UPDATE CONFIRM message:

3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the corresponding CN domain;

3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN;

3> set the remaining bits of the HFN component of the COUNT-C values of all UM RLC entities to zero;

3> set the remaining bits of the HFN component of the COUNT-C values of all AM RLC entities to zero, for those bearers to which RLC entities where re-established;

3> re-initialize the PDCP header compression entities of each radio bearer in the variable ESTABLISHED_RABS as specified in ETSI TS 101 376-4-15 [24].

2> for each radio bearer in the variable PDCP_SN_INFO:

3> if the IE "*RB Started*" in the variable ESTABLISHED_RABS is set to "started":

4> configure the RLC entity for that radio bearer to "continue";

2> enter the RRC-GRA_PCH state;

1> continue with the remainder of the procedure.

7.8.1.7 Physical channel failure

If the received CELL UPDATE CONFIRM message would cause the MES to transit to RRC-Cell_Dedicated state; and

1> if the MES failed to establish the physical channel(s) indicated in the received CELL UPDATE CONFIRM message according to the criteria defined in clause 7.8.1.6 are not fulfilled; or

1> the received CELL UPDATE CONFIRM message does not contain the IE "*DCH Description*";

the MES shall:

1> the IE "*Reconfiguration*" in the variable CIPHERING_STATUS is set to TRUE; and/or

1> the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO is set to TRUE:

2> abort the ongoing integrity and/or ciphering reconfiguration;

2> if the received CELL UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*":

3> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

3> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> if the received CELL UPDATE CONFIRM message contained the IE "*Integrity Protection Mode Info*":

3> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

3> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

1> if the variable ORDERED_RECONFIGURATION is set to TRUE caused by the received CELL UPDATE CONFIRM message:

2> set the variable ORDERED_RECONFIGURATION to FALSE;

1> if V302 is equal to or smaller than N302:

2> select a suitable GERAN cell according to ETSI TS 101 376-5-6 [9];

2> set the contents of the CELL UPDATE message according to clause 7.8.1.3, except for the IE "*Cell Update Cause*" which shall be set to "radio link failure";

2> submit the CELL UPDATE message for transmission on the uplink SRB2;

2> increment counter V302; and

2> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

3> restart timer T302;

2> if the RLC sub-layer indicates a link failure to the RRC layer:

3> enter RRC-Idle mode;

3> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

3> consider the Cell Update procedure to be unsuccessful;

3> the procedure ends.

1> if V302 is greater than N302:

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> in case of a cell update procedure:

3> clear the entry for the CELL UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

2> release all its radio resources;

2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> set the variable CELL_UPDATE_STARTED to FALSE;

2> enter RRC-Idle mode.

7.8.1.8 Unsupported configuration by the MES

If the MES does not support the configuration in the CELL UPDATE CONFIRM message and/or the variable UNSUPPORTED_CONFIGURATION is set to TRUE, the MES shall:

1> if V302 is equal to or smaller than N302, the MES shall:

2> if, caused by the received CELL UPDATE CONFIRM message;

3> the IE "*Reconfiguration*" in the variable CIPHERING_STATUS is set to TRUE; and/or

3> the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO is set to TRUE:

4> abort the ongoing integrity and/or ciphering reconfiguration;

4> if the received CELL UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*":

5> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

5> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

4> if the received CELL UPDATE CONFIRM message contained the IE "*Integrity Protection Mode Info*":

5> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

5> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> if the variable ORDERED_RECONFIGURATION is set to TRUE caused by the received CELL UPDATE CONFIRM message in case of a cell update procedure:

3> set the variable ORDERED_RECONFIGURATION to FALSE;

2> set the variable FAILURE_INDICATOR to TRUE;

2> set the variable FAILURE_CAUSE to "configuration unsupported";

2> set the content of the CELL UPDATE message according to clause 7.8.1.3;

2> submit the CELL UPDATE message for transmission on the uplink SRB2;

2> increment counter V302; and

2> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

3> restart timer T302;

2> if the RLC sub-layer indicates a link failure to the RRC layer:

3> enter RRC-Idle mode;

3> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

3> consider the Cell Update procedure to be unsuccessful;

3> the procedure ends.

1> if V302 is greater than N302, the MES shall:

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> clear the variable PDCP_SN_INFO;

2> clear the entry for the CELL UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

2> release all its radio resources;

2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> set the variable CELL_UPDATE_STARTED to FALSE;

2> enter RRC-Idle mode;

2> other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clause 7.18;

2> and the procedure ends.

7.8.1.9 Invalid configuration

If the variable INVALID_CONFIGURATION is set to TRUE, the MES shall:

1> if V302 is equal to or smaller than N302:

2> if, caused by the received CELL UPDATE CONFIRM message;

3> the IE "*Reconfiguration*" in the variable CIPHERING_STATUS is set to TRUE; and/or

3> the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO is set to TRUE:

4> abort the ongoing integrity and/or ciphering reconfiguration;

4> if the received CELL UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*":

5> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

5> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

4> if the received CELL UPDATE CONFIRM message contained the IE "*Integrity Protection Mode Info*";

5> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

5> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> if the variable ORDERED_RECONFIGURATION is set to TRUE caused by the received CELL UPDATE CONFIRM message in case of a cell update procedure:

3> set the variable ORDERED_RECONFIGURATION to FALSE;

2> in case of a Cell Update procedure:

3> set the variable FAILURE_INDICATOR to TRUE;

3> set the variable FAILURE_CAUSE to "Invalid configuration";

3> set the contents of the CELL UPDATE message according to clause 7.8.1.3;

3> submit the CELL UPDATE message for transmission on the uplink SRB2;

2> increment counter V302; and

2> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

3> restart timer T302;

2> if the RLC sub-layer indicates a link failure to the RRC layer:

3> enter RRC-Idle mode;

3> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

3> consider the Cell Update procedure to be unsuccessful;

3> the procedure ends.

1> if V302 is greater than N302:

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> clear the variable PDCP_SN_INFO;

2> clear the entry for the CELL UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

2> release all its radio resources;

2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> set the variable CELL_UPDATE_STARTED to FALSE;

2> enter RRC-Idle mode;

2> other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clause 7.18;

1> the procedure ends.

7.8.1.10 Incompatible simultaneous reconfiguration

In case of a cell update procedure and if the received CELL UPDATE CONFIRM message:

- includes RB information elements (*RB Information to Release list, RB Information to Reconfigure list, RB Information to Be Affected list)*; and
- if the variable ORDERED_RECONFIGURATION is set to TRUE because of an ongoing Reconfiguration procedure; or
- if the variable INCOMPATIBLE_SECURITY_RECONFIGURATION is set to TRUE due to the received CELL UPDATE CONFIRM message:

the MES shall:

1> if V302 is equal to or smaller than N302:

2> if, caused by the received CELL UPDATE CONFIRM message;

3> the IE "*Reconfiguration*" in the variable CIPHERING_STATUS is set to TRUE; and/or

3> the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO is set to TRUE:

4> abort the ongoing integrity and/or ciphering reconfiguration;

4> if the received CELL UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*":

5> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

5> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

4> if the received CELL UPDATE CONFIRM message contained the IE "*Integrity Protection Mode Info*":

5> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

5> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> if the variable ORDERED_RECONFIGURATION is set to TRUE caused by the received CELL UPDATE CONFIRM message in case of a Cell Update procedure:

3> set the variable ORDERED_RECONFIGURATION to FALSE;

2> set the variable FAILURE_INDICATOR to TRUE;

2> set the variable FAILURE_CAUSE to "Incompatible simultaneous reconfiguration";

2> set the content of the CELL UPDATE message according to clause 7.8.1.3;

2> submit the CELL UPDATE message for transmission on the uplink SRB2;

2> increment counter V302; and

2> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

3> restart timer T302;

2> if the RLC sub-layer indicates a link failure to the RRC layer:

3> enter RRC-Idle mode;

3> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

3> consider the Cell Update procedure to be unsuccessful;

3> the procedure ends;

1> if V302 is greater than N302:

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> clear the variable PDCP_SN_INFO;

2> set the variable INCOMPATIBLE_SECURITY_RECONFIGURATION to FALSE;

2> clear the entry for the CELL UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

2> release all its radio resources;

2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> set the variable CELL_UPDATE_STARTED to FALSE;

2> enter RRC-Idle mode;

2> other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clauses 6 and 7.18;

1> the procedure ends.

7.8.1.10a Security reconfiguration during Cell update procedure

If:

- the variable CELL_UPDATE_STARTED is set to TRUE; and

- the MES receives a SECURITY MODE COMMAND message:

the MES shall:

1> ignore the received SECURITY MODE COMMAND message and continue with any ongoing processes and procedures as if the SECURITY MODE COMMAND message had not been received.

7.8.1.11 Void

7.8.1.12 Invalid CELL UPDATE CONFIRM message

If the MES receives a CELL UPDATE CONFIRM message, which contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MES shall perform procedure specific error handling as follows:

1> if V302 is equal to or smaller than N302, the MES shall:

2> set the variable PROTOCOL_ERROR_INDICATOR to TRUE;

2> in case of a Cell Update procedure:

3> set the contents of the CELL UPDATE message according to clause 7.8.1.3;

3> submit the CELL UPDATE message for transmission on the uplink SRB2;

2> increment counter V302; and

2> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

3> restart timer T302;

2> if the RLC sub-layer indicates a link failure to the RRC layer:

3> enter RRC-Idle mode;

3> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

3> consider the Cell Update procedure to be unsuccessful;

3> the procedure ends.

1> if V302 is greater than N302, the MES shall:

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> in case of a Cell Update procedure:

3> clear the entry for the CELL UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> set the variable CELL_UPDATE_STARTED to FALSE;

2> release all its radio resources;

2> enter RRC-Idle mode;

2> other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clauses 6 and 7.18;

2> the procedure ends.

7.8.1.13 T302 expiry or cell reselection

If any or several of the following conditions are true:

- expiry of timer T302;
- reselection to another GERAN cell (including the previously serving cell) before completion of the Cell Update procedure;

the MES shall:

1> stop T302 if it is running;

1> if the MES was in RRC-Cell_Dedicated state prior to the initiation of the procedure; and

2> if timers T314 and T315 have elapsed while T302 was running:

3> enter RRC-Idle mode;

3> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers. Other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clauses 6 and 7.18;

3> and the procedure ends;

2> if timer T314 has elapsed while T302 was running; and

3> if "*T314 Expired*" in the variable RB_TIMER_INDICATOR is set to FALSE; and

3> if T315 is still running:

4> release locally all radio bearers which are associated with any radio access bearers for which in the variable ESTABLISHED_RABS the value of the IE "*Re-establishment Timer*" is set to "useT314";

4> indicate release of those radio access bearers to upper layers;

4> delete all information about those radio access bearers from the variable ESTABLISHED_RABS;

4> set "*T314 Expired*" in the variable RB_TIMER_INDICATOR to TRUE;

2> if timer T315 has elapsed while T302 was running; and

3> if "*T315 Expired*" in the variable RB_TIMER_INDICATOR is set to FALSE; and

3> if T314 is still running:

4> release locally all radio bearers which are associated with any radio access bearers for which in the variable ESTABLISHED_RABS the value of the IE "*Re-establishment Timer*" is set to "useT315";

4> indicate release of those radio access bearers to upper layers;

4> delete all information about those radio access bearers from the variable ESTABLISHED_RABS;

4> set "*T315 Expired*" in the variable RB_TIMER_INDICATOR to TRUE;

1> if, caused by the received CELL UPDATE CONFIRM message the IE "*Reconfiguration*" in the variable CIPHERING_STATUS is set to TRUE and/or the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO is set to TRUE:

2> abort the ongoing integrity and/or ciphering reconfiguration;

2> if the received CELL UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*":

3> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

3> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> if the received CELL UPDATE CONFIRM message contained the IE "*Integrity Protection Mode Info*":

3> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

3> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

1> if the variable ORDERED_RECONFIGURATION is set to TRUE caused by the received CELL UPDATE CONFIRM message in case of a cell update procedure:

2> set the variable ORDERED_RECONFIGURATION to FALSE;

1> in case of a Cell Update procedure:

2> clear any entry for the CELL UPDATE CONFIRM message in the table "Accepted transactions" in the variable TRANSACTIONS;

If the MES has not entered RRC-Idle mode, and:

1> if V302 is equal to or smaller than N302, the MES shall:

2> in case of a Cell Update procedure:

3> set the contents of the CELL UPDATE message according to clause 7.8.1.3;

3> if a CELL UPDATE CONFIRM message was received and caused the IE "Reconfiguration" in the variable CIPHERING_STATUS to be set to TRUE and/or the IE "Reconfiguration" in the variable INTEGRITY_PROTECTION_INFO to be set to TRUE:

4> if the IE "Downlink counter synchronization info" was included in the received CELL UPDATE CONFIRM message:

5> apply the new security (integrity protection) configuration received in the CELL UPDATE CONFIRM on the CELL UPDATE message;

3> submit the CELL UPDATE message for transmission on the uplink SRB2;

2> increment counter V302;

2> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

3> restart timer T302;

2> if the RLC sub-layer indicates a link failure to the RRC layer:

3> enter RRC-Idle mode;

3> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

3> consider the Cell Update procedure to be unsuccessful;

3> the procedure ends;

1> if V302 is greater than N302, the MES shall:

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> clear the variable PDCP_SN_INFO;

2> in case of a Cell Update procedure:

3> clear the entry for the CELL UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

2> release all its radio resources;

2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> set the variable CELL_UPDATE_STARTED to FALSE;

2> enter RRC-Idle mode;

2> other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clauses 6 and 7.18;

2> and the procedure ends.

7.8.1.14 T314 expiry

Upon expiry of timer T314 the MES shall:

1> if timer T302 is running:

2> continue awaiting response message from GERAN;

1> if timer T302 is not running and timer T315 is running:

2> set IE "*T314 Expired*" in variable RB_TIMER_INDICATOR to TRUE;

2> release locally all radio bearers which are associated with any radio access bearers for which in the variable ESTABLISHED_RABS the value of the IE "*Re-establishment Timer*" is set to "use T314";

2> indicate release of those radio access bearers to upper layers;

2> delete all information about those radio access bearers from the variable ESTABLISHED_RABS;

1> if timers T302 and T315 are not running:

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> clear the variable PDCP_SN_INFO;

2> clear the entry for the CELL UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

2> release all its radio resources;

2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> set the variable CELL_UPDATE_STARTED to FALSE;

2> enter RRC-Idle mode;

2> other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clauses 6 and 7.18;

2> and the procedure ends.

7.8.1.15 T315 expiry

Upon expiry of timer T315 the MES shall:

1> if timer T302 is running:

2> continue awaiting response message from GERAN;

1> if timer T302 is not running and timer T314 is running:

2> set IE "*T315 Expired*" in variable RB_TIMER_INDICATOR to TRUE;

2> release locally all radio bearers which are associated with any radio access bearers for which in the variable ESTABLISHED_RABS the value of the IE "*Re-establishment Timer*" is set to "use T315";

2> indicate release of those radio access bearers to upper layers;

2> delete all information about those radio access bearers from the variable ESTABLISHED_RABS;

1> if timers T302 and T314 are not running:

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> clear the variable PDCP_SN_INFO;

2> clear the entry for the CELL UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

2> release all its radio resources;

2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> set the variable CELL_UPDATE_STARTED to FALSE;

2> enter RRC-Idle mode;

2> other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clauses 6 and 7.18;

2> and the procedure ends.

7.8.1.16 Reception of the GERAN MOBILITY INFORMATION CONFIRM message by the GERAN

See clause 7.8.1.6.

7.8.1.17 Inter-RAT cell reselection to GERAN *Iu mode*

7.8.1.17.1 General

The purpose of the inter-RAT cell reselection procedure to GERAN *Iu mode* is to transfer, under the control of the MES and to some extent the source radio access technology, a connection between the MES and another radio access technology (e.g. UTRAN) to GERAN *Iu mode*.

7.8.1.17.2 Initiation

When the MES makes an inter-RAT cell reselection to GERAN *Iu mode* according to the criteria specified in ETSI TS 101 376-4-14 [14], it shall initiate this procedure. The inter-RAT cell reselection made by the MES may use system information broadcast from the source radio access technology or MES dedicated information.

When the MES performs an inter-RAT cell reselection from another RAT, the MES shall:

1> set the variable ESTABLISHMENT_CAUSE to "Inter-RAT cell reselection";

1> initiate an RRC connection establishment procedure as specified in clause 7.5;

1> after initiating an RRC connection establishment:

2> release all resources specific to the other radio access technology.

7.8.1.17.3 MES fails to complete an inter-RAT cell reselection

When the MES performs an inter-RAT cell reselection from a RAT other than UTRAN, and if the inter-RAT cell reselection fails before the MES has initiated the RRC connection establishment, the MES may return back to the other radio access technology.

When the MES performs an inter-RAT cell reselection from a RAT other than UTRAN, and if the RRC connection establishment fails, the MES shall enter RRC-Idle mode.

When the MES performs an inter-RAT cell reselection from UTRAN to GERAN *Iu mode*, and the cell reselection fails, the MES may return back to the UTRAN RRC Connected state, from which it initiated the inter-RAT cell reselection.

7.8.1.18 Inter-RAT cell reselection from GERAN Iu mode

7.8.1.18.1 General

The purpose of the inter-RAT cell reselection procedure from GERAN *Iu mode* is to transfer, under the control of the MES and to some extent the GERAN, a connection between the MES and GERAN *Iu mode* to another radio access technology (e.g. UTRAN).

7.8.1.18.2 Initiation

This procedure is applicable in states RRC-Cell_Shared or RRC GRA_PCH.

When the MES based on received system information makes a inter-RAT cell reselection to a radio access technology other than UTRAN, according to the criteria specified in ETSI TS 101 376-4-14 [14], the MES shall:

1> initiate the establishment of a connection to the target radio access technology according to its specifications.

When the MES in RRC-Cell_Shared state performs an inter-RAT cell reselection to UTRAN, according to the criteria specified in ETSI TS 101 376-4-14 [14], the MES shall:

1> initiate the cell update procedure according to ETSI TS 125 331 [21], using the cause "cell reselection" and setting the G-RNTI in the IE "*U-RNTI*". When the MES in RRC-GRA_PCH state performs an inter-RAT cell reselection to UTRAN, according to the criteria specified in ETSI TS 101 376-4-14 [14], the MES shall:

1> compare the GRA identity which the MES had been assigned to in GERAN against the URA identities which are broadcast in the UTRAN cell:

2> if the assigned GRA identity is not present in the list of URA identities that are broadcast in the UTRAN cell:

3> initiate the URA update procedure as specified in ETSI TS 125 331 [21], using the cause "change of URA" and setting the G-RNTI in the IE "*U-RNTI*".

7.8.1.18.3 Successful cell reselection

When the MES has succeeded in reselecting a cell in the target radio access technology other than UTRAN and has initiated the establishment of a connection, it shall release all GERAN specific resources.

When the MES has succeeded in reselecting to a UTRAN cell, it shall release all GERAN specific radio resources.

7.8.1.18.4 MES fails to complete an inter-RAT cell reselection

If the inter-RAT cell reselection to another radio access technology fails, the MES shall resume the connection to GERAN *Iu mode* using the resources used before initiating the inter-RAT cell reselection procedure.

7.8.2 GRA update procedure

7.8.2.0 Signalling flow

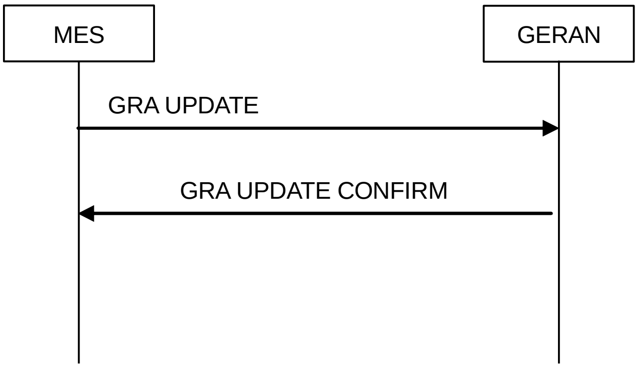

Figure 7.8.2.0.1: GRA Update procedure, basic flow

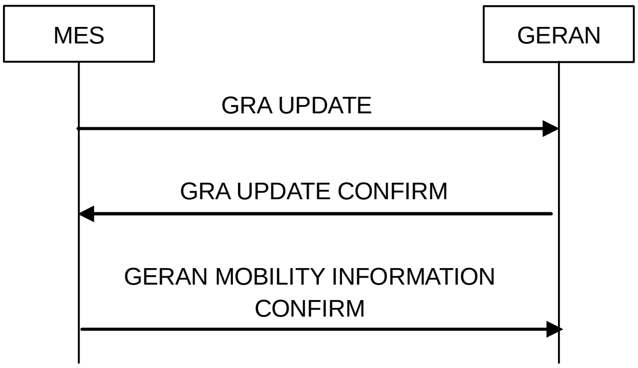

Figure 7.8.2.0.2: GRA Update procedure with update of GERAN mobility information

Figure 7.8.2.0.3: GRA Update procedure, failure case

7.8.2.1 General

In GMR-1 3G, GRA Update procedures are optimized to reduce the round trip message exchanges. A GRA Update is requested on CCCH or PCCCH.

The MES shall use GRA update procedure when it selects a new GRA. In addition the GRA Update procedure is used as a supervision mechanism in RRC-GRA_PCH state by means of periodical update.

The GRA Update procedures may:

- include an update of mobility related information in the MES.

7.8.2.2 Initiation

A MES in RRC-GRA_PCH state shall initiate the GRA Update procedure in the following cases:

1> GRA reselection:

2> if the MES detects that the current GRA assigned to the MES, stored in the variable GRA_IDENTITY, is not present in the list of GRA identities in system information:

3> perform GRA update using the cause "change of GRA".

1> Periodic GRA update:

2> if the criteria for performing GRA update with the causes as specified above in the current clause are not met; and

2> if the timer T305 expires while the MES is in RRC-GRA_PCH;

3> perform GRA update using the cause "periodic GRA update".

When initiating the GRA Update procedure, the MES shall:

1> stop timer T305;

1> set the variables PROTOCOL_ERROR_INDICATOR, FAILURE_INDICATOR, UNSUPPORTED_CONFIGURATION and INVALID_CONFIGURATION to FALSE;

1> set the contents of the GRA UPDATE message according to clause 7.8.2.3;

1> submit the GRA UPDATE message for transmission on the CCCH or PCCCH;

1> set counter V302 to 1;

1> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

2> start timer T302;

1> if the RLC sub-layer indicates a link failure to the RRC layer:

2> enter RRC-Idle mode;

2> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

2> consider the GRA Update procedure to be unsuccessful;

2> the procedure ends.

7.8.2.3 GRA UPDATE message contents to set

For initiating a GRA Update procedure the MES shall set the IEs in the CHANNEL REQUEST TYPE3 (see ETSI TS 101 376-4-8 [7]) or PACKET CHANNEL REQUEST TYPE2 (see ETSI TS 101 376-4-12 [13]) message as follows:

1> If the cause of GRA update is:

2> Periodic GRA update:

3> set the IE "S-RNTI" to the value of the value S-RNTI;

2> Normal GRA update:

3> set the IE "*G-RNTI*" to the value of the G-RNTI;

1> set the IE "*MES position"* as specified in ETSI TS 101 376-4-8 [7].

7.8.2.4 Reception of an GRA UPDATE message by the GERAN

When the GERAN receives a GRA UPDATE message, the GERAN shall:

1> in case the procedure was triggered by reception of a CHANNEL REQUEST TYPE 3 or PACKET CHANNEL REQUEST TYPE 2 message requesting a GRA Update procedure:

2> if SBSS relocation was performed:

3> transmit a GRA UPDATE CONFIRM message on the downlink SRB2;

2> if SBSS relocation was not performed:

3> include the IE "*GRA Identity*" in the GRA UPDATE CONFIRM message in a cell where multiple GRA identifiers are broadcast;

3> generate a new STARTn value;

3> apply integrity protection for GRA UPDATE CONFIRM message using STARTn;

3> transmit a un-ciphered GRA UPDATE CONFIRM message on the SRB2 with STARTn;

GRA UPDATE CONFIRM shall always be transmitted or retransmitted in un-ciphered mode.

3> apply the security mode configuration from the most recent, successful security mode procedure for all uplink and downlink radio bearers using STARTn;

3> if the IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info*", at which time the ciphering configuration shall be applied, was included for signalling radio bearer used to carry GRA UPDATE CONFIRM:

4> at the RLC Sequence number present in the IE "*RB Downlink Ciphering Activation Time Info*", start transmission of SRB RLC PDUs with security mode configuration;

3> if the IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info"* was not included for signalling radio bearer used to carry GRA UPDATE CONFIRM:

4> start transmission of SRB RLC PDUs with security mode configuration at the next RLC sequence number (modulo sequence number space);

3> if there is upper layer PDUs awaiting transmission for User Radio bearers (for which network has allocated radio resources):

4> after the last RLC PDU carrying GRA UPDATE CONFIRM is transmitted, start transmission of URB RLC PDUs with security mode configuration at RLC sequence number 0 (for Non-transparent mode Radio Bearers) or the next TDMA frame (for Transparent mode Radio Bearers):

After the last RLC PDU carrying GRA UPDATE CONFIRM, the GERAN shall be prepared to receive RLC PDU from all radio bearers with security mode configuration that was established by the most recent successful security mode procedure:

1> initiate an RRC Connection Release procedure (see clause 7.5.2) by transmitting an RRC CONNECTION RELEASE message on the SRB2. If RRC CONNECTION RELEASE is integrity protected, the GERAN shall generate STARTn and use STARTn in integrity protecting RRC CONNECTION RELEASE;

Only in instances when RRC CONNECTION RELEASE is sent in response to GRA UPDATE CONFIRM shall STARTn be used for integrity protection.

1> if MES is unknown at GERAN, transmit Immediate Assignment reject on CCCH, with reject cause set to *Directed Signalling Re-establishment*.

7.8.2.5 Reception of the GRA UPDATE CONFIRM message by the MES

When the MES receives a GRA UPDATE CONFIRM message the MES shall:

1> stop timer T302;

1> act upon all received information elements as specified in clause 7.19 unless specified otherwise;

1> if the \ GRA UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*" or contained the IE "*Integrity Protection Mode Info*":

2> set the IE "*Status*" in the variable SECURITY_MODIFICATION for all the CN domains in the variable SECURITY_MODIFICATION to "Affected";

1> enter a state according to clause 7.19 applied on the GRA UPDATE CONFIRM message.

If the MES after state transition enters RRC-GRA_PCH state, it shall:

1> start the timer T305 using its initial value if timer T305 is not running and periodical update has been configured by T305 in the IE "*MES Timers and Constants in Connected mode*" set to any other value than "infinity";

If the MES, after state transition, enters RRC-Cell_Dedicated or RRC-Cell_Shared state, it shall:

1> if the GRA UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*":

2> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

1> if the GRA UPDATE CONFIRM message contained the IE "*Integrity Protection Mode Info*":

2> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

1> apply the security mode configuration (keys) from the most recent, successful security mode procedure for all uplink and downlink radio bearers using STARTn (see clause 7.19.4.11) supplied by the GERAN;

1> transmit a response message, on SRB2, per clause 7.8.2.6 to the GERAN;

The sequence number of RLC.PDU transmitted by MES on SRB2 with security configuration shall start at 0.

1> if user data is awaiting transmission (e.g. arrival of upper layer PDU while waiting for GRA UPDATE CONFIRM):

2> request radio resources for user radio bearers for which data is pending using procedures specified in ETSI TS 101 376-4-14 [14];

2> on successful allocation of radio resources, start data transmission on RLC-AM or RLC-UM or RLC-TM bearers;

The sequence number of RLC PDU transmitted by MES on RLC-AM and RLC-UM with security configuration shall start at 0. For RLC-TM the activation time shall be the next uplink TDMA frame following the receipt of GRA UPDATE CONFIRM.

1> clear the entry for the GRA UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

1> clear the variable SECURITY_MODIFICATION.

The procedure ends.

7.8.2.6 Transmission of a response message to GERAN

If the GRA UPDATE CONFIRM message:

- includes the IEs "*CN Information Info*"; or
- includes the IE "*New G-RNTI*", or

the MES shall:

1> transmit a GERAN MOBILITY INFORMATION CONFIRM as response message on SRB2.

If the GRA UPDATE CONFIRM message does not contain the above specified IEs, the MES shall:

1> transmit no response message.

7.8.2.7 Invalid configuration

If the variable INVALID_CONFIGURATION is set to TRUE, the MES shall:

1> if V302 is equal to or smaller than N302:

 2> in case of a GRA Update procedure:

  3> set the contents of the GRA UPDATE message according to clause 7.8.1.3;

  3> submit the GRA UPDATE message for transmission on the uplink SRB2;

 2> increment counter V302; and

 2> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

  3> restart timer T302;

 2> if the RLC sub-layer indicates a link failure to the RRC layer:

  3> enter RRC-Idle mode;

  3> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

  3> consider the GRA Update procedure to be unsuccessful;

  3> the procedure ends;

1> if V302 is greater than N302:

 2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

 2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

 2> clear the variable PDCP_SN_INFO;

 2> clear the entry for the GRA UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

 2> release all its radio resources;

 2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

 2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

 2> clear the variable ESTABLISHED_RABS;

 2> set the variable CELL_UPDATE_STARTED to FALSE;

 2> enter RRC-Idle mode;

2> other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clause 7.18;

1> the procedure ends.

7.8.2.8 Incompatible simultaneous reconfiguration

if the variable INCOMPATIBLE_SECURITY_RECONFIGURATION is set to TRUE due to the received GRA UPDATE CONFIRM message:

the MES shall:

1> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

1> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

1> clear the variable PDCP_SN_INFO;

1> set the variable INCOMPATIBLE_SECURITY_RECONFIGURATION to FALSE;

1> clear the entry for the GRA UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

1> release all its radio resources;

1> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

1> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

1> clear the variable ESTABLISHED_RABS;

1> set the variable CELL_UPDATE_STARTED to FALSE;

1> enter RRC-Idle mode;

1> other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clauses 6 and 7.18;

1> the procedure ends.

7.8.2.9 Confirmation error of GRA ID list

If the GRA UPDATE CONFIRM message causes a confirmation error of GRA identity list as specified in clause 7.19.3 the MES shall:

1> check the value of V302; and

1> if V302 is smaller or equal than N302:

2> if, caused by the received GRA UPDATE CONFIRM message;

3> the IE "*Reconfiguration*" in the variable CIPHERING_STATUS is set to TRUE; and/or

3> the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO is set to TRUE:

4> abort the ongoing integrity and/or ciphering reconfiguration;

4> if the received GRA UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*":

5> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

5> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

4> if the received GRA UPDATE CONFIRM message contained the IE "*Integrity Protection Mode Info*";

5> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

5> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> set the IEs in the GRA UPDATE message according to clause 7.8.1.3;

2> submit the GRA UPDATE message for transmission on the uplink SRB2;

2> increment counter V302; and

2> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

3> restart timer T302;

2> if the RLC sub-layer indicates a link failure to the RRC layer:

3> enter RRC-Idle mode;

3> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

3> consider the GRA Update procedure to be unsuccessful;

3> the procedure ends.

1> if V302 is greater than N302:

2> release all its radio resources;

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> clear the variable PDCP_SN_INFO;

2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> set the variable CELL_UPDATE_STARTED to FALSE;

2> enter RRC-Idle mode;

2> perform the actions specified in clauses 6 and 7.18 when entering RRC-Idle mode from RRC-Connected mode;

2> the procedure ends.

7.8.2.10 Invalid CELL GRA UPDATE CONFIRM message

If the MES receives a GRA UPDATE CONFIRM message, which contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MES shall perform procedure specific error handling as follows:

1> if V302 is equal to or smaller than N302, the MES shall:

2> set the variable PROTOCOL_ERROR_INDICATOR to TRUE;

2> in case of a GRA Update procedure:

3> set the contents of the GRA UPDATE message according to clause 7.8.1.3;

3> submit the GRA UPDATE message for transmission on the uplink SRB2;

2> increment counter V302; and

2> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

3> restart timer T302;

2> if the RLC sub-layer indicates a link failure to the RRC layer:

3> enter RRC-Idle mode;

3> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

3> consider the GRA update procedure to be unsuccessful;

3> the procedure ends.

1> if V302 is greater than N302, the MES shall:

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> in case of a GRA Update procedure:

3> clear the entry for the GRA UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> set the variable CELL_UPDATE_STARTED to FALSE;

2> release all its radio resources;

2> enter RRC-Idle mode;

2> other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clauses 6 and 7.18;

2> the procedure ends.

7.8.2.11 T302 expiry or cell reselection

If any or several of the following conditions are true:

- expiry of timer T302;
- reselection to another GERAN cell (including the previously serving cell) before completion of the GRA Update procedure;

the MES shall:

1> stop T302 if it is running;

1> if, caused by the received GRA UPDATE CONFIRM message the IE "*Reconfiguration*" in the variable CIPHERING_STATUS is set to TRUE and/or the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO is set to TRUE:

2> abort the ongoing integrity and/or ciphering reconfiguration;

2> if the received GRA UPDATE CONFIRM message contained the IE "*Ciphering Mode Info*":

3> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

3> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> if the received GRA UPDATE CONFIRM message contained the IE "*Integrity Protection Mode Info*":

3> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

3> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

1> in case of a GRA Update procedure:

2> clear any entry for the GRA UPDATE CONFIRM message in the table "Accepted transactions" in the variable TRANSACTIONS;

If the MES has not entered RRC-Idle mode, and:

1> if V302 is equal to or smaller than N302, the MES shall:

2> in case of a GRA Update procedure:

3> set the contents of the GRA UPDATE message according to clause 7.8.1.3;

3> if a GRA UPDATE CONFIRM message was received and caused the IE "Reconfiguration" in the variable CIPHERING_STATUS to be set to TRUE and/or the IE "Reconfiguration" in the variable INTEGRITY_PROTECTION_INFO to be set to TRUE:

4> if the IE "Downlink counter synchronization info" was included in the received GRA UPDATE CONFIRM message:

5> apply the new security (integrity protection) configuration received in the GRA UPDATE CONFIRM on the GRA UPDATE message;

3> submit the GRA UPDATE message for transmission on the uplink SRB2;

2> increment counter V302;

2> if the RLC sub-layer indicates to the RRC layer a successful transmission of the message:

3> restart timer T302;

2> if the RLC sub-layer indicates a link failure to the RRC layer:

3> enter RRC-Idle mode;

3> perform the actions specified in clause 6 when MES is in RRC-Idle mode;

3> consider the GRA Update procedure to be unsuccessful;

3> the procedure ends;

1> if V302 is greater than N302, the MES shall:

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> clear the variable PDCP_SN_INFO;

2> in case of a GRA Update procedure:

3> clear the entry for the GRA UPDATE CONFIRM message in the table "Rejected transactions" in the variable TRANSACTIONS;

2> release all its radio resources;

2> indicate release (abort) of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> set the variable CELL_UPDATE_STARTED to FALSE;

2> enter RRC-Idle mode;

2> other actions the MES shall perform when entering RRC-Idle mode from RRC-Connected mode are specified in clauses 6 and 7.18;

2> and the procedure ends.

7.8.3 GERAN mobility information

7.8.3.0 Signalling flow

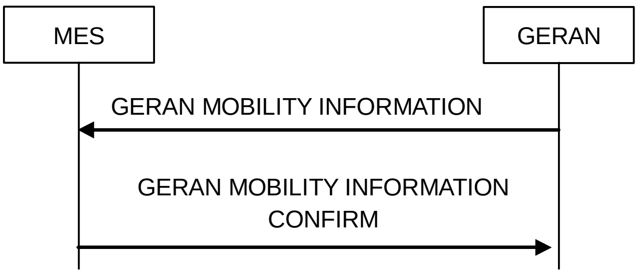

Figure 7.8.3.0.1: GERAN Mobility Information procedure, normal flow

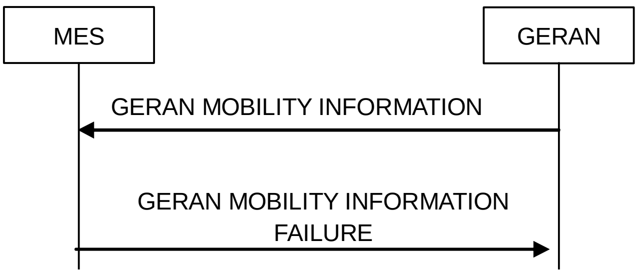

Figure 7.8.3.0.2: GERAN Mobility Information procedure, failure case

7.8.3.1 General

The purpose of this procedure is to allocate any one or a combination of the following to a MES in Connected Mode:

- a new G-RNTI;
- other mobility related information.

7.8.3.2 Initiation

To initiate the procedure GERAN transmits a GERAN MOBILITY INFORMATION message to the MES on the downlink SRB2.

7.8.3.3 Reception of GERAN MOBILITY INFORMATION message by the MES

When the MES receives a GERAN MOBILITY INFORMATION message, it shall:

act on received information elements as specified in clause 7.19;

1> if the IE "*BCCH ARFCN*" is present:

2> store the value of the BCCH ARFCN, and upon the next transition to RRC-GRA_PCH state or RRC Idle mode, use *this* as the "most recently designated BCCH" in the spotbeam reselection procedure (see ETSI TS 101 376-3-10 [12]).

1> if the IE "*MES Timers and Constants in Connected Mode*" and/or "*MES Additional Timers and Constants in Connected Mode*" are present:

2> perform the actions described in clause 7.19.2a;

1> set the IE "RRC Transaction Identifier" in the GERAN MOBILITY INFORMATION CONFIRM message to the value of "RRC transaction identifier" in the entry for the GERAN MOBILITY INFORMATION message in the table "Accepted transactions" in the variable TRANSACTIONS; and

1> clear that entry;

1> if the GERAN MOBILITY INFORMATION message contained the IE "*Ciphering Mode Info*" or contained the IE "*Integrity Protection Mode Info*":

2> set the IE "*Status*" in the variable SECURITY_MODIFICATION for all the CN domains in the variable SECURITY_MODIFICATION to "Affected";

1> if the GERAN MOBILITY INFORMATION message contained the IE "Ciphering Mode Info":

2> include the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" in the GERAN MOBILITY INFORMATION CONFIRM message and set to the value of the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

1> if the variable PDCP_SN_INFO is non-empty:

2> include the IE "*RB with PDCP Information List*" in the GERAN MOBILITY INFORMATION CONFIRM message and set it to the value of the variable PDCP_SN_INFO;

1> if the received GERAN MOBILITY INFORMATION message included the structure "Downlink Counter Synchronization Info":

2> if the variable PDCP_SN_INFO is empty:

3> configure the corresponding RLC entity for all AM and UM radio bearers and AM and UM signalling radio bearers except SRB2 to "stop";

2> else:

3> configure the RLC entity for signalling radio bearers SRB1, SRB3 and SRB4 to "stop";

3> configure the RLC entity for UM and AM radio bearers for which the IE "*PDCP SN Info*" is not included to "stop";

2> re-establish SRB2;

2> for the downlink and the uplink, apply the ciphering configuration as follows:

3> if the received re-configuration message included the IE "*Ciphering Mode Info*":

4> use the ciphering configuration in the received message when transmitting the response message;

3> if the ciphering configuration for SRB2 from a previously received SECURITY MODE COMMAND has not yet been applied because of the activation times not having been reached:

4> if the previous SECURITY MODE COMMAND was received due to new keys being received:

5> consider the new ciphering configuration to include the received new keys;

5> initialize the HFN component of the uplink COUNT-C and downlink COUNT-C of SRB2 as indicated in clause 7.16.1.2.3.1;

4> if the ciphering configuration for SRB2 from a previously received SECURITY MODE COMMAND has not yet been applied because of the corresponding activation times not having been reached and the previous SECURITY MODE COMMAND caused a change in LATEST_CONFIGURED_CN_DOMAIN:

5> initialize the HFN component of the uplink COUNT-C and downlink COUNT-C of SRB2 to the most recently transmitted IE "*START List*" or IE "*START*" for the LATEST_CONFIGURED_CN_DOMAIN at the reception of the previous SECURITY MODE COMMAND message;

5> consider the new ciphering configuration to include the keys associated with the LATEST_CONFIGURED_CN_DOMAIN;

4> apply the new ciphering configuration immediately following RLC re-establishment;

3> else:

4> continue using the current ciphering configuration;

2> set the new uplink and downlink HFN of SRB2 to MAX (uplink HFN of SRB2, downlink HFN of SRB2) + 1;

2> increment by one the downlink and uplink HFN values for SRB2;

2> calculate the START value according to clause 7.18;

2> include the calculated START values for each CN domain in the IE "START List" in the structure "Uplink Counter Synchronization Info" in the GERAN MOBILITY INFORMATION CONFIRM message;

1> transmit a GERAN MOBILITY INFORMATION CONFIRM message on the uplink SRB2;

1> if the IE "*Integrity Protection Mode Info*" was present in the GERAN MOBILITY INFORMATION message:

2> start applying the new integrity protection configuration in the uplink for signalling radio bearer SRB2 from and including the transmitted GERAN MOBILITY INFORMATION CONFIRM message;

1> if the structure "*Downlink Counter Synchronization Info*" was included in the received GERAN MOBILITY INFORMATION message:

2> when RLC has confirmed the successful transmission of the response message:

3> if the variable PDCP_SN_INFO is empty:

4> configure the RLC entity for all AM and UM radio bearers and AM and UM signalling radio bearers except SRB2 to "continue";

3> else:

4> configure the RLC entity for signalling radio bearers SRB1, SRB3 and SRB4 to "continue";

4> configure the RLC entity for UM and AM radio bearers for which the IE "*PDCP SN Info*" is not included to "continue";

3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the corresponding CN domain;

3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN;

3> set the remaining bits of the HFN component of the COUNT-C values of all UM RLC entities to zero;

3> set the remaining bits of the HFN component of the COUNT-C values of all AM RLC entities to zero, for those bearers to which RLC entities where re-established;

3> if the IE "*PDCP Context Relocation Info*" is not present:

4> re-initialize the PDCP header compression entities of each radio bearer in the variable ESTABLISHED_RABS as specified in ETSI TS 101 376-4-15 [24];

3> if the IE "*PDCP Context Relocation Info"* is present:

4> perform the actions as specified in clause 7.19;

1> if the variable PDCP_SN_INFO is empty:

2> if the GERAN MOBILITY INFORMATION message contained the IE "*Ciphering Mode Info*":

3> when RLC has confirmed the successful transmission of the GERAN MOBILITY INFORMATION CONFIRM message, perform the actions below;

2> if the GERAN MOBILITY INFORMATION message did not contain the IE "*Ciphering Mode Info*":

3> when RLC has been requested to transmit the GERAN MOBILITY INFORMATION CONFIRM message, perform the actions below;

1> if the variable PDCP_SN_INFO is non-empty:

2> when RLC has confirmed the successful transmission of the GERAN MOBILITY INFORMATION CONFIRM message:

3> for each radio bearer in the variable PDCP_SN_INFO:

4> if the IE "*RB Started*" in the variable ESTABLISHED_RABS is set to "started":

4> configure the RLC entity for that radio bearer to "continue";

3> clear the variable PDCP_SN_INFO;

1> if the GERAN MOBILITY INFORMATION message contained the IE "*Ciphering Mode Info*":

2> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

1> if the GERAN MOBILITY INFORMATION message contained the IE "*Integrity Protection Mode Info*":

2> allow the transmission of RRC messages on all signalling radio bearers with any RRC SN;

2> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> clear the variable SECURITY_MODIFICATION.

The procedure ends.

7.8.3.4 Reception of an GERAN MOBILITY INFORMATION CONFIRM message by the GERAN

When the network receives GERAN MOBILITY INFORMATION CONFIRM message, GERAN may delete any old G-RNTI. The procedure ends.

7.8.3.5 Cell re-selection

If the MES performs cell re-selection, the MES shall:

1> initiate a Cell Update procedure according to clause 7.8.1;

1> if the MES has not yet submitted the GERAN MOBILITY INFORMATION CONFIRM message to lower layers for transmission:

2> transmit a GERAN MOBILITY INFORMATION FAILURE message on the uplink SRB2;

2> set the IE "*RRC Transaction Identifier*" in the GERAN MOBILITY INFORMATION FAILURE message to the value of "RRC transaction identifier" in the entry for the GERAN MOBILITY INFORMATION message in the table "Accepted transactions" in the variable TRANSACTIONS; and

2> clear that entry;

2> set the IE "*Failure Cause*" to the cause value "cell reselection";

2> when the GERAN MOBILITY INFORMATION FAILURE message has been submitted to lower layers for transmission:

3> continue with any ongoing processes and procedures as if the invalid GERAN MOBILITY INFORMATION message has not been received and the procedure ends.

1> otherwise:

2> continue the procedure normally.

7.8.3.6 Incompatible simultaneous security reconfiguration

If the variable INCOMPATIBLE_SECURITY_RECONFIGURATION becomes set to TRUE because of the received GERAN MOBILITY INFORMATION message, the MES shall:

1> transmit a GERAN MOBILITY INFORMATION FAILURE message on the uplink SRB2;

1> set the IE "*RRC Transaction Identifier*" in the GERAN MOBILITY INFORMATION FAILURE message to the value of "RRC transaction identifier" in the entry for the GERAN MOBILITY INFORMATION message in the table "Accepted transactions" in the variable TRANSACTIONS; and

1> clear that entry;

1> set the IE "*Failure Cause*" to the cause value "incompatible simultaneous reconfiguration";

1> when the GERAN MOBILITY INFORMATION FAILURE message has been delivered to lower layers for transmission:

2> set the variable INCOMPATIBLE_SECURITY_RECONFIGURATION to FALSE;

2> continue with any ongoing processes and procedures as if the GERAN MOBILITY INFORMATION message has not been received;

2> and the procedure ends.

7.8.3.7 Invalid GERAN MOBILITY INFORMATION message

If the GERAN MOBILITY INFORMATION message contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MES shall perform procedure specific error handling as follows. The MES shall:

1> transmit a GERAN MOBILITY INFORMATION FAILURE message on the uplink SRB2;

1> set the IE "*RRC Transaction Identifier* RRC" in the GERAN MOBILITY INFORMATION FAILURE message to the value of "RRC transaction identifier" in the entry for the GERAN MOBILITY INFORMATION message in the table "Rejected transactions" in the variable TRANSACTIONS; and

1> clear that entry;

1> set the IE "*Failure Cause*" to the cause value "protocol error";

1> include the IE "*Protocol Error Information*" with contents set to the value of the variable PROTOCOL_ERROR_INFORMATION;

1> when the GERAN MOBILITY INFORMATION FAILURE message has been submitted to lower layers for transmission:

  2> continue with any ongoing processes and procedures as if the invalid GERAN MOBILITY INFORMATION message has not been received;

1> and the procedure ends.

7.8.4 Inter-mode handover from GERAN Iu mode

Not supported in GMR-1 3G.

7.9 Procedures for System Information transmission and Measurement reporting in RRC-Cell_Dedicated state

7.9.0 Relation to ETSI TS 101 376-4-8

NOTE: Any modification to the clause 7.9 may have impact on ETSI TS 101 376-4-8 [7].

7.9.1 General

In RRC-Cell_Dedicated state, the MES sends measurement report messages only in response to measurement command from the network. The network shall include necessary parameters to assist the measurements process on the MES.

7.9.2 Measurement Report and Enhanced Measurement Report

7.9.2.1 Void

7.9.2.2 Parameters for Measurements and Reporting

7.9.2.2.1 General

The network shall request for measurements from the MES by transmitting a MEASUREMENT ORDER message on downlink SRB2. On successful transmission of MEASUREMENT ORDER, the network shall start timer $T_{RRC\text{-}M\text{-}ORD}$. The MEASUREMENT ORDER message shall include *Reference Number*, and an indication if measurement of GPS position or measurement of 3G neighbour cell is required. The Transaction Id IE shall be used to match the response from the MES.

On receipt of a valid MEASUREMENT ORDER, the MES shall start timer $T_{RRC\text{-}M\text{-}REP}$ and attempt to perform measurements indicated by the network. On successful completion of measurements the MES shall stop timer $T_{RRC\text{-}M\text{-}REP}$ and transmit MEASUREMENT REPORT message on uplink SRB2. MEASUREMENT REPORT shall include the *Reference Number* received in MEASUREMENT ORDER and the measurement results.

If MEASUREMENT ORDER received from the network is invalid or if any error conditions prevent the MES from starting the measurement process, the MES shall ignore the MEASUREMENT ORDER message.

On receipt of MEASUREMENT REPORT with matching *Reference Number*, the network shall stop the timer $T_{RRC\text{-}M\text{-}ORD}$ and process the measurement results. The network shall ignore MEASUREMENT REPORT with *Reference Number* that does not match an outstanding measurement order.

If the timer $T_{RRC\text{-}M\text{-}ORD}$ expires on the network side, the network may retransmit the MEASUREMENT ORDER. The number or retransmission attempt is network implementation dependent.

If the timer $T_{RRC\text{-}M\text{-}REP}$ expires on the MES side, the MES shall abandon the measurement procedure.

The MES shall ignore MEASUREMENT ORDER messages received while it is in the process of measuring.

7.9.2.2.2 Deriving the 3G Neighbour Cell list from the 3G Neighbour Cell Description

Same as clause 5.6.3.1 of ETSI TS 101 376-4-12 [13].

7.9.2.2.3 Deriving the GSM Neighbour Cell list from the BSICs and the BCCH Allocation

Not supported in GMR-1 3G.

7.9.2.2.4 Deriving the Neighbour Cell list from the GSM Neighbour Cell list and the 3G Neighbour Cell list

Not supported in GMR-1 3G.

7.9.2.2.5 Real Time Differences

Not supported in GMR-1 3G.

7.9.2.2.6 Report Priority Description

Not supported in GMR-1 3G.

7.9.2.2.7 The 3G Cell Reselection list

Not supported in GMR-1 3G.

7.9.2.2.8 CCN Support description

Not supported in GMR-1 3G.

7.9.3 Extended measurement report

Not supported in GMR-1 3G.

7.10 Void

7.11 Void

7.12 Mapping of user data substreams onto timeslots in a multislot configuration

Not supported in GMR-1 3G.

7.13 Application Procedures

7.13.1 LCS transfer

7.13.1.0 Signalling flow

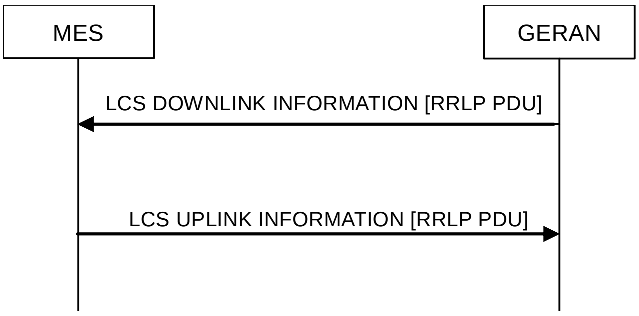

Figure 7.13.1.0.1: LCS transfer

7.13.1.1 General

The LCS Transfer procedure enables the SMLC on the network side and the MES to exchange RRLP Protocol Data Units (PDUs). Only the GERAN may initiate the exchange of RRLP PDUs (initiated by the SMLC). The MES only sends RRLP PDUs in the uplink direction in response to RRLP PDUs sent by the GERAN (SMLC).

The maximum size of the RRLP PDU in the LCS DOWNLINK INFORMATION and LCS UPLINK INFORMATION messages is 242 octets. Since RRLP pseudo segmentation limits the length of RRLP PDUs, segmentation is not defined for the LCS Transfer procedure.

7.13.1.2 Initiation of LCS transfer procedure in the GERAN

In the GERAN, the LCS transfer procedure is initiated when the SMLC requests the transfer of an RRLP PDU after the initial signalling connection is established. The GERAN may also initiate the LCS transfer procedure when another RRC procedure is ongoing, and in that case the state of the latter procedure shall not be affected. The RRLP PDU in the LCS DOWNLINK INFORMATION message shall contain a complete RRLP PDU according to the RRLP protocol ETSI TS 144 031 [29]. The GERAN shall transmit the LCS DOWNLINK INFORMATION message on the downlink using AM RLC on signalling radio bearer SRB3.

The SMLC may be a "stand alone SMLC" (and therefore not tightly integrated to the GERAN). This can lead to message loss or truncation during the Handover procedure (during change of physical channels).

7.13.1.3 Reception of LCS DOWNLINK INFORMATION message by the MES

When the MES has received an LCS DOWNLINK INFORMATION message, the MES shall deliver the RRLP PDU to the LCS local application.

The MES shall detect RRLP PDU truncation if an LCS DOWNLINK INFORMATION message is received carrying an RRLP PDU that is shorter than the indicated length. If a truncated RRLP PDU is received, RRLP PDU shall be discarded.

7.13.1.4 Transmission of a response message by the MES

When the LCS local application has received and processed an RRLP PDU from the LCS DOWNLINK INFORMATION message, one or two RRLP PDUs shall be returned to the GERAN. The MES shall:

1> encapsulate the RRLP PDU received from the LCS local application in the LCS UPLINK INFORMATION message;

1> transmit the LCS UPLINK INFORMATION message on the uplink using AM RLC on signalling radio bearer SRB3;

1> if a second RRLP PDU is received from the LCS local application, repeat the previous two steps.

Suspend/Resume functions of lower layers will prevent message loss on the uplink. If the BPSCH is changed before the RLC ACK is received in the MES, message duplication is possible in the uplink after change of the physical channel.

7.13.1.5 Reception of a response message by the GERAN

When the GERAN has received an LCS UPLINK INFORMATION message, the GERAN shall deliver the RRLP PDU to the SMLC.

The GERAN shall detect RRLP PDU truncation if an LCS UPLINK INFORMATION message is received carrying an RRLP PDU that is shorter than the indicated length. If a truncated RRLP PDU is received, the RRLP PDU shall be discarded.

7.13.1.6 Invalid LCS DOWNLINK INFORMATION message

If the MES receives a LCS DOWNLINK INFORMATION message, which contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MES shall perform procedure specific error handling as follows. The MES shall:

1> transmit an RRC STATUS message on the SRB2;

1> include the IE "*Identification of Received Message*";

1> set the IE "*Received Message Type*" to LCS DOWNLINK INFORMATION message;

1> set the IE "*RRC Transaction Identifier*" to the value of "RRC transaction identifier" in the entry for the LCS DOWNLINK INFORMATION message in the table "Rejected transactions" in the variable TRANSACTIONS;

1> clear that entry;

1> include the IE "*Protocol Error Information*" with contents set to the value of the variable PROTOCOL_ERROR_INFORMATION;

1> when the RRC STATUS message has been submitted to lower layers for transmission:

  2> continue with any ongoing processes and procedures as if the invalid LCS DOWNLINK INFORMATION message has not been received.

7.13.2 Position Reporting

7.13.2.0 Signalling flow

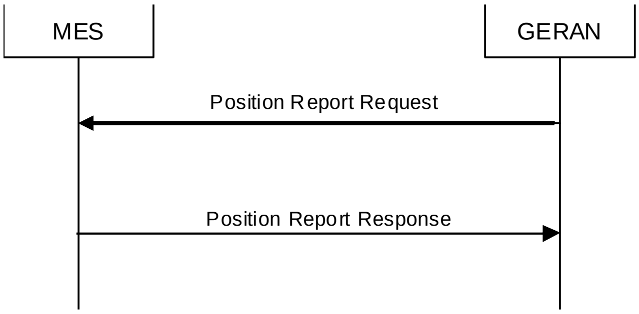

Figure 7.13.2.0.1: Position Reporting

7.13.2.1 General

The position reporting procedure enables the GERAN to obtain position information from the MES. Only the GERAN may initiate the Position Report Request message in the downlink direction.

7.13.2.2 Initiation of position reporting procedure in the GERAN

In the GERAN, the position request procedure shall be initiated when the CN requests the position of the MES. The GERAN may optionally provide the GPS assist information.

7.13.2.3 Reception of POSITION REPORT REQUEST message by the MES

On receipt of Position Request message, the MES shall start timer $T_{RRC\text{-}M\text{-}REP}$ and initiate position determination procedures to obtain its current position. On completion of position determination, the MES shall respond to the GERAN with Position Report and stop timer $T_{RRC\text{-}M\text{-}REP}$.

If the timer $T_{RRC\text{-}M\text{-}REP}$ expires MES shall abort the position measurement procedure.

7.13.2.4 Transmission of a response message by the MES

On completion of position determination the MES shall:

1> transmit the Position Request Response message on the uplink on signalling radio bearer SRB2.

7.13.2.5 Reception of a response message by the GERAN

When the GERAN has received the Position Report Response message, the GERAN shall deliver the response to the CN.

7.13.2.6 Invalid POSITION REPORT REQUEST message

If the MES receives a Position Report Request message, which contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MES shall perform procedure specific error handling as follows. The MES shall:

1> transmit an RRC STATUS message on the SRB2;

1> include the IE "*Identification of Received Message*";

1> set the IE "*Received Message Type*" to Position Report Request message;

1> set the IE "*RRC Transaction Identifier*" to the value of "RRC transaction identifier" in the entry for the POSITION REPORT REQUEST message in the table "Rejected transactions" in the variable TRANSACTIONS;

1> clear that entry;

1> include the IE "*Protocol Error Information*" with contents set to the value of the variable PROTOCOL_ERROR_INFORMATION;

1> when the RRC STATUS message has been submitted to lower layers for transmission:

2> continue with any ongoing processes and procedures as if the invalid POSITION REPORT REQUEST message has not been received.

7.13.2a Autonomous Position Update

7.13.2a.0 Signalling flow

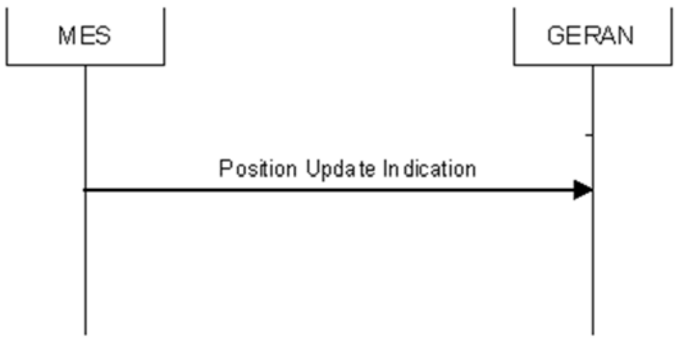

Figure 7.13.2a.0.1: Autonomous Position Update

7.13.2a.1 General

The autonomous position update procedure enables the MES to report unsolicited position information to the GERAN while in connected state. The MES performs autonomous position update only if it has been enabled by the GERAN.

7.13.2a.2 Enabling and Disabling of Autonomous Position Update

The GERAN enables autonomous position update at an MES by sending it connected mode position update parameters containing non-zero values of GPS Update Timer and GPS Update Distance in an RRC Connection Setup or other message. See clause 7.19.4.10.

The GERAN disables autonomous position update at an MES by sending it connected mode position update parameters containing zero values for GPS Update Timer and GPS Update Distance. See clause 7.19.4.10.

Autonomous position update shall be disabled by default at the MES, that is, enabling the procedure requires explicit action by the GERAN as described above.

7.13.2a.3 Transmission of POSITION UPDATE INDICATION message by the MES

When autonomous position update has been enabled, the MES shall periodically measure its position using timer T3119 set to the value of the connected mode GPS Update Timer parameter.

At each expiry of the GPS Update Timer T3119, the MES shall attempt to update its GPS position from the GPS system. However, if the GPS Update Timer parameter is set to 0, then the GPS Update Timer T3119 is not run at all. In addition, if the GPS Update Distance parameter is nonzero and the currently calculated GPS position exceeds the last reported GPS position by more than the GPS Update Distance, the MES shall transmit a POSITION UPDATE INDICATION message to the network to report its current position.

If the current value of the connected mode GPA Update Timer parameter is non-zero, then the MES shall restart timer T3119 each time it expires. Otherwise, it shall not start T3119.

7.13.2a.4 Reception of POSITION UPDATE INDICATION message by the GERAN

When the GERAN receives a POSITION UPDATE INDICATION message, it shall update its knowledge of the current MES position. The GERAN may then trigger additional RRC procedures such as handover if required.

7.13.3 RAB Upper Layer Reconfiguration

7.13.3.0 Signalling flow

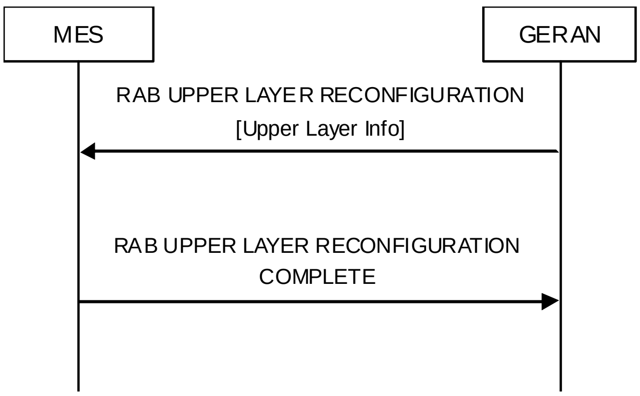

Figure 7.13.3.0.1: RAB Upper Layer Reconfiguration

7.13.3.1 General

The RAB Upper Layer Reconfiguration procedure enables the GERAN to control upper layer (NAS or application) attributes associated with a given Radio Access Bearer. A particular example is the ability of the GERAN to control source vocoder rate as part of the support for dynamic adaptation to changing link conditions.

7.13.3.2 Initiation of RAB Upper Layer Reconfiguration procedure in the GERAN

In the GERAN, the RAB Upper Layer Reconfiguration procedure is initiated when the GERAN determines that link adaptation to maintain service quality requires an upper layer change rather than a change to the provided radio bearer. The GERAN shall transmit the RAB UPPER LAYER RECONFIGURATION message on the downlink using AM RLC on signalling radio bearer SRB2.

7.13.3.3 Reception of RAB Upper Layer Reconfiguration message by the MES

When the MES has received a RAB UPPER LAYER RECONFIGURATION message, the MES shall initiate the appropriate internal signalling to convey the necessary configuration information to the relevant upper layer (NAS or application) entity.

7.13.3.4 Transmission of a response message by the MES

When the MES has received and processed the upper layer information conveyed in the RAB UPPER LAYER RECONFIGURATION message, and has confirmed that the necessary reconfiguration has been effected, a RAB UPPER LAYER RECONFIGURATION COMPLETE message shall be returned to the GERAN. The MES shall:

1> transmit the RAB UPPER LAYER RECONFIGURATION COMPLETE message on the uplink using AM RLC on signalling radio bearer SRB2.

7.13.3.5 Reception of a response message by the GERAN

When the GERAN has received a RAB UPPER LAYER RECONFIGURATION COMPLETE message, the procedure is complete.

7.13.4 RAB Binding

7.13.4.0 Signalling flow

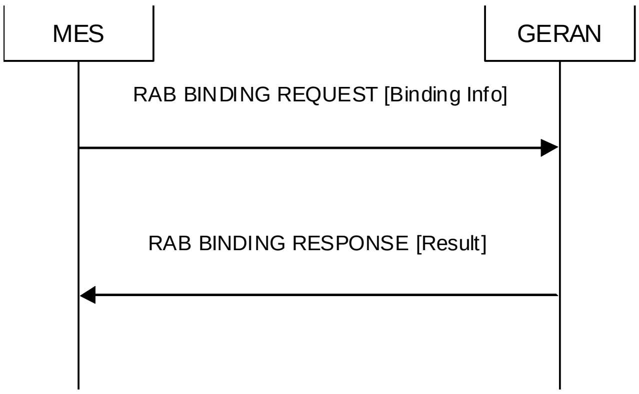

Figure 7.13.4.0.1: RAB Binding

7.13.4.1 General

The RAB Binding procedure enables the MES to add, update or remove the association between a RAB and a specific application service of which the GERAN needs to be aware. RAB binding is used to implement application-specific radio behaviours and optimizations.

7.13.4.2 Initiation of RAB Binding procedure in the MES

7.13.4.2.0 General

The RAB Binding procedure is initiated when the MES determines the need to add, update or remove the binding of a RAB to an application service. The GERAN shall transmit the RAB BINDING REQUEST message on the uplink using AM RLC on signalling radio bearer SRB2.

The contents and semantics of the RAB Binding Request message are application-specific.

7.13.4.2.1 Adding a RAB Binding

Addition of a RAB binding is triggered by upper layers informing the RRC layer to create the binding. The MES shall construct and transmit the RAB Binding Request message to the GERAN prior to activating the corresponding Secondary PDP Context. The MES shall set the *RAB Id IE* in the message to the value of the NSAPI of the Secondary PDP context.

7.13.4.2.2 Updating a RAB Binding

Updating of a RAB binding may be used by an application to update the application-specific information associated with the binding. Some applications might not allow updating a RAB binding after the corresponding Secondary PDP Context has been activated.

Updating of a RAB Binding is triggered by upper layers informing the RRC layer to update the binding. The MES shall construct and transmit the RAB Binding Request message to the GERAN. The MES shall set the *RAB Id IE* in the message to the value of the NSAPI of the Secondary PDP context.

7.13.4.2.3 Removing a RAB Binding

Removal of a RAB binding is triggered by upper layers informing the RRC layer to remove the binding. The MES shall not remove a RAB binding while the corresponding Secondary PDP Context is active. The MES shall construct and transmit the RAB Binding Request message to the GERAN. The MES shall set the *RAB Id IE* in the message to the value of the NSAPI of the Secondary PDP context.

7.13.4.3 Reception of RAB Binding Request message by the GERAN

When the GERAN receives a RAB BINDING REQUEST message, it shall validate the request and perform the application-specific binding operation.

7.13.4.4 Transmission of a response message by the GERAN

When the GERAN has received and processed the information conveyed in the RAB BINDING REQUEST message, a RAB BINDING RESPONSE message shall be returned to the MES. The response shall indicate success or failure of the operation. An application-specific failure code shall be included if the operation is a failure.

7.13.4.5 Reception of a response message by the MES

The MES may wait for the reception of the RAB BINDING RESPONSE before proceeding with subsequent operations.

Upon receiving a RAB BINDING RESPONSE, the MES shall inform the upper layers of the success or failure reported in the response message.

In case the response indicates a failure to perform requested binding operation, the upper layers should take appropriate application-specific action which may include deactivating the corresponding Secondary PDP Context.

7.14 Radio Bearer control procedures

7.14.1 Reconfiguration procedures

7.14.1.0 Signalling flow

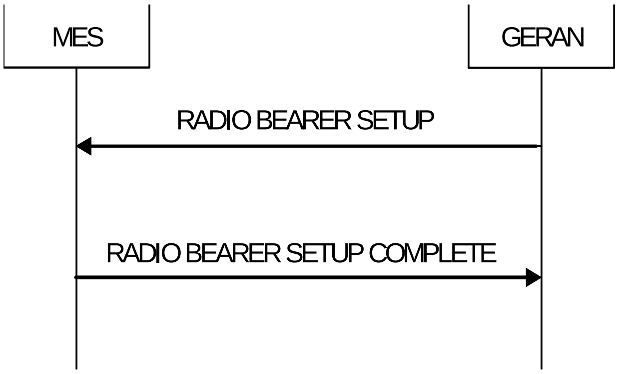

Figure 7.14.1.0.1: Radio Bearer Establishment, normal case

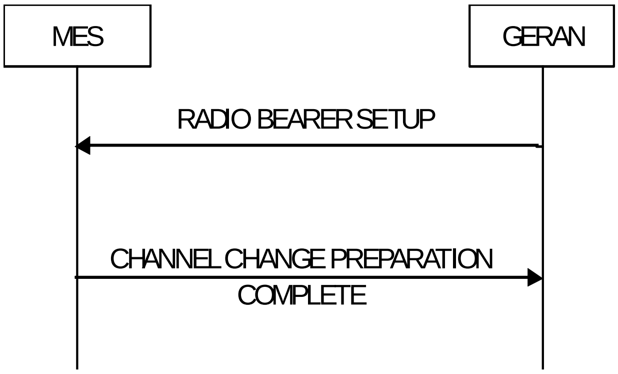

Figure 7.14.1.0.1a: Radio Bearer Establishment, uplink physical channel type change

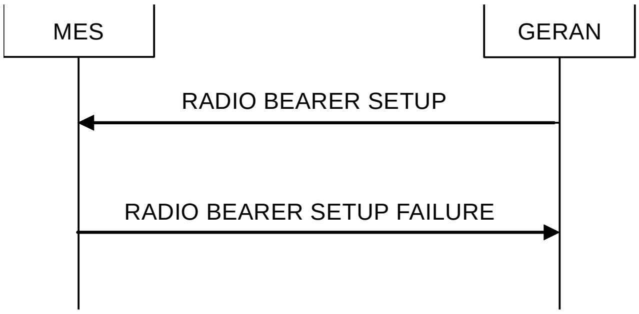

Figure 7.14.1.0.2: Radio Bearer Establishment, MES reverts to old configuration

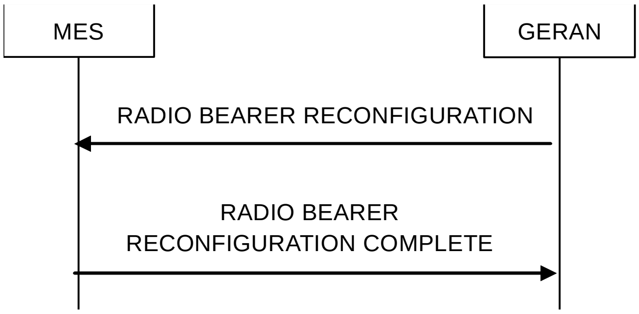

Figure 7.14.1.0.3: Radio Bearer Reconfiguration, normal flow

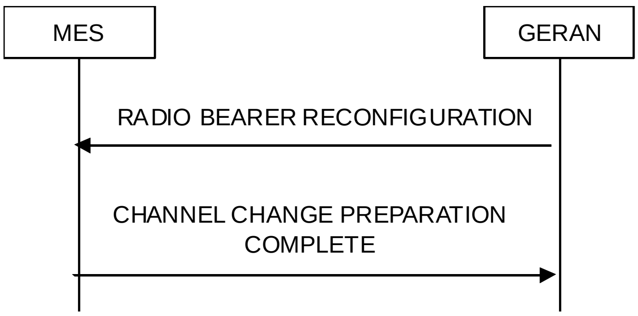

Figure 7.14.1.0.3a: Radio Bearer Reconfiguration, uplink physical channel type change

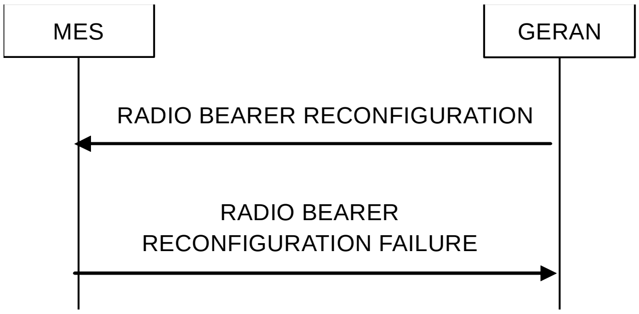

Figure 7.14.1.0.4: Radio Bearer Reconfiguration, failure case

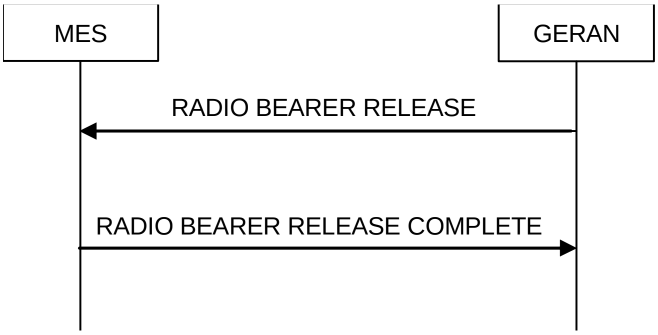

Figure 7.14.1.0.5: Radio Bearer Release, normal case

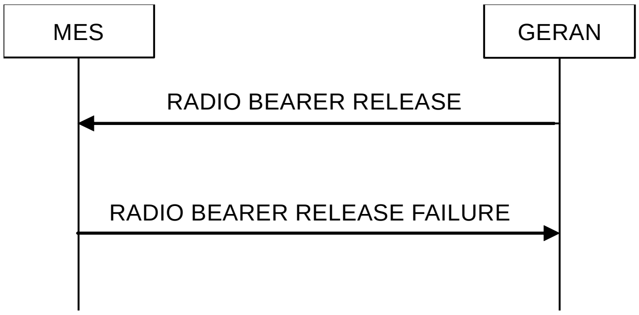

Figure 7.14.1.0.6: Radio Bearer Release, MES reverts to old configuration

7.14.1.1 General

The reconfiguration procedures include the following procedures:

- the Radio Bearer Establishment procedure;
- the Radio Bearer Reconfiguration procedure;
- the Radio Bearer Release procedure.

The Radio Bearer Establishment procedure is used to establish new radio bearer(s) and to optionally reconfigure existing radio bearers.

The Radio Bearer Reconfiguration procedure is used to reconfigure parameters for a radio bearer and optionally to release radio bearer(s).

The Radio Bearer Release procedure is used to release radio bearer(s).

The Radio Bearer Reconfiguration procedure is used to reconfigure transport channel(s).

7.14.1.2 Initiation

To initiate any one of the establishment or reconfiguration procedures that does not involve change of only uplink physical channel type for all radio bearers or change of uplink and downlink physical channel type for all radio bearers(i.e. established, as well as those to be established), the GERAN shall:

NOTE 1: The GERAN will determine if uplink or uplink and downlink physical channel type, should be changed for all radio bearers or not based on the MES capability (GMPRS terminal type identifier, see ETSI TS 101 376-5-2 [8]).

1> configure new radio links in any new physical channel;

1> start transmission and reception on the new radio links;

1> for a Radio Bearer Establishment procedure:

2> transmit a RADIO BEARER SETUP message on the SRB2;

2> if signalling radio bearer SRB4 is setup with this procedure and signalling radio bearers SRB1-SRB3 were already established prior to the procedure:

3> if the variable "LATEST_CONFIGURED_CN_DOMAIN" has been initialized:

4> any radio bearers setup by the same message as signalling radio bearer SRB4 shall be connected to the CN domain indicated in the variable "LATEST CONFIGURED CN DOMAIN";

1> for a Radio Bearer Reconfiguration procedure:

2> transmit a RADIO BEARER RECONFIGURATION message on the SRB2;

1> for a Radio Bearer Release procedure:

2> transmit a RADIO BEARER RELEASE message on the SRB2;

1> for a transport channel reconfiguration (setup, reconfigure or release) procedure:

2> transmit a RADIO BEARER SETUP, RADIO BEARER RECONFIGURATION or RADIO BEARER RELEASE message on the SRB2.

The RADIO BEARER RECONFIGURATION message shall include in case of SBSS relocation procedure the structure "*Downlink Counter Synchronization Info*"; and

1> if ciphering and/or integrity protection are activated:

2> include new ciphering and/or integrity protection configuration information to be used after reconfiguration.

If one of the reconfiguration messages is transmitted then the IE "*New G-RNTI*" may be present.

NOTE 2: The RADIO BEARER RECONFIGURATION message always includes the IE "*RB Information to Reconfigure*", even if GERAN does not require the reconfiguration of any RB. In these cases, GERAN may include only the IE "*RB Identity*" within the IE "*RB Information to Reconfigure*".

GERAN shall take the MES capabilities into account when setting the new configuration. If the message is used to initiate a transition from RRC-Cell_Dedicated state to RRC-Cell_Shared state, the RRC may allocate the new physical resources.

In following description, a change in physical channel type or radio frequency is a reference to a change between PDCH to DCH channels, DCH Channel Type (i.e. DCH(1,3) to DCH(1,6)), change in carrier, or Assigned MAC Slots.

To initiate any one of the establishment or reconfiguration procedures that requires change of physical channel type or radio frequency for all radio bearers (i.e. established as well as to be established), the GERAN shall:

1> list all radio bearers using RLC-AM, RLC-UM, or RLC-TM and signalling radio bearers using RLC-AM or RLC-UM that are required to be stopped until establishment or reconfiguration is complete. SRB2 shall not be stopped as it is used to send the RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION message on the downlink;

1> complete the reassembly process of upper layer PDUs received so far from the MES;

1> obtain the sequence number of the last successfully received in-sequence uplink RLC block from lower layer for each radio bearer in the list of radio bearers to be stopped for inclusion in RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION;

1> obtain the sequence number of the last successfully received in-sequence uplink RLC block from lower layer for SRB2 for inclusion in RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION to indicate RLC reset after reconfiguration is complete. SRB2 shall not be stopped as it is used to send the RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION message on the downlink;

1> omit inclusion of last successfully received in-sequence uplink RLC block from lower layer for SRB2 if RLC shall not reset after reconfiguration is complete;

1> use SRB2 only for transmission or retransmission of RLC blocks carrying RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION message, Upper layer PDUs that require use of SRB2, shall be queued and transmitted only after completion of radio bearer establishment procedure;

1> transmit a RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION message on the SRB2 with:

2> list of radio bearers to setup;

2> for each radio bearer that requires setup, include:

3> Reduced Radio Bearer (RRB) ID; This field is optional if the uplink channel type is PDCH.

3> Physical channel description for downlink.

3> Physical channel description for uplink.

2> include IE *"Carrier Reconfiguration Type"* if there are radio bearers that require reconfiguration;

2> optionally include IE "Downlink Activation Time" if there are radio bearers that require reconfiguration;

2> list of radio bearers that require reconfiguration;

2> for each Radio Bearer that requires reconfiguration, include:

3> Reduced Radio Bearer (RRB) ID; This field is optional if the uplink channel type is PDCH.

3> Physical channel description.

3> If the radio bearer is in the list of radio bearers to be stopped:

4> include "*Last Received RLC Block*" IE. For radio bearers in RLC-TM set sequence number to 0 as RLC-TM has no sequence number.

3> else:

4> do not include "*Last Received RLC Block*" IE.

3> If SRB2 RLC shall reset after reconfiguration:

4> include "*Last Received RLC Block*" IE for SRB2.

3> else:

4> do not include "*Last Received RLC Block*" IE for SRB2.

1> For RADIO BEARER SETUP or if the radio bearer is in the list of radio bearers to be stopped during reconfiguration:

2> queue upper layer PDUs, requiring transmission to the MES on stopped radio bearers, for transmission after completion of radio bearer establishment procedure;

2> discard uplink RLC blocks received from MES on all radio bearers, except SRB2;

2> for each radio bearer, other than SRB2, flush RLC block reassembly queue and discard segments of partially assembled upper layer PDUs;

1> if the radio bearer is not in the list of radio bearers to be stopped during reconfiguration:

2> continue normal operation and data transfer of the radio bearer. At activation frame apply the reconfiguration without RLC sequence reset or HFN update;

2> the above applies for TM mode RBs as well.

7.14.1.3 Reception of RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION or RADIO BEARER RELEASE message by the MES

If the MES receives the one of the following reconfiguration messages:

- RADIO BEARER SETUP; or
- RADIO BEARER RECONFIGURATION; or
- RADIO BEARER RELEASE;

it shall:

1> set the variable ORDERED_RECONFIGURATION to TRUE;

1> act upon all received information elements as specified in clauses 7.18 and 7.19, unless specified in the following and perform the actions below;

1> if a complete reconfiguration, setup or release is indicated, that does not require change in uplink or uplink and downlink physical channel type for all radio bearers (i.e. established, as well as those to be established) in the reconfiguration or setup messages:

2> initiate the radio bearer, transport channel and physical channel configuration/reconfiguration in accordance with the received radio bearer, transport channel and physical channel information elements as is specified in clauses 7.18 and 7.19.

NOTE 1: The network indicates change in uplink (and in some cases downlink) physical channel type for all radio bearers (i.e. established, as well as those to be established) by using the IE *"Carrier Reconfiguration Type"* in the message.

If a change in uplink or downlink physical channel type is not required for all radio bearers (established, as well as those to be established), then the MES may first release the physical channel used at reception of the reconfiguration message (i.e. a RADIO BEARER SETUP message, a RADIO BEARER RECONFIGURATION message or a RADIO BEARER RELEASE message). The MES shall:

1> If RADIO BEARER RECONFIGURATION includes RB Information to Release

2> release the radio bearers first before processing the radio bearers requiring reconfiguration

1> if "*Last Received RLC Block*" IE is not present for the radio bearer in the RADIO BEARER RECONFIGURATION

2> then the RLC does not get reset and operation of the RB does not get interrupted during the reconfiguration procedure;

1> else:

2> stop the RLC operation for the duration of the reconfiguration procedure;

1> if "*Last Received RLC Block*" IE is not present for SRB2 in the RADIO BEARER RECONFIGURATION:

2> then do not rest RLC for SRB2 after the reconfiguration procedure;

1> else:

2> reset RLC for SRB2 after the reconfiguration procedure;

1> establish a new physical channel and act upon all received information elements as specified in clause 7.19;

1> enter a state according to clause 7.19;

1> continue the RLC operation, if applicable.

NOTE 2: The RADIO BEARER RECONFIGURATION message always includes the IE "*RB Information to Reconfigure*". GERAN has to include it even if it does not require the reconfiguration of any RB.

If a change in physical channel type or radio frequency is required for all radio bearers (established as well as to be established), then the MES shall not release the physical channel currently being used for uplink until channel change preparation procedure is complete. The MES shall:

1> If RADIO BEARER SETUP OR RADIO BEARER RECONFIGURATION message is valid, then:

2> If RADIO BEARER RECONFIGURATION includes RB Information to Release

3> release the radio bearers first before processing the radio bearers requiring reconfiguration

2> stop all radio bearers and RBs for which "*Last Received RLC Block*" IE is not present, except SRB2, for the duration of the reconfiguration procedure;

2> if "*Last Received RLC Block*" IE is present, assume that all uplink RLC blocks with sequence number higher (modulo sequence number space) than that included by the network in RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION message are lost;

2> handle upper layer PDUs waiting transmission as specified in sub-clause 7.19.5.15;

2> if the received reconfiguration message includes "*Downlink Activation Time*":

3> at activation time, establish new physical channel(s) specified in RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION message;

3> re-establish uplink RLC entities for all radio bearers that were stopped for use with new uplink channel;

3> re-establish uplink RLC entities for SRB2 for use with new uplink channel if the last RLC block successfully received in-sequence in the uplink is indicated. Reconfigure the channel without RLC reset if the last RLC block successfully received in-sequence in the uplink is not indicated;

3> for power control after reconfiguration, see ETSI TS 101 376-5-6 [9];

3> if security mode procedure was successfully completed:

4> For all AM and UM RLC entities that were stopped, set the 20 most significant bits of HFN component of COUNT-C to the most recently transmitted START value and remaining bits of the HFN component of the COUNT-C values to zero;

4> For all RLC TM entities that were stopped, set the 11 bits of HFN component of COUNT-C to the 11 most significant most bits of the recently transmitted START value;

4> If SRB2 RLC is reset:

5> set the 20 most significant bits of HFN component of COUNT-C to the most recently transmitted START value and remaining bits of the HFN component of the COUNT-C values to zero;

5> for all AM and UM RLC entities, set the 20 most significant bits of HFN component of COUNT-I to the most recently transmitted START value and remaining bits of the COUNT-I values to zero;

4> else:

5> HFN of COUNT-C and COUNT-I shall not be changed;

3> resume transmission of RLC blocks on all radio bearers;

NOTE 3: RLC sequence number of re-established RLC entities will start at '0'.

2> else:

3> transmit CHANNEL CHANGE PREPARATION COMPLETE message on SRB2 on existing physical channel, including the sequence number of the last successfully received in-sequence downlink RLC Block for each suspended radio bearer;

3> start timer T306;

3> when the successful delivery of the CHANNEL CHANGE PREPARATION COMPLETE message has been confirmed by RLC on MAC slot m of frame N:

4> stop timer T306;

4> establish new physical channel(s) specified in RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION message;

4> re-establish uplink RLC entities for all radio bearers that were stopped for use with new uplink channel;

4> re-establish uplink RLC entities for SRB2 for use with new uplink channel if the last RLC block successfully received in-sequence in the uplink is indicated. Reconfigure the channel without RLC reset if the last RLC block successfully received in-sequence in the uplink is not indicated;

4> if security mode procedure was successfully completed:

5> For all AM and UM RLC entities that were stopped, set the 20 most significant bits of HFN component of COUNT-C to the most recently transmitted START value and remaining bits of the HFN component of the COUNT-C values to zero;

5> For all RLC TM entities that were stopped, set the 11 bits of HFN component of COUNT-C to the 11 most significant bits of the most recently transmitted START value;

5> For all AM, UM, and TM RLC entities that were not stopped, HFN shall not be changed;

5> if SRB2 RLC is reset:

6> set the 20 most significant bits of HFN component of COUNT-C to the most recently transmitted START value and remaining bits of the HFN component of the COUNT-C values to zero;

6> for all AM and UM RLC entities, set the 20 most significant bits of HFN component of COUNT-I to the most recently transmitted START value and remaining bits of the HFN component of the COUNT-I values to zero.

5> else:

6> HFN of COUNT-C and COUNT-I shall not be changed;

4> resume transmission of RLC blocks on all radio bearers on or after MAC slot m of frame (N + USF DELAY), with MAC slot m of frame N being the first MAC slot on which the MES starts listening to downlink channel;

NOTE 4: RLC sequence number of re-established RLC entities will start at '0'.

3> if timer T306 expires, without having received a delivery confirmation of CHANNEL CHANGE PREPARATION COMPLETE message from RLC:

4> locally release all temporary block flows (see ETSI TS 101 376-4-14 [14]) and associated radio resources;

4> indicate the release of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers; and

4> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

4> clear the variable ESTABLISHED_RABS;

4> enter RRC-Idle mode;

4> perform the actions specified in clause 7.18 and clause 6 when entering RRC-Idle mode from RRC-Connected mode;

4> and the procedure ends.

If the MES is in RRC-Cell_Dedicated state upon reception of the setup or reconfiguration message and remains in RRC-Cell_Dedicated state after that, the MES shall:

1> stop the RLC operation for the duration of the reconfiguration procedure;

1> then establish a new physical channel and act upon all received information elements as specified in clause 7.19.6; and

1> if RADIO BEARER RECONFIGURATION message has been received; and if the IE "*DCH Description*" is present; and:

2> if the following IEs are present IE "*Handover Reference*" the MES shall:

3> if the IE "*Synchronization Parameters*" is not present, establish new physical channel using non-synchronized method as specified in clause 7.18.6 and act upon all received information elements and clause 7.19;

3> if the IE "*Synchronization Parameters*" is present, establish new physical channel using one of the synchronized methods as specified below:

4> if IE "*Timing Correction*" is present the MES shall:

5> establish new physical channel using the pre-synchronized method as specified in clause 7.18.6 and act upon all received information elements and clause 7.19;

2> if the following IEs, IE "*Handover Reference*" are not present the MES shall:

3> not use the procedures specified in clause 7.18.6;

1> if RADIO BEARER RELEASE message has been received and is indicating the release of one or more channels, then:

2> transmit response and perform actions specified in clause 7.14.1.4.

If the RADIO BEARER RECONFIGURATION message refers to a cell to which the MES is not synchronized to (see ETSI TS 101 376-5-6 [9]), this shall not be considered as an error.

NOTE 5: The network takes into account limitations of certain MESs to understand formats used in the IE "*Frequency List"*, IE "*Frequency Short List"*, and IE "*Cell Channel Description"* used in the RADIO BEARER RECONFIGURATION message, see clause 7.19.

If the MES is in RRC-Cell_Dedicated state when receives the one of the reconfiguration messages (i.e. RADIO BEARER SETUP message, a RADIO BEARER RECONFIGURATION message or RADIO BEARER RELEASE message) and enters in RRC-Cell_Shared state after state transition, the MES shall:

1> release the dedicated basic physical resources;

1> act upon all received information elements as specified in clause 7.19;

1> if RADIO BEARER RELEASE message has been received and is indicating the release of one or more channels, then:

2> transmit response and perform actions specified in clause 7.14.1.4.

If after state transition the MES enters RRC-Cell_Shared state, the MES shall:

1> if timer T305 is not running and if periodical update in the IE "*MES Timers and Constants In Connected Mode*" has been set to any other value than "infinity";

2> start timer T305 using its initial value.

If the MES is in RRC-Cell_Shared state when receives the one of the reconfiguration messages (i.e. RADIO BEARER SETUP message or RADIO BEARER RECONFIGURATION message or RADIO BEARER RELEASE message) and enters in RRC-Cell_Dedicated state after state transition, the MES shall:

1> act upon all received information elements as specified in clause 7.19.6.1;

1> if RADIO BEARER RELEASE message has been received and is indicating the release of one or more channels, then:

2> transmit response and perform actions specified in clause 7.14.1.4.

If the MES is in RRC-Cell_Shared state upon reception of the reconfiguration message and remains in RRC-Cell_Shared state after that, the MES shall:

1> if IE "*PDCH Description*" is included then:

2> establish new physical channels for each RB identity included in the IE "*RB Information to Reconfigure*" and act upon all received information elements as specified in clause 7.19.

If after state transition the MES enters RRC-GRA_PCH state, the MES shall:

1> if timer T305 is not running and if periodical update in the IE "*MES Timers And Constants In Connected Mode*" has been set to any other value than "infinity";

2> start timer T305 using its initial value.

If either the RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION message contains the "RB Priority" for a given RB, the MES shall use the value when prioritizing multiple RB traffic on an assigned Dedicated Channel (DCH).

The MES shall transmit a response message as specified in clause 7.14.1.4, setting the information elements as specified below. The MES shall:

1> if the received reconfiguration message includes the structure "Downlink Counter Synchronization Info"; or

1> if the received reconfiguration message includes the IE "*New G-RNTI*":

2> if the variable PDCP_SN_INFO is empty:

3> configure the corresponding RLC entity for all AM and UM radio bearers and AM and UM signalling radio bearers except SRB2 to "stop";

2> else:

3> configure the RLC entity for signalling radio bearers SRB1, SRB3 and SRB4 to "stop";

3> configure the RLC entity for UM and AM radio bearers for which the IE "*PDCP SN Info*" is not included to "stop";

2> re-establish SRB2;

2> for the downlink and the uplink, apply the ciphering configuration as follows:

3> if the received re-configuration message included the IE "*Ciphering Mode Info*":

4> use the ciphering configuration in the received message when transmitting the response message;

3> if the ciphering configuration for SRB2 from a previously received SECURITY MODE COMMAND has not yet been applied because of the activation times not having been reached:

4> if the previous SECURITY MODE COMMAND was received due to new keys being received:

5> consider the new ciphering configuration to include the received new keys;

5> initialize the HFN component of the uplink COUNT-C and downlink COUNT-C of SRB2 as indicated in clause 7.16.1.2.3.1;

4> if the ciphering configuration for SRB2 from a previously received SECURITY MODE COMMAND has not yet been applied because of the corresponding activation times not having been reached and the previous SECURITY MODE COMMAND caused a change in LATEST_CONFIGURED_CN_DOMAIN:

5> initialize the HFN component of the uplink COUNT-C and downlink COUNT-C of SRB2 to the most recently transmitted IE "*START List*" or IE "*START*" for the LATEST_CONFIGURED_CN_DOMAIN at the reception of the previous SECURITY MODE COMMAND message;

5> consider the new ciphering configuration to include the keys associated with the LATEST_CONFIGURED_CN_DOMAIN;

4> apply the new ciphering configuration immediately following RLC re-establishment.

3> else:

4> continue using the current ciphering configuration;

2> set the new uplink and downlink HFN component of COUNT-C of SRB2 to MAX(uplink HFN component of COUNT-C of SRB2, downlink HFN component of COUNT-C of SRB2);

2> increment by one the downlink and uplink values of the HFN component of COUNT -C for SRB2;

2> calculate the START value according to clause 7.18.4;

2> include the calculated START values for each CN domain in the IE "*START List*" in the structure "*Uplink Counter Synchronization Info*".

1> if the handover is performed from UTRAN and RADIO BEARER RECONFIGURATION message is received:

2> set the 20 most significant bits of the uplink and downlink HFN component of COUNT-C of SRB2 to MAX (uplink HFN_U, downlink HFN_U) where HFN_U is the HFN component of COUNT-C of SRB2 in UTRAN;

2> set the remaining bits of the uplink and downlink HFN component of COUNT-C of SRB2 equal to zero;

2> increment by one the downlink and uplink values of the HFN component of COUNT-C for SRB2;

2> calculate the START value according to clause 7.18;

2> include the calculated START values for each CN domain in the IE "*START list*" in the RADIO BEARER RECONFIGURATION COMPLETE message;

2> set the variable LATEST_CONFIGURED_CN_DOMAIN equal to the corresponding UTRAN variable;

2> set the variable MES_CAPABILITY_TRANSFERRED equal to the corresponding UTRAN variable;

2> set the variable ESTABLISHED_RABS equal to the corresponding UTRAN variable;

2> set the variable ESTABLISHED_SIGNALLING_CONNECTIONS equal to the corresponding UTRAN variable;

2> set the variable CIPHERING_STATUS equal to the corresponding UTRAN variable;

2> set the variable START_THRESHOLD equal to the corresponding UTRAN variable;

2> set the variable START_VALUE_TO_TRANSMIT equal to the corresponding UTRAN variable;

2> set IE "*Status*" for the ciphering status in the variable SECURITY_MODIFICATION equal to the corresponding UTRAN variable;

2> set IE "*Status*" for the integrity protection in the variable INTEGRITY_PROTECTION_INFO equal to the corresponding UTRAN variable;

1> if the received reconfiguration message did not include the structure "*Downlink Counter Synchronization Info*":

2> if the variable START_VALUE_TO_TRANSMIT is set:

3> include and set the IE "*START*" to the value of that variable;

2> if the variable START_VALUE_TO_TRANSMIT is not set and the IE "*New G-RNTI*" is included:

3> calculate the START value according to clause 7.18.4;

3> include the calculated START values for each CN domain in the IE "*START List*" in the structure "Uplink Counter Synchronization Info";

2> if the received reconfiguration message caused a change in the RLC size for any RB using RLC-AM:

3> calculate the START value according to clause 7.18.4;

3> include the calculated START values for the CN domain associated with the corresponding RB identity in the IE "*START List*" in the structure "Uplink Counter Synchronization Info";

1> if the received reconfiguration message contained the IE "*Ciphering Mode Info*" or contained the IE "*Integrity Protection Mode Info*":

2> set the IE "*Status*" in the variable SECURITY_MODIFICATION for all the CN domains in the variable SECURITY_MODIFICATION to "Affected";

1> if the received reconfiguration message (contained the IE "*Ciphering Mode Info*":

2> include and set the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" to the value of the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

1> if the received reconfiguration message did not contain the IE "*Ciphering Activation Time for DCH*" in the IE "*Ciphering Mode Info*":

2> if prior to this procedure there exist no transparent mode RLC radio bearers for the CN domain indicated in the IE "*CN Domain Identity*" in the IE "*RAB info*":

3> if, at the conclusion of this procedure, the MES will be in RRC-Cell_Dedicated state; and

3> if, at the conclusion of this procedure, at least one transparent mode RLC radio bearer exists for the CN domain indicated in the IE "*CN Domain Identity*" in the IE "*RAB info*":

4> include the IE "*COUNT-C Activation Time*" and specify a TDMA frame number for this IE;

NOTE 6: GERAN does not include the IE "*Ciphering Mode Info*" in any reconfiguration messages unless it is also used to perform an SBSS relocation with change of ciphering algorithm.

1> set the IE "*RRC Transaction Identifier*" to the value of "RRC transaction identifier" in the entry for the received message in the table "Accepted transactions" in the variable TRANSACTIONS; and

1> clear that entry;

1> if the variable PDCP_SN_INFO is not empty:

2> include the IE "*RB with PDCP Information List*" and set it to the value of the variable PDCP_SN_INFO.

1> if the IE "*Integrity Protection Mode Info*" was present in the received reconfiguration message:

2> start applying the new integrity protection configuration in the uplink for SRB2 from and including the transmitted response message.

If after state transition the MES enters RRC-GRA_PCH state, the MES shall, after the transmission of the response message:

1> if the criteria for GRA Update caused by "GRA reselection" according to clause 7.8 are fulfilled:

2> initiate a GRA Update procedure according to clause 7.8 using the cause "GRA reselection";

2> when the GRA Update procedure completed:

3> the procedure ends.

7.14.1.4 Transmission of a response message by the MES, normal case

In case the procedure was triggered by reception of a RADIO BEARER SETUP message and change in uplink or uplink and downlink physical channel type is not required for all radio bearers, the MES shall:

1> if IE "*Downlink Activation Time"* is present:

2> At activation frame, transmit a RADIO BEARER SETUP COMPLETE as response message on the uplink SRB2. The response message is sent on the new configuration if SRB2 is reconfigured; otherwise, use existing configuration.

1> Else:

2> transmit a RADIO BEARER SETUP COMPLETE as response message on the uplink SRB2 immediately.

In case the procedure was triggered by reception of a RADIO BEARER RECONFIGURATION message and change in uplink or uplink and downlink physical channel type is not required for all radio bearers, the MES shall:

1> if IE "*Downlink Activation Time"* is present:

2> at activation frame, transmit a RADIO BEARER RECONFIGURATION COMPLETE as response message on the uplink SRB2. The response message is sent on the new configuration if SRB2 is reconfigured; otherwise, use existing configuration.

1> else:

2> transmit a RADIO BEARER RECONFIGURATION COMPLETE as response message on the uplink SRB2.

In case the procedure was triggered by reception of a RADIO BEARER SETUP message or RADIO BEARER RECONFIGURATION message, and change in physical channel type or radio frequency is required for all radio bearers, the MES shall:

1> if IE "*Downlink Activation Time"* is present:

2> at activation frame, transmit a RADIO BEARER SETUP COMPLETE as response message on the uplink SRB2. The response message is sent on the new configuration if SRB2 is reconfigured; otherwise, use existing configuration;

1> else:

2> transmit a CHANNEL CHANGE PREPARATION COMPLETE as response message on the uplink SRB2.

In case the procedure was triggered by reception of a RADIO BEARER RELEASE message, the MES shall:

1> transmit a RADIO BEARER RELEASE COMPLETE as response message on the uplink SRB2;

1> when the successful delivery of the RADIO BEARER RELEASE COMPLETE message has been confirmed by the lower layers:

2> locally release temporary block flow associated with the Radio Bearer(s);

2> deactivate the physical channel associated with the Radio Bearer(s);

2> inform upper layers on release of Radio Bearer(s).

If the new RRC state is RRC-Cell_Dedicated state or RRC-Cell_Shared state, the response message shall be transmitted using the new configuration after the state transition, and the MES shall:

1> if the structure "Downlink Counter Synchronization Info" was included in the reconfiguration message; or

1> if the received reconfiguration message is a RADIO BEARER RECONFIGURATION and the IE "*New G-RNTI*" is included:

2> when RLC sub-layer has confirmed the successful transmission of the response message:

3> if the variable PDCP_SN_INFO is empty:

4> configure the RLC entity for all AM and UM radio bearers and AM and UM signalling radio bearers except SRB2 to "continue";

3> else:

4> configure the RLC entity for signalling radio bearers SRB1, SRB3 and SRB4 to "continue";

4> configure the RLC entity for UM and AM radio bearers for which the IE "*PDCP SN Info*" is not included to "continue";

3> re-establish all AM and UM RLC entities with RB identities larger than 4 and set the first 20 bits of all the HFN component of the respective COUNT-C values to the START value included in the response message for the corresponding CN domain;

3> re-establish the RLC entities with RB identities 1, 3 and 4 and set the first 20 bits of all their HFN component of the respective COUNT-C values to the START value included in the response message for the CN domain stored in the variable LATEST_CONFIGURED_CN_DOMAIN;

3> set the remaining bits of the HFN component of COUNT-C values of all UM RLC entities to zero;

3> set the remaining bits of the HFN component of the COUNT-C values of all AM RLC entities to zero, for those bearers to which RLC entities where re-established;

3> if the IE "*PDCP Context Relocation Info*" is not present:

4> re-initialize the PDCP header compression entities of each radio bearer in the variable ESTABLISHED_RABS as specified in ETSI TS 101 376-4-15 [24]; except those radio bearers using the header suppression (or zero-byte header compression) method;

3> if the IE "*PDCP Context Relocation Info*" is present:

4> perform the actions as specified in clause 7.19;

1> if the variable PDCP_SN_INFO is empty:

2> if the received reconfiguration message contained the IE "*Ciphering Mode Info*":

3> when RLC sub-layer has confirmed the successful transmission of the response message:

4> notify upper layers upon change of the security configuration;

4> perform the actions below;

2> if the received reconfiguration message did not contain the IE "*Ciphering Mode Info*":

3> when RLC sub-layer has been requested to transmit the response message:

4> perform the actions below;

1> if the variable PDCP_SN_INFO is non-empty:

2> when RLC sub-layer has confirmed the successful transmission of the response message:

3> for each radio bearer in the variable PDCP_SN_INFO:

4> if the IE "*RB Started*" in the variable ESTABLISHED_RABS is set to "started":

5> configure the RLC entity for that radio bearer to "continue";

3> perform the actions below.

If the IE "*Synchronization Parameter*" is present in the RADIO BEARER RECONFIGURATION and if requested in the IE "*Synchronization Parameter*", the MES shall:

1> include the observed time difference which it has measured when performing reconfiguration of the physical channels, corrected by half the timing advance received in the IE "*Timing Correction*" in the RADIO BEARER RECONFIGURATION COMPLETE message (detailed specifications are given in ETSI TS 101 376-5-7 [10]).

If the new RRC state is RRC-GRA_PCH state, the response message shall be transmitted using the old configuration before the state transition and the MES shall:

1> when RLC sub-layer has confirmed the successful transmission of the response message:

2> for each radio bearer in the variable PDCP_SN_INFO:

3> if the IE "*RB Started*" in the variable ESTABLISHED_RABS is set to "started":

4> configure the RLC entity for that radio bearer to "continue";

2> enter the new RRC state (RRC-Cell_Shared state or RRC-GRA_PCH state, respectively);

2> perform the actions below.

The MES shall:

1> set the variable ORDERED_RECONFIGURATION to FALSE;

1> if the received reconfiguration message contained the IE *"Ciphering Mode Info":*

2> resume data transmission on any suspended radio bearer and signalling radio bearer mapped on RLC-AM or RLC-UM;

2> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

1> if the received reconfiguration message contained the IE *"Integrity Protection Mode Info":*

2> allow the transmission of RRC messages on all signalling radio bearers with any RRC SN;

2> set the IE "Reconfiguration" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

1> clear the variable PDCP_SN_INFO;

1> clear the variable START_VALUE_TO_TRANSMIT;

1> clear the variable SECURITY_MODIFICATION*;*

1> continue RLC operation.

7.14.1.5 Reception of a response message by the GERAN, normal case

When GERAN has received one of the following reconfiguration response messages:

- RADIO BEARER SETUP COMPLETE message; or
- RADIO BEARER RECONFIGURATION COMPLETE message; or
- RADIO BEARER RELEASE COMPLETE message.

GERAN shall delete the old configuration.

If CHANNEL CHANGE PREPARATION COMPLETE message is received and if the GERAN had initiated Radio Bearer establishment or reconfiguration procedure requiring a change in physical channel type for all radio bearers, then the GERAN shall:

1> confirm the receipt of CHANNEL CHANGE PREPARATION COMPLETE message by instructing RLC entity on the network side (see ETSI TS 101 376-4-14 [14]) to send one or more RLC acknowledgments;

NOTE 1: The number of RLC acknowledgements transmitted by GERAN is network implementation dependent.

1> after transmitting one or more RLC acknowledgments the GERAN shall:

2> delete the old physical channel configuration;

2> configure new uplink physical channel;

2> re-establish uplink RLC entities for all radio bearers (including SRB2) if there is a change in the uplink physical channel type;

2> re-establish downlink RLC entities for all radio bearers (including SRB2) if there is a change in the downlink physical channel type;

2> resume transmission of downlink RLC blocks on all radio bearers.

NOTE 2: CHANNEL CHANGE PREPARATION COMPLETE is only sent when "*Downlink Activation Time"* IE is not present otherwise the above applies at "*Downlink Activation Time"*

If the IE "*START*" or the IE "*START List*" is included in reconfiguration response message, the GERAN shall:

1> set the START value for each CN domain with the corresponding values as received in this response message;

1> consequently, then use the START values to initialize the hyper frame numbers, in the same way as specified for the MES in clause 7.14.1.3, for any new radio bearers that are established.

If GERAN has ordered a ciphering reconfiguration by including the IE "*Ciphering Mode Info*", GERAN shall:

1> For radio bearers using RLC-AM or RLC-UM:

2> use the old ciphering configuration for received RLC PDUs with RLC sequence number less than the RLC sequence number indicated in the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" sent by the MES;

2> use the new ciphering configuration for received RLC PDUs with RLC sequence number greater than or equal to the RLC sequence number indicated in the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" sent by the MES;

2> if an RLC reset or re-establishment occurs after the reconfiguration response message has been received by the GERAN before the activation time for the new ciphering configuration has been reached:

3> ignore the activation time; and

3> apply the new ciphering configuration immediately after the RLC reset or RLC re-establishment.

1> For radio bearers using RLC-TM:

2> use the new ciphering configuration and only begin incrementing the COUNT-C at the TDMA FRAME NUMBER as indicated in:

3> the IE "*Ciphering Activation Time for DCH*" in the IE "*Ciphering Mode Info*", if included in the message that triggered the radio bearer control procedure; or

3> the IE "*COUNT-C Activation Time*", if included in the response message for this procedure;

1> the procedure ends on the GERAN side.

7.14.1.6 Unsupported configuration in the MES

If the GERAN instructs the MES to use a configuration, which it does not support and/or if the received message causes the variable UNSUPPORTED_CONFIGURATION to be set to TRUE, the MES shall:

1> transmit a failure response as specified in clause 7.14.1.9, setting the information elements as specified below:

2> include the IE "*RRC Transaction Identifier*"; and

2> set it to the value of "RRC Transaction Identifier" in the entry for the received message in the table "Accepted transactions" in the variable TRANSACTIONS; and

2> clear that entry;

2> set the IE "*Failure Cause*" to "configuration unsupported".

1> set the variable UNSUPPORTED_CONFIGURATION to FALSE;

1> continue with any ongoing processes and procedures as if the reconfiguration message was not received.

The procedure ends.

7.14.1.7 Physical channel failure

A physical channel failure occurs in case the criteria defined in clause 7.18 are not fulfilled.

If the received message (a RADIO BEARER SETUP message, a RADIO BEARER RECONFIGURATION message or a RADIO BEARER RELEASE message) causes the MES to enter in RRC-Cell_Dedicated state and the MES fails to establish the basic physical subchannel(s) indicated in the received message the MES shall:

1> revert to the configuration prior to the reception of the message (old configuration);

1> if the old configuration includes dedicated physical channels (RRC-Cell_Dedicated state) and the MES is unable to revert to the old configuration:

2> initiate a Cell Update procedure according to clause 7.8, using the cause "radio link failure";

2> after the Cell Update procedure has completed successfully:

3> proceed as below.

1> if the old configuration does not include dedicated physical channels (RRC-Cell_Shared state):

2> select a suitable GRA cell according to clause 7.8;

2> if the MES selects another cell than the cell the MES camped on upon reception of the reconfiguration message:

3> initiate a Cell Update procedure according to clause 7.8, using the cause "cell reselection";

3> after the Cell Update procedure has completed successfully:

4> proceed as below.

1> transmit a failure response message as specified in clause 7.14.1.9, setting the information elements as specified below:

2> include the IE "*RRC Transaction Identifier*"; and

2> set it to the value of "RRC transaction identifier" in the entry for the received message in the table "Accepted transactions" in the variable TRANSACTIONS; and

2> clear that entry;

2> set the IE "*Failure Cause*" to "physical channel failure".

1> set the variable ORDERED_RECONFURATION to FALSE;

1> continue with any ongoing processes and procedures as if the reconfiguration message was not received.

The procedure ends.

If the criteria for radio link failure are met in the old configuration during the reconfiguration procedure as specified in clause 7.18.8 the MES shall:

1> if MES would have entered in RRC-GRA_PCH state as a successful completion of this reconfiguration procedure and MES has already submitted a response message to lower layers:

2> initiate a Cell Update procedure according to clause 7.8.1.3, using the cause "radio link failure";

2> the procedure ends. If the criteria for radio link failure are met in the new configuration during the reconfiguration procedure (i.e. while MES is waiting for RLC acknowledgement for a response message.) the MES shall act as specified in clause 7.18.8 and in addition it shall:

1> if the received reconfiguration causes:

- the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to be set to TRUE; or

- the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to be set to TRUE;

2> perform the actions specified in clause 7.14.1.12.2.

7.14.1.8 Cell re-selection

If the MES performs cell re-selection during the reconfiguration procedure, the MES shall:

1> initiate a Cell Update procedure, as specified in clause 7.8;

1> continue with the Reconfiguration procedure.

7.14.1.9 Transmission of a response message by the MES, failure case

The MES shall:

1> in case of reception of a RADIO BEARER SETUP message:

2> if the Radio Bearer Establishment procedure affects several radio bearers:

3> (may) include the identities of the radio bearers for which the procedure would have been successful into the RADIO BEARER SETUP FAILURE message;

2> transmit a RADIO BEARER SETUP FAILURE as response message on the SRB2;

1> in case of reception of a RADIO BEARER RECONFIGURATION message:

2> if the Radio Bearer Reconfiguration procedure affects several radio bearers:

3> (may) include the identities of the radio bearers for which the procedure would have been successful into the RADIO BEARER RECONFIGURATION FAILURE message;

2> transmit a RADIO BEARER RECONFIGURATION FAILURE as response message on the SRB2;

1> in case of reception of a RADIO BEARER RELEASE message:

2> if the Radio Bearer Release procedure affects several radio bearers:

3> (may) include the identities of the radio bearers for which the procedure would have been successful into the RADIO BEARER RELEASE FAILURE message;

2> transmit a RADIO BEARER RELEASE FAILURE as response message on the SRB2;

1> when the response message has been submitted to lower layers for transmission:

2> continue with any ongoing processes and procedures as if no reconfiguration attempt had occurred;

2> if a lower layer failure happens while attempting to connect back to the old channels, the standard rules are applied according to clause 7.18.8.

7.14.1.10 Reception of a response message by the GERAN, failure case

When the GERAN has received:

- the RADIO BEARER SETUP FAILURE message; or
- the RADIO BEARER RECONFIGURATION FAILURE message; or
- the RADIO BEARER RELEASE FAILURE message;

the GERAN may restore the old and delete the new configuration. Upper layers shall be notified of the failure.

The procedure ends on the GERAN side.

7.14.1.11 Invalid configuration

If the variable INVALID_CONFIGURATION is set to TRUE the MES shall:

1> keep the configuration existing before the reception of the message;

1> transmit a failure response message as specified in clause 7.14.1.9, setting the information elements as specified below:

2> include the IE "*RRC Transaction Identifier*"; and:

3> set it to the value of "RRC transaction identifier" in the entry for the received message in the table "Accepted transactions" in the variable TRANSACTIONS; and

3> clear that entry;

2> set the IE "*Failure Cause*" to "invalid configuration";

1> set the variable INVALID_CONFIGURATION to FALSE;

1> continue with any ongoing processes and procedures as if the reconfiguration message was not received.

The procedure ends.

7.14.1.12 Incompatible simultaneous reconfiguration

7.14.1.12.0 General

If the table "Rejected transactions" in the variable TRANSACTIONS is set due to the received message and the variable PROTOCOL_ERROR_REJECT is set to FALSE, the MES shall:

1> not apply the configuration contained in the received reconfiguration message;

1> transmit a failure response message as specified in clause 7.14.1.9, setting the information elements as specified below:

2> include the IE "*RRC Transaction Identifier*"; and

2> set it to the value of "RRC transaction identifier" in the entry for the received message in the table "Rejected transactions" in the variable TRANSACTIONS; and

2> clear that entry;

2> set the IE "*Failure Cause*" to "incompatible simultaneous reconfiguration";

1> continue with any ongoing processes and procedures as if the reconfiguration message was not received.

The procedure ends.

7.14.1.12.1 Incompatible simultaneous security reconfiguration

If the variable INCOMPATIBLE_SECURITY_RECONFIGURATION is set to TRUE due to the received reconfiguration message, the MES shall:

1> transmit a failure response message as specified in clause 7.14.1.9, setting the information elements as specified below:

2> include the IE "*RRC Transaction Identifier*"; and

2> set it to the value of "RRC transaction identifier" in the entry for the received message in the table "Accepted transactions" in the variable TRANSACTIONS; and

2> clear that entry;

2> set the IE "*Failure Cause*" to the cause value "incompatible simultaneous reconfiguration";

1> set the variable INCOMPATIBLE_SECURITY_RECONFIGURATION to FALSE;

1> continue with any ongoing processes and procedures as if the reconfiguration message was not received.

The procedure ends.

7.14.1.12.2 Cell Update procedure during security reconfiguration

If:

- a Cell Update procedure according to clause 7.8.1 is initiated; and
- the received reconfiguration message causes either;
- the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to be set to TRUE; and/or
- the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to be set to TRUE;

the MES shall:

1> release all radio resources;

1> indicate the release of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers; and

1> clear any entry for the RRC CONNECTION RELEASE message in the tables "Accepted transactions" and "Rejected transactions" in the variable TRANSACTIONS;

1> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

1> clear the variable ESTABLISHED_RABS;

1> if the received reconfiguration message contained the IE "*Ciphering Mode Info*":

2> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

2> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;2> clear the variable SECURITY_MODIFICATION;

1> if the received reconfiguration message contained the IE "*Integrity Protection Mode Info*":

2> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

2> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

1> enter RRC-Idle mode;

1> perform the actions specified in clauses 6 and 7.18 when entering RRC- Idle mode from RRC-Connected mode;

1> the procedure ends.

The GERAN shall use radio bearer control messages to perform an SBSS relocation only in case of state transitions from RRC-CELL_Dedicated to RRC-Cell-CELL_Dedicated state.

7.14.1.13 Invalid received message

If the received reconfiguration message contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MS shall perform procedure specific error handling as follows. The MES shall:

1> transmit a failure response message as specified in clause 7.14.1.9, setting the information elements as specified below:

2> include the IE "*RRC Transaction Identifier*"; and

2> set it to the value of "RRC transaction identifier" in the entry for the received message in the table "Rejected transactions" in the variable TRANSACTIONS; and

2> clear that entry;

2> set the IE "*Failure Cause*" to the cause value "protocol error";

2> include the IE "*Protocol Error Information*" with contents set to the value of the variable PROTOCOL_ERROR_INFORMATION;

1> continue with any ongoing processes and procedures as if the reconfiguration message was not received.

7.14.1.14 Abnormal cases

If the RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION or RADIO BEARER RELEASE message instructs the MES to use a Channel Description or Channel Mode that it does not support, or if the Channel Mode to use is not defined for all channel sets, then the MES shall:

1> send the failure message according to clause 7.14.1.9 with cause "channel mode unacceptable"; and

1> act and set the variables according with clauses 7.19 and 10.4; and

1> remain on the current channel(s) and use the old Channel Description or Channel Mode(s).

If the RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION or RADIO BEARER RELEASE message instructs the MES to use a frequency that it is not capable of, then the MES shall:

1> send the failure message according to clause 7.14.1.9 with cause "frequency not implemented"; and

1> act and set the variables according with clauses 7.19 and 10.4; and

1> remain on the current channel(s).

A RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION or RADIO BEARER RELEASE message sent to a multi band MES shall not be considered invalid because it indicates frequencies that are all in a different frequency band to that of the current channel.

If the RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION message instructs the MES to use a new uplink physical channel without Physical Channel Description IE, RLC Sequence Number IE or RRB Id IE (when transitioning to dedicated channel), then the mobile earth station shall:

1> send the failure message according to clause 7.14.1.9 with cause "Semantically incorrect message"; and

1> act and set the variables according with the clauses 7.19 and 10.4; and

1> remain on the current channel(s) and use the old Channel Description or Channel Mode(s).

If the MES receives a RADIO BEARER RECONFIGURATION message with the IE "*Synchronization parameter*" and the IE "*Timing Correction*" included; and

if synchronous or pseudo-synchronous (see clause 7.18.6) physical channel establishment is performed, when using Radio Bearer Reconfiguration procedure; and

if the MES knows that the timing advance with the new cell is out of range, i.e. is bigger than the maximum timing advance that can be coded as specified in ETSI TS 144 004 [i.4]; and

if the new cell does not accept out of range timing advance as indicated in the RADIO BEARER RECONFIGURATION message, the MES shall:

1> send a failure message according with clause 7.14.1.9 on the SRB2 and does not attempt that reconfiguration as defined in clause 7.14.1.3;

1> act and set the variables according with the clauses 7.19 and 10.4; and

1> remain on the current channel(s).

If a lower layer failure happens on the new channel before the RADIO BEARER RECONFIGURATION COMPLETE message has been sent, the MES shall:

1> deactivate the new channels, reactivates the old channels;

1> reconnect the DCHs if any;

1> then send a failure message as specified in clause 7.14.1.9; and

1> resume normal operation as if no physical channel establishment (see clause 7.18.6) attempt had occurred. The operational parameters (e.g. ciphering mode) when returning on the old channel are those applied before the RADIO BEARER RECONFIGURATION message was received.

If the MES receives a RADIO BEARER RECONFIGURATION message and if at least one of the following IEs, IE "*Handover Reference*", IE "*Power Command and Access Type*", IE "*Cell Description*" is not present, the MES shall:

1> send a failure message according with clause 7.14.1.9 on the SRB2 and does not attempt that reconfiguration as defined in clause 7.14.3;

1> act and set the variables according with clauses 7.19 and 10.4; and

1> remain on the current channel(s).

If the MES receives a RADIO BEARER RECONFIGURATION message and if only IE "*Power Command*" is present, the MES shall:

1> send a failure message according with clause 7.14.1.9 on the SRB2 and does not attempt that reconfiguration as defined in clauses 7.14.3 and 10.4;

1> act and set the variables according with clauses 7.19 and 10.4.

If IE "*PDCH Description*" is present in the reconfiguration messages and if RLC data blocks are not received in the T3190 seconds(as specified in ETSI TS 101 376-4-12 [13]), the MES shall:

1> deactivate the new channels, reactivates the old channels;

1> reconnect the PDCHs if any;

1> then send a failure message as specified in clause 7.14.1.9 with a cause "protocol error unspecified"; and

1> resume normal operation as if no physical channel establishment (see clause 7.18.6) attempt had occurred. The operational parameters (e.g. ciphering mode) when returning on the old channel are those applied before the reconfiguration message was received.

If IE "*PDCH Description*" is present in the reconfiguration messages and if the MES has been assigned more PDCHs than it supports according to its MES multislot class or if the MES has been assigned an MCS (e.g. 8-PSK in the uplink) that the MES does not support or if the failure is due to any other reason, return to MAC-Idle state and cell reselection continues.

The MES shall:

1> then send a failure message as specified in clause 7.14.1.9 with a cause "protocol error unspecified".

7.14.2 MES initiated DTM procedures while in RRC-Cell_Dedicated-MAC-Dedicated state

7.14.2.1 General

While in RRC-Cell_Dedicated-MAC-Dedicated state, the establishment of one or more PDCHs may be initiated by the RRC entity of the MES using the DTM Request procedure. The procedure is used only for existing radio bearers and is triggered by a request from upper layers to transfer an upper layer PDU.

7.14.2.2 Initiation of the DTM Request procedure by the MES

The MES initiates the DTM Request procedure by sending a GERAN Iu mode DTM REQUEST message on the SRB2.

The MES shall set the IEs in the GERAN Iu mode DTM REQUEST message as follows:

1> calculate the START according to clause 7.19.4 for the CN domain as set in the IE "*CN Domain Identity*"; and:

2> include the calculated START value for that CN domain in the IE "*START*";

1> include IE "*Iu mode RRC Channel Request Description*" to indicate the establishment cause, as applicable, a request to send user data, page response or a mobility management message;

1> may include "*Integrity Check Info*" IE. If the IE is included, act as is specified in clause 7.19.4.6;

The MES shall:

1> transmit the GERAN Iu mode DTM REQUEST message on the uplink SRB 2;

1> start timer T3148.

7.14.2.3 Reception of a GERAN Iu mode DTM REQUEST message by the GERAN

7.14.2.3.1 General

Upon receiving a GERAN Iu mode DTM REQUEST message, GERAN shall either:

1> transmit the RADIO BEARER RECONFIGURATION message on the downlink SRB 2 as specified in clause 7.14.2.3.2; or

1> transmit the GERAN Iu mode DTM REJECT message on the downlink SRB 2 as specified in clause 7.14.2.3.3.

7.14.2.3.2 PDCH assignment

On receipt of a GERAN Iu mode DTM REQUEST message the network may allocate one or more uplink PDCH(s) for the MES. The PDCH(s) are assigned to the MES in the RADIO BEARER RECONFIGURATION message.

The RADIO BEARER RECONFIGURATION is sent on SRB2 as specified in clause 7.14.1.

The allocation of the uplink PDCH(s) may imply the reallocation of the DCH(s). The RADIO BEARER RECONFIGURATION message shall not be used to change to a dependent configuration.

On receipt of a RADIO BEARER RECONFIGURATION message the MES shall stop T3148.

If the received RADIO BEARER RECONFIGURATION message includes uplink PDCH(s), the MES shall proceed as specified in clause 7.14.1.3. If the received RADIO BEARER RECONFIGURATION message includes downlink PDCH(s) and no uplink PDCH(s), the MES shall stop T3148, abort the DTM request procedure and proceed as specified in clause 7.14.1.3, and then attempt an establishment of uplink TBF, using the applicable procedure specified in ETSI TS 101 376-4-14 [14].

If the RADIO BEARER RECONFIGURATION includes allocation of one or more uplink PDCHs but the resources cannot be allocated for all RBs requested by the MES, then failure is triggered for the radio bearers to which resources where not granted and T3148 is stopped. Request of resources for failed RBs is then done as specified in ETSI TS 101 376-4-14 [14].

7.14.2.3.3 DTM Request rejection

If the network cannot allocate the requested PDCH(s) it may send to the MES a GERAN Iu mode DTM REJECT message on the SRB2. This message shall contain:

1> the "*Wait Indication*" IE;

1> the "*RB Identity*" IE set to the RB_IDENTITY;

1> the "*RRC transaction identifier*" IE set to the value of "RRC transaction identifier" in the entry for the GERAN Iu mode DTM REJECT message in the table "Rejected transactions" in the variable TRANSACTIONS;

1> the "*Failure Cause*" IE set to the cause value "protocol error";

1> the "*Protocol Error Information*" IE with contents set to the value of the variable PROTOCOL_ERROR_INFORMATION.

7.14.2.3.4 Reception of a GERAN Iu mode DTM REJECT message by the MES, normal case

On receipt of the GERAN Iu mode DTM REJECT message, the MES shall:

1> stop T3148;

1> notify upper layers of a PDCH establishment failure;

1> start timer T3142 with the value given in the "*Wait Indication*" information element.

The MES is not allowed to make a new attempt for a DTM request procedure in the same cell until T3142 expires. The value of the wait indication (i.e. T3142) relates to the cell from which it was received.

After sending GERAN Iu mode DTM REQUEST message the MES shall wait for the response from the network or expiry of timer T3148 before it may initiate new DTM Request procedure.

The GERAN Iu mode DTM Reject procedure rejects all pending requests that were sent in the previous GERAN Iu mode DTM Request message.

7.14.2.3.5 Invalid GERAN Iu mode DTM REJECT message

If the MES receives an GERAN Iu mode DTM REJECT message which contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MES shall perform procedure specific error handling as follows:

The MES shall:

1> set the variable PROTOCOL_ERROR_INDICATOR to TRUE;

1> set the IEs in the GERAN Iu mode DTM REQUEST message as specified in clause 7.14.2.2;

1> transmit the GERAN Iu mode DTM REQUEST message on the uplink SRB 2;

1> start timer T3148.

7.14.2.4 Abnormal cases

Abnormal cases related to radio bearer reconfiguration procedures are defined in clause 7.14.1.14.

In the following cases a GERAN Iu mode DTM Request failure has occurred:

- At expiry of T3148;
- If a RADIO BEARER RECONFIGURATION message indicates resources in a non-supported frequency band. The cause value is "frequency not implemented". The actions are defined in clause 7.14.1.14.
- If the information available in the MES after the reception of a RADIO BEARER RECONFIGURATION message does not satisfactorily define uplink packet resources. The cause value is "protocol error unspecified". The actions are defined in clause 7.14.1.14.
- If a RADIO BEARER RECONFIGURATION message includes a mobile allocation or a frequency list that indexes frequencies in more than one frequency band. The cause value is "frequency not implemented". The actions are defined in clause 7.14.1.14.
- If a RADIO BEARER RECONFIGURATION message assigns resources not compliant with the multislot capabilities of the MES. The cause value is "channel mode unacceptable". The actions are defined in clause 7.14.1.14.
- If the MES has no current CA and if it needs a CA to analyse the RADIO BEARER RECONFIGURATION message. The cause value is "no cell allocation available". The actions are defined in clause 7.14.1.14.
- If the RADIO BEARER RECONFIGURATION message instructs the MES to use a channel description or mode that it does not support. The cause value is "channel mode unacceptable". The actions are defined in clause 7.14.1.14.
- If the RADIO BEARER RECONFIGURATION message does not include any uplink or downlink packet resources. The cause value is "protocol error unspecified". The actions are defined in clause 7.14.1.4.

7.14.2.5 T3148 expiry

On expiry of timer T3148 DTM Request procedure has failed on the MES side. The MES shall then reinitiate DTM Request procedure unless it has already been reinitiated 4 times. In that case DTM Request procedure shall be aborted.

7.15 Signalling flow procedures

7.15.1 Signalling connection release procedure

7.15.1.1 General

Figure 7.15.1.1.1: Signalling Connection Release procedure, normal case

The Signalling Connection Release procedure is used to notify to the MES that one of its ongoing signalling connections has been released. The procedure does not initiate the release of the RRC connection.

7.15.1.2 Initiation of SIGNALLING CONNECTION RELEASE by the GERAN

To initiate the procedure, the GERAN transmits a SIGNALLING CONNECTION RELEASE message on SRB 2.

7.15.1.3 Reception of SIGNALLING CONNECTION RELEASE by the MES

Upon reception of a SIGNALLING CONNECTION RELEASE message, the MES shall:

1> indicate the release of the signalling connection and pass the value of the IE "*CN Domain Identity*" to upper layers;

1> remove the signalling connection with the identity indicated by the IE "*CN Domain Identity*" from the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

1> clear the entry for the SIGNALLING CONNECTION RELEASE message in the table "Accepted transactions" in the variable TRANSACTIONS;

1> the procedure ends.

7.15.1.4 Invalid SIGNALLING CONNECTION RELEASE message

If the MES receives a SIGNALLING CONNECTION RELEASE message, which contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8, the MES shall perform procedure specific error handling as follows:

1> include the IE "*Identification of Received Message*"; and:

    2> set the IE "*Received Message Type*" to SIGNALLING CONNECTION RELEASE;

    2> set the IE "*RRC Transaction Identifier*" to the value of "RRC transaction identifier" in the entry for the SIGNALLING CONNECTION RELEASE message in the table "Rejected transactions" in the variable TRANSACTIONS; and

    2> clear that entry;

1> include the IE "*Protocol Error Information*" with contents set to the value of the variable PROTOCOL_ERROR_INFORMATION;

1> transmit an RRC STATUS message on SRB 2 uplink;

1> when the RRC STATUS message has been submitted to lower layers for transmission:

2> continue with any ongoing processes and procedures as if the invalid SIGNALLING CONNECTION RELEASE message has not been received.

7.15.1.5 Invalid configuration

If radio access bearers for the CN domain indicated by the IE "CN domain identity" exist in the variable ESTABLISHED_RABS, the MES shall:

1> transmit an RRC STATUS message on SRB 2 uplink using AM RLC;

1> include the IE "*Identification of Received Message*"; and

1> set the IE "*Received Message Type*" to SIGNALLING CONNECTION RELEASE; and

1> set the IE "*RRC Transaction Identifier*" to the value of "RRC transaction identifier" in the entry for the SIGNALLING CONNECTION RELEASE message in the table "Accepted transactions" in the variable TRANSACTIONS and clear that entry;

1> include the IE "*Protocol Error Information*" with contents set to the value "Message not compatible with receiver state";

1> when the RRC STATUS message has been submitted to lower layers for transmission:

2> continue with any ongoing processes and procedures as if the invalid SIGNALLING CONNECTION RELEASE message has not been received.

7.15.2 Signalling connection release indication procedure

7.15.2.1 General

Figure 7.15.2.1.1: Signalling Connection Release Indication procedure, normal case

The Signalling Connection Release Indication procedure is used by the MES to indicate to the GERAN that one of its signalling connections has been released. The procedure may in turn initiate the RRC connection release procedure.

7.15.2.2 Initiation

The MES shall, on receiving a request to release (abort) the signalling connection from upper layers:

1> if a signalling connection in the variable ESTABLISHED_SIGNALLING_CONNECTIONS for the specific CN domain identified with the IE "*CN domain identity*" exists:

2> initiate the signalling connection release indication procedure;

1> otherwise:

2> abort any ongoing establishment of signalling connection for that specific CN domain as specified in clause 7.15.2.2a.

Upon Initiation of the Signalling Connection Release Indication procedure in RRC-GRA_PCH state, the MES shall:

1> perform a Cell Update procedure, according to clause 7.8, using the cause "uplink data transmission";

1> when the Cell Update procedure completed successfully:

2> continue with the signalling connection release indication procedure as described below.

The MES shall:

1> set the IE "*CN Domain Identity*" to the value indicated by the upper layers. The value of the IE indicates the CN domain whose associated signalling connection the upper layers are indicating to be released;

1> remove the signalling connection with the identity indicated by upper layers from the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

1> transmit a SIGNALLING CONNECTION RELEASE INDICATION message on SRB 2.

When the successful delivery of the SIGNALLING CONNECTION RELEASE INDICATION message has been confirmed by RLC sub-layer the procedure ends.

7.15.2.2a RLC re-establishment, inter-mode handover or inter-RAT change

If a re-establishment of RLC on signalling radio bearer SRB2 occurs before the successful delivery of the SIGNALLING CONNECTION RELEASE INDICATION message has been confirmed by RLC sublayer, the MES shall:

1> retransmit the SIGNALLING CONNECTION RELEASE INDICATION message on the uplink using signalling radio bearer SRB2.

If an inter-RAT handover from GERAN procedure occurs before the successful delivery of the SIGNALLING CONNECTION RELEASE INDICATION message has been confirmed by RLC sublayer, the MES shall:

1> abort the signalling connection while in the new RAT.

7.15.2.3 Reception of SIGNALLING CONNECTION RELEASE INDICATION by the GERAN

Upon reception of a SIGNALLING CONNECTION RELEASE INDICATION message, the GERAN requests the release of the signalling connection from upper layers. Upper layers may then initiate the release of the signalling connection.

7.16 Security mode control

7.16.1 Security mode control

7.16.1.0 Signalling flow

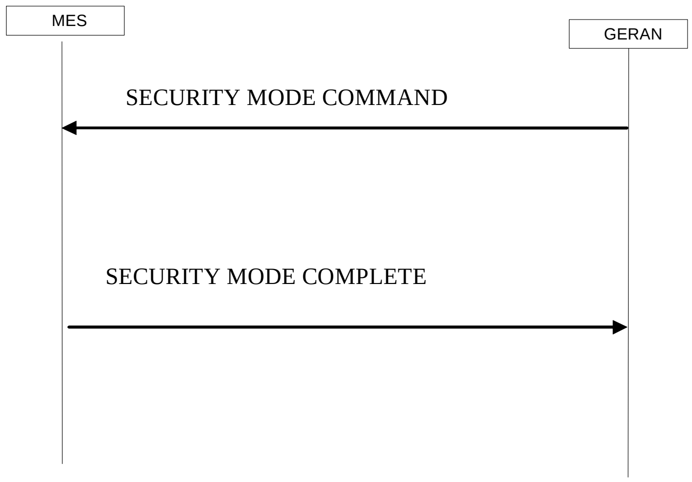

Figure 7.16.1.0.1: Security mode control procedure

7.16.1.1 General

The purpose of this procedure is to trigger the start of ciphering or to command the restart of the ciphering with a new ciphering configuration, for the radio bearers of one CN domain and for all signalling radio bearers.

It is also used to start integrity protection or to modify the integrity protection configuration for all signalling radio bearers.

7.16.1.2 Initiation

7.16.1.2.1 Ciphering configuration change

To start/restart ciphering, GERAN sends a SECURITY MODE COMMAND message on one downlink SRB2 using the most recent ciphering configuration. If no such ciphering configuration exists then the SECURITY MODE COMMAND message is not ciphered. The security mode control is initiated by SGSN (see ETSI TS 133 102 [23]); However, the GERAN may also internally change the ciphering configuration to use AES-256 after a successful Key Exchange Procedure as described in clause 7.20.

When configuring ciphering, GERAN shall ensure that the MES needs to store at most two different ciphering configurations (keyset and algorithm) per CN domain, in total over all radio bearers at any given time. For signalling radio bearers the total number of ciphering configurations that need to be stored is at most three.

Prior to sending the SECURITY MODE COMMAND message, for the CN domain indicated in the IE "*CN Domain Identity*" in the SECURITY MODE COMMAND message, the GERAN shall:

1> suspend all radio bearers using RLC-AM or RLC-UM and suspend all signalling radio bearers using RLC-AM or RLC-UM, except the signalling radio bearer used to send the SECURITY MODE COMMAND message on the downlink SRB2 according to the following:

2> send an indication to lower layers:

3> not to transmit RLC PDUs with sequence number greater than or equal to the number in IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info*" on all suspended radio bearers and all suspended signalling radio bearers;

3> optionally include, for the signalling radio bearer used to send the SECURITY MODE COMMAND message, the IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info*", at which time the new ciphering configuration shall be applied. If "*RB Downlink Ciphering Activation Time Info*" is included in the IE "*Ciphering Mode Info*" the GERAN shall also include the "RLC sequence number" in the "*RB Downlink Ciphering Activation Time Info*" IE;

3> if the IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info*", is not included for the signalling radio bearer used to send the SECURITY MODE COMMAND, then the new ciphering configuration shall be applied for all subsequent signalling radio bearer RLC PDUs once receipt of SECURITY MODE COMPLETE message is received at the network indicating successful transition to new security configuration.

If RLC sequence number is not included in the IE "*RB Downlink Ciphering Activation Time Info*", then the RLC Sequence number at which the new security configuration is applied in the downlink direction for the signalling radio bearer shall be one greater (modulo the sequence number space) the sequence number used by the last RLC PDU block that carried the SECURITY MODE COMMAND message.

1> if a transparent mode radio bearer for this CN domain exists:

2> include the "Ciphering Activation Time for DCH" in IE "*Ciphering Mode Info*", at which time the new ciphering configuration shall be applied;

2> GERAN chooses the value for the "Ciphering Activation Time for DCH" such that the new ciphering configuration will occur after all the pending ciphering activation times have been reached for the transparent mode radio bearers of this CN domain;

1> consider an ciphering activation time in downlink to be pending until the RLC sequence number of the next RLC PDU to be transmitted for the first time is equal to or larger than the selected activation time;

1> set, for each suspended radio bearer and signalling radio bearer that has no pending ciphering activation time set by a previous security mode control procedure, an "RLC sequence number" in IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info*", at which time the new ciphering configuration shall be applied;

1> set, for each suspended radio bearer and signalling radio bearer that has a pending ciphering activation time set by a previous security mode control procedure, the "RLC sequence number" in IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info*" to the value used in the previous security mode control procedure, at which time the latest ciphering configuration shall be applied;

1> if Integrity protection has already been started for the MES; and:

2> if *"Ciphering Algorithm"* IE in "*Ciphering Mode Info"* indicates AES-256:

3> do not include the IE "*Integrity Protection Mode Info*" in the SECURITY MODE COMMAND message; if new integrity protection key has been received from upper layers since the transmission of the last SECURITY MODE COMMAND message for that CN domain, a separate SECURITY MODE COMMAND procedure is required.

2> else for the CN domain indicated in the IE "*CN Domain Identity*" in the SECURITY MODE COMMAND message, a new security key set (new ciphering and integrity protection keys) has been received from upper layers since the transmission of the last SECURITY MODE COMMAND message for that CN domain:

3> include the IE "*Integrity Protection Mode Info*" in the SECURITY MODE COMMAND message;

The ciphering configuration change does not apply to downlink TBF(s) for which a ciphering key was provided during Radio Bearer Setup or Radio Bearer Reconfiguration. These downlink TBF(s) continue their normal operation with previously provided ciphering key and RB ciphering synchronization.

1> if integrity protection has already been started for the MES; and:

2> if the IE "*CN Domain Identity*" in the SECURITY MODE COMMAND message is different from the IE "*CN Domain Identity*" that was sent in the previous SECURITY MODE COMMAND message to the MES:

3> include the IE "*Integrity Protection Mode Info*" in the SECURITY MODE COMMAND message;

1> transmit the SECURITY MODE COMMAND message on the downlink SRB2.

7.16.1.2.2 Integrity protection configuration change

To start or modify integrity protection, the GERAN sends a SECURITY MODE COMMAND message on the downlink SRB2 using the new integrity protection configuration. The GERAN shall not modify integrity protection for a CN domain for which a SECURITY MODE COMMAND message configuring integrity protection has been previously sent for an ongoing signalling connection unless the application of new integrity keys needs to be signalled to the MES. The GERAN shall not transmit a SECURITY MODE COMMAND message to signal a change in integrity protection algorithm.

When configuring Integrity protection, the GERAN shall:

1> ensure that the MES needs to store at most three different Integrity protection configurations (keysets) at any given time. This includes the total number of Integrity protection configurations for all signalling radio bearers;

1> if Ciphering has already been started for the MES for the CN domain to be set in the IE "*CN Domain Identity*" in the SECURITY MODE COMMAND message; and:

2> If ciphering is configured to use AES-256:

3> do not include the IE "*Ciphering Mode Info*" in the SECURITY MODE COMMAND message; if new AES-256 key has been received from upper layers since the transmission of the last SECURITY MODE COMMAND message for that CN domain, a separate SECURITY MODE COMMAND procedure is required.

2> else for the CN domain indicated in the IE "*CN Domain Identity*" in the SECURITY MODE COMMAND message, a new security key set (new ciphering and integrity protection keys) has been received from upper layers since the transmission of the last SECURITY MODE COMMAND message for that CN domain:

3> include the IE "*Ciphering Mode Info*" in the SECURITY MODE COMMAND message;

1> if Ciphering has already been configured for the MES for a CN domain different from the CN domain to be set in the IE "*CN Domain Identity*" in the SECURITY MODE COMMAND:

2> include the IE "*Ciphering Mode Info*" in the SECURITY MODE COMMAND message.

Prior to sending the SECURITY MODE COMMAND message, for the CN domain indicated in the IE "*CN Domain Identity*" in the SECURITY MODE COMMAND message, the GERAN shall:

1> if this is the first SECURITY MODE COMMAND message sent for this RRC connection:

2> if new keys have been received:

3> initialize the hyper frame numbers as follows:

4> set all bits of the hyper frame numbers of the COUNT-I values for all signalling radio bearers to zero;

2> else (if new keys have not been received):

3> use the value "START" in the most recently received IE "*START List*" or IE "*START*" that belongs to the CN domain indicated in the IE "*CN Domain Identity*" to initialize all hyper frame numbers of COUNT-I for all the signalling radio bearers; by:

4> setting the 20 most significant bits of the hyper frame numbers for all signalling radio bearers to the value "START" in the most recently received IE "*START List*" or IE "*START*" for that CN domain;

4> setting the remaining bits of the hyper frame numbers equal to zero;

1> else (this is not the first SECURITY MODE COMMAND message sent for this RRC connection):

2> if new keys have been received:

3> initialize the hyper frame number for COUNT-I for SRB2 as follows:

4> set all bits of the HFN of the COUNT-I value for SRB2 to zero;

2> if new keys have not been received:

3> initialize the hyper frame number for COUNT-I for SRB2 as follows:

4> set the 20 most significant bits of the HFN of the downlink and uplink COUNT-I to the value of the most recently received IE "*START*" or IE "*START List*" for the CN domain to be set in the IE "*CN Domain Identity*";

4> set the remaining bits of the HFN of the downlink and uplink COUNT-I to zero;

1> if the IE "*Integrity Protection Mode Command*" has the value "Start":

2> prohibit the transmission of signalling messages with any RRC SN on all signalling radio bearers, except SRB2;

2> set the FRESH value in the IE "*Integrity Protection Initialization Number*", included in the IE "*Integrity Protection Mode Info*";

1> if the IE "*Integrity Protection Mode Command*" has the value "Modify":

2> for each signalling radio bearer SRBn, except SRB2:

3> prohibit the transmission of signalling messages with RRC SN greater or equal to the RRC sequence number in entry for signalling radio bearer n in the "RRC message sequence number list" in the IE "*Downlink Integrity Protection Activation Info*", included in the IE "*Integrity Protection Mode Info*";

2> consider an integrity protection activation time in downlink to be pending until the selected activation time is equal to the next RRC sequence number to be used, which means that the last RRC message using the old integrity protection configuration has been transmitted to lower layers;

2> set, for each signalling radio bearer SRBn, that has no pending integrity protection activation time set by a previous security mode control procedure, an RRC sequence number in entry for signalling radio bearer n in the "RRC message sequence number list" in the IE "*Downlink Integrity Protection Activation Info*", included in the IE "*Integrity Protection Mode Info*", at which time the new integrity protection configuration shall be applied;

2> set, for each signalling radio bearer SRBn, that has a pending integrity protection activation time set by a previous security mode control procedure, the RRC sequence number in entry for signalling radio bearer n in the "RRC message sequence number list" in the IE "*Downlink Integrity Protection Activation Info*", included in the IE "*Integrity Protection Mode Info*", to the value used in the previous security mode control procedure, at which time the latest integrity protection configuration shall be applied.

1> transmit the SECURITY MODE COMMAND message on SRB2 using the new integrity protection configuration.

NOTE 1: In the case of re-initialization of Integrity Protection at HFN wrap around, the network takes into account the MES actions as described in clauses 7.18.5.1 and 7.18.5.2.

NOTE 2: After the SECURITY MODE COMMAND message is transmitted, the network needs to ensure that it can revert back to the old integrity protection until it receives a SECURITY MODE COMPLETE message, and take into account the MES actions when the Security Mode Control procedure is unsuccessful. The network is also aware that the MES may revert to old configuration when waiting for the acknowledgement from layer 2 for SECURITY MODE COMPLETE message, and it has to act accordingly.

7.16.1.2.3 Reception of SECURITY MODE COMMAND message by the MES

7.16.1.2.3.0 General

Upon reception of the SECURITY MODE COMMAND message, the MES shall:

1> if neither IE "*Ciphering Mode Info*" nor IE "*Integrity Protection Mode Info*" is included in the SECURITY MODE COMMAND:

  2> set the variable INVALID_CONFIGURATION to TRUE;

1> if the IE "*Security Capability*" is the same as indicated by variable MES_CAPABILITY_TRANSFERRED, and the IE "*GSM MES Security Capability*" (if included in the SECURITY MODE COMMAND message) is the same as indicated by the variable MES_CAPABILITY_TRANSFERRED:

  2> set the variable LATEST_CONFIGURED_CN_DOMAIN equal to the IE "*CN Domain Identity*";

  2> set the IE "*Status*" in the variable SECURITY_MODIFICATION message for the CN domain indicated in the IE "CN domain identity" in the received SECURITY MODE COMMAND message to the value "Affected";

  2> set the IE "*Status*" in the variable SECURITY_MODIFICATION for all CN domains other than the CN domain indicated in the IE "*CN Domain Identity*" to "Not affected";

  2> set the IE "*RRC Transaction Identifier*" in the SECURITY MODE COMPLETE message to the value of "RRC transaction identifier" in the entry for the SECURITY MODE COMMAND message in the table "Accepted transactions" in the variable TRANSACTIONS; and

  2> clear that entry;

  2> if the SECURITY MODE COMMAND message contained the IE "*Ciphering Mode Info*":

    3> perform the actions as specified in clause 7.19.4.4 "Ciphering mode info".

  2> if the SECURITY MODE COMMAND message contained the IE "*Integrity Protection Mode Info*":

    3> perform the actions as specified in clause 7.19.4.5 "*Integrity Protection Mode Info*".

1> Prior to sending the SECURITY MODE COMPLETE message the MES shall:

  2> use the old ciphering configuration for this message;

  2> if the SECURITY MODE COMMAND message contains the IE "*Ciphering Mode Info*":

    3> optionally include and set the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" to the value of the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

    3> if the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" is not included for signalling radio bearers used for transporting SECURITY MODE COMPLETE then the new ciphering configuration shall be applied for all subsequent SRB RLC PDUs once receipt of SECURITY MODE COMPLETE message by the network is confirmed by layer 2 acknowledgement;

    3> for each radio bearer and signalling radio bearer that belongs to the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN:

4> start or continue incrementing the COUNT-C values for all RLC-AM and RLC-UM signalling radio bearers at the ciphering activation time as specified in the Ciphering mode info procedure (see clause 7.19.4.4);

4> start or continue incrementing the COUNT-C values for all transparent mode radio bearers for this CN domain at the ciphering activation time as specified in the Ciphering mode info procedure (see clause 7.19.4.4);

4> continue incrementing the COUNT-C values for all RLC-AM and RLC-UM radio bearers.

3> if no new security key set (new ciphering and integrity protection keys) or AES-256 ciphering key has been received from the upper layers (see ETSI TS 133 102 [23]) or KEP respectively for the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN:

4> for ciphering on signalling radio bearers using RLC-AM and RLC-UM in the downlink, at the RLC sequence number indicated in IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info*" included in the SECURITY MODE COMMAND message, for each signalling radio bearer:

5> set the 20 most significant bits of the HFN component of the downlink COUNT-C to the value "START" in the most recently transmitted IE "*START List*" or IE "*START*", at the reception of the SECURITY MODE COMMAND message, that belongs to the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN;

5> set the remaining bits of the hyper frame numbers to zero.

3> if new keys have been received perform the actions in clause 7.16.1.2.3.1;

2> if the SECURITY MODE COMMAND message contained the IE "*Integrity Protection Mode Info*":

3> include and set the IE "*Uplink Integrity Protection Activation Info*" to the value of the variable INTEGRITY_PROTECTION_ACTIVATION_INFO for each signalling radio bearer;

3> if no new security key set (new ciphering and integrity protection keys) has been received from the upper layers (see ETSI TS 133 102 [23]) for the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN, for SRB2:

4> in the downlink, for the received SECURITY MODE COMMAND message:

5> set the 20 most significant bits of the IE "*Downlink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the downlink COUNT-I to the value "START" in the most recently transmitted IE "*START List*" or IE "*START*", at the reception of the SECURITY MODE COMMAND message, that belongs to the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN;

5> set the remaining bits of the IE "*Downlink RRC HFN*" to zero;

4> in the uplink, for the transmitted response message, SECURITY MODE COMPLETE message:

5> set the 20 most significant bits of the IE "*Uplink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the uplink COUNT-I to the value "START" in the most recently transmitted IE "*START List*" or IE "*START*", at the reception of the SECURITY MODE COMMAND message, that belongs to the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN;

5> set the remaining bits of the IE "*Uplink RRC HFN*" to zero;

3> if no new security key set (new ciphering and integrity protection keys) has been received from the upper layers (ETSI TS 133 102 [23]) for the CN domain indicated in the variable LATEST_CONFIGURED_CN_DOMAIN, the MES shall for each signalling radio bearer other than SRB2:

4> if the IE "*Integrity Protection Mode Command*" has the value "start":

5> in the downlink, for this signalling radio bearer, set the 20 most significant bits of IE "*Downlink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the downlink COUNT-I to the value START transmitted in the most recently transmitted IE "*START List*" or IE "*START*", at the reception of the SECURITY MODE COMMAND message, that belongs to the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN;

5> set the remaining bits of the IE "*Downlink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the downlink COUNT-I to zero.

4> else:

5> in the downlink, for the first message for which the RRC sequence number in a received RRC message for this signalling radio bearer is equal to or greater than the activation time as indicated in IE "*Downlink Integrity Protection Activation Info*" as included in the IE "*Integrity Protection Mode Info*":

6> for this signalling radio bearer, set the 20 most significant bits of the IE "*Downlink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the downlink COUNT-I to the value "START" in the most recently transmitted IE "*START List*" or IE "*START*", at the reception of the SECURITY MODE COMMAND message, that belongs to the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN;

6> set the remaining bits of the IE "*Downlink RRC HFN*" to zero.

3> if new keys have been received perform the actions in clause 7.16.1.2.3.1;

2> start applying the new integrity protection configuration in the uplink for signalling radio bearer SRB2 from and including the transmitted SECURITY MODE COMPLETE message;

2> transmit the SECURITY MODE COMPLETE message on the uplink SRB2.

After submission of the SECURITY MODE COMPLETE message to the lower layers, the MES shall accept messages received in the DL which requires the new security configuration to be applied on them. If a received message is successfully integrity checked, the MES shall not discard the message due to lack of completion of the security procedure caused by the successful delivery of the SECURITY MODE COMPLETE message not having been confirmed by lower layers yet, unless the security configuration to be applied has been aborted and the message received requires integrity protection (see ETSI TS 101 376-4-8 [7]).

1> when the successful delivery of the SECURITY MODE COMPLETE message has been confirmed by RLC:

2> if the SECURITY MODE COMMAND message contained the IE "*Ciphering Mode Info*":

3> if no new security key set (new ciphering and integrity protection keys) has been received from the upper layers (see ETSI TS 133 102 [23]) for the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN:

4> for ciphering on signalling radio bearers using RLC-AM and RLC-UM in the uplink, at the RLC sequence number indicated in IE "*Radio Bearer Uplink Ciphering Activation Time Info*" included in the SECURITY MODE COMPLETE message, for each signalling radio bearer:

5> set the 20 most significant bits of HFN component of the uplink COUNT-C to the value "START" in the most recently transmitted IE "*START List*" or IE "*START*", at the reception of the SECURITY MODE COMMAND message, that belongs to the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN;

5> set the remaining bits of the hyper frame numbers to zero;

4> if the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" was not included in the SECURITY MODE COMPLETE message, then for ciphering all new RLC PDUs sent on signalling radio bearers following successful acknowledgement of SECURITY MODE COMPLETE:

5> set the HFN component of the uplink COUNT-C to the value "START" in the most recently transmitted IE "*START List*" or IE "*START*", at the reception of the SECURITY MODE COMMAND message, that belongs to the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN;

5> set the remaining bits of the hyper frame numbers to zero.

If RLC sequence number is not included in the IE "*RB Uplink Ciphering Activation Time Info*", then the RLC Sequence number at which the new security configuration is applied in the uplink direction for the signalling radio bearer shall be one greater (modulo the sequence number space) the sequence number used by the last RLC PDU block that carried the SECURITY MODE COMPLETE message.

3> if new keys have been received perform the actions in clause 7.16.1.2.3.1;

3> resume data transmission on any suspended radio bearer and signalling radio bearer mapped on RLC-AM or RLC-UM;

3> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

3> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> if the SECURITY MODE COMMAND message contains the IE "*Integrity protection mode info*":

3> if no new security key set (new ciphering and integrity protection keys) has been received from the upper layers (see ETSI TS 133 102 [23]) for the CN domain indicated in the variable LATEST_CONFIGURED_CN_DOMAIN, the MES shall for each signalling radio bearer other than SRB2:

4> if the IE "*Integrity Protection Mode Command*" has the value "start":

5> in the uplink, for this signalling radio bearer, set the 20 most significant bits of IE "*Uplink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the uplink COUNT-I to the value START transmitted in the most recently transmitted IE "*START List*" or IE "*START*", at the reception of the SECURITY MODE COMMAND message, that belongs to the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN;

5> set the remaining bits of the IE "*Uplink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the uplink COUNT-I to zero;

4> else:

5> in the uplink, for the first transmitted RRC message for this signalling radio bearer with RRC sequence number equal to the activation time as indicated in IE "*Uplink Integrity Protection Activation Info*" included in the transmitted SECURITY MODE COMPLETE message:

6> for this signalling radio bearer, set the 20 most significant bits of the IE "*Uplink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the uplink COUNT-I to the value "START" in the most recently transmitted IE "*START List*" or IE "*START*", at the reception of the SECURITY MODE COMMAND message, that belongs to the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN;

6> set the remaining bits of the IE "*Uplink RRC HFN*" to zero.

3> if new keys have been received perform the actions in clause 7.16.1.2.3.1;

3> allow the transmission of RRC messages on all signalling radio bearers with any RRC SN;

3> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

3> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO.

2> clear the variable SECURITY_MODIFICATION;

2> notify upper layers upon change of the security configuration;

2> and the procedure ends.

1> if "Check Last Used Ciphering Algorithm" bit in Security Mode Command message is set to 1, the MES shall check the last used ciphering algorithm and shall report it in Security Mode Complete message. If "Check Last Used Ciphering Algorithm" bit in Security Mode Command message is set to 1 and last used ciphering algorithm is AES-256, suspend all uplink data transmissions until a subsequent security mode procedure completes. The only uplink data allowed from MES is SRB2 traffic to send Uplink Key Exchange message or to send Security Mode Complete message. All MAC control messages are also allowed to be transmitted.

The MES shall maintain the last used ciphering algorithm through RRC connections.

The security mode command procedure does not apply to downlink TBF(s) for which a ciphering key was provided during Radio Bearer Setup or Radio Bearer Reconfiguration. These downlink TBF(s) continue their normal operation with previously provided ciphering key and RB ciphering synchronization.

1> if the IE "*Security Capability*" is not the same as indicated by the variable MES_CAPABILITY_TRANSFERRED, or the IE "*GSM MES Security Capability*" (if included in the SECURITY MODE COMMAND message) is not the same as indicated by the variable MES_CAPABILITY_TRANSFERRED, or if the IE "*GSM* MES *Security Capability*" is not included in the SECURITY MODE COMMAND message and is included in the variable MES_CAPABILITY_TRANSFERRED:

2> release all its radio resources;

2> indicate the release of the established signalling connections (as stored in the variable ESTABLISHED_SIGNALLING_CONNECTIONS) and established radio access bearers (as stored in the variable ESTABLISHED_RABS) to upper layers;

2> clear the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

2> clear the variable ESTABLISHED_RABS;

2> clear the variable SECURITY_MODIFICATION;

2> enter RRC-Idle mode;

2> perform actions when entering RRC-Idle mode as specified in clause 7.18 "Actions when entering RRC-Idle mode from RRC-Connected mode";

2> and the procedure ends.

7.16.1.2.3.1 New ciphering and integrity protection keys

The actions in this clause are to be performed only if the new keys were received for an on-going signalling connection while in GERAN *Iu mode*.

If a new security keyset (new ciphering and integrity protection keys) has been received from the upper layers (see ETSI TS 133 102 [23]) for the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN, the MES shall:

1> set the START value for the CN domain indicated in the variable LATEST_CONFIGURED_CN_DOMAIN to zero;

1> if the SECURITY MODE COMMAND message contained the IE "*Integrity Protection Mode Info*":

2> for integrity protection in the downlink on each signalling radio bearer except SRB2:

3> if IE "*Integrity Protection Mode Command*" has the value "start":

4> for the first received message on this signalling radio bearer:

5> start using the new integrity key;

5> for this signalling radio bearer, set the IE "*Downlink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the downlink COUNT-I to zero;

3> else:

4> for the first message for which the RRC sequence number in a received RRC message for this signalling radio bearer is equal to or greater than the activation time as indicated in IE "*Downlink Integrity Protection Activation Info*" as included in the IE "*Integrity Protection Mode Info*":

5> start using the new integrity key;

5> for this signalling radio bearer, set the IE "*Downlink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the downlink COUNT_I to zero;

2> for integrity protection in the uplink on each signalling radio bearer except SRB2:

3> for the first message for which the RRC sequence number in a to be transmitted RRC message for this signalling radio bearer is equal to the activation time as indicated in IE "*Uplink Integrity Protection Activation Info*" included in the transmitted SECURITY MODE COMPLETE message:

4> start using the new integrity key;

4> for this signalling radio bearer, set the IE "*Uplink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the uplink COUNT-I to zero;

2> for integrity protection in the downlink on signalling radio bearer SRB2:

3> at the received SECURITY MODECOMMAND:

4> start using the new integrity key;

4> set the IE "*Downlink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the downlink COUNT-I to zero;

2> for integrity protection in the uplink on signalling radio bearer SRB2:

3> at the transmitted SECURITY MODE COMPLETE:

4> start using the new integrity key;

4> set the IE "*Uplink RRC HFN*" in the variable INTEGRITY_PROTECTION_INFO of the uplink COUNT-I to zero.

1> if the SECURITY MODE COMMAND message contained the IE "*Ciphering Mode Info*":

2> for each signalling radio bearer and for each radio bearer for the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN:

3> if the IE "*Status*" in the variable CIPHERING_STATUS has the value "Started" for this CN domain, then for ciphering on the radio bearer using RLC-TM:

4> at the TDMA frame number as indicated in the IE "*Ciphering Activation Time for DCH*" in the IE "*Ciphering Mode Info":*

5> start using the new key in uplink and downlink;

5> set the HFN component of the COUNT-C to zero;

3> if the IE "*Status*" in the variable CIPHERING_STATUS has the value "Started" for this CN domain, then for ciphering on the radio bearers and signalling radio bearers using RLC-AM and RLC-UM:

4> in the downlink, at the RLC sequence number indicated in IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info*":

5> start using the new key;

5> set the HFN component of the downlink COUNT-C to zero;

4> in the uplink, at and after the RLC sequence number indicated in IE "*Radio Bearer Uplink Ciphering Activation Time Info*":

5> start using the new key;

5> set the HFN component of the uplink COUNT-C to zero.

1> consider the value of the latest transmitted START value to be zero.

If a new AES-256 ciphering key has been received from the upper layers for the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN, the MES shall:

1> if the SECURITY MODE COMMAND message contained the IE "*Ciphering Mode Info*" and if *"Ciphering Algorithm"* IE indicates AES-256:

2> for each signalling radio bearer and for each radio bearer for the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN:

3> if the IE "*Status*" in the variable CIPHERING_STATUS has the value "Started" for this CN domain, then for ciphering on the radio bearer using RLC-TM:

4> at the TDMA frame number as indicated in the IE "*Ciphering Activation Time for DCH*" in the IE "*Ciphering Mode Info";*

5> start using the new AES-256 key and algorithm, if not already started, in uplink and downlink;

5> set the HFN component of the COUNT-C to zero.

3> if the IE "*Status*" in the variable CIPHERING_STATUS has the value "Started" for this CN domain, then for ciphering on the radio bearers and signalling radio bearers using RLC-AM and RLC-UM:

4> in the downlink, at the RLC sequence number indicated in IE "*RB Downlink Ciphering Activation Time Info*" in the IE "*Ciphering Mode Info*":

5> start using the new key and algorithm, if not already started;

5> set the HFN component of the downlink COUNT-C to zero;

4> in the uplink, at and after the RLC sequence number indicated in IE "*Radio Bearer Uplink Ciphering Activation Time Info*":

5> start using the new key and algorithm, if not already started;

5> set the HFN component of the uplink COUNT-C to zero.

1> consider the value of the latest transmitted START value to be unchanged.

The new ciphering key does not apply to downlink TBF(s) for which a ciphering key was provided during Radio Bearer Setup or Radio Bearer Reconfiguration. These downlink TBF(s) continue their normal operation with previously provided ciphering key and RB ciphering synchronization.

7.16.1.2.4 Incompatible simultaneous security reconfiguration

If the variable INCOMPATIBLE_SECURITY_RECONFIGURATION becomes set to TRUE of the received SECURITY MODE COMMAND message, the MES shall:

1> transmit a SECURITY MODE FAILURE message on the uplink SRB2, using the ciphering and integrity protection configurations prior to the reception of this SECURITY MODE COMMAND;

1> set the IE "*RRC Transaction Identifier*" in the SECURITY MODE FAILURE message to the value of "RRC transaction identifier" in the entry for the SECURITY MODE COMMAND message in the table "Accepted transactions" in the variable TRANSACTIONS; and

1> clear that entry;

1> set the IE "*Failure Cause*" to the cause value "incompatible simultaneous reconfiguration";

1> when the response message has been submitted to lower layers for transmission:

2> set the variable INCOMPATIBLE_SECURITY_RECONFIGURATION to FALSE;

2> continue with any ongoing processes and procedures as if the invalid SECURITY MODE COMMAND message has not been received;

2> only accept a message on SRB 2, with a COUNT-I that:

3> is higher than the COUNT-I used prior to receiving the SECURITY MODE COMMAND message incremented by one; and

3> not take into account the HFN from the received SECURITY MODE COMMAND message;

1> and the procedure ends.

7.16.1.2.5 Cell Update procedure during security reconfiguration

If:

- a cell update procedure according to clause 7.6.1 is initiated; and
- the received SECURITY MODE COMMAND message causes;
- the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to be set to TRUE; and/or
- the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to be set to TRUE:

the MES shall:

1> abort the ongoing integrity and/or ciphering reconfiguration;

1> resume data transmission on any suspended radio bearer and signalling radio bearer mapped on RLC-AM or RLC-UM;

1> allow the transmission of RRC messages on all signalling radio bearers with any RRC SN;

1> when the CELL UPDATE message has been submitted to lower layers for transmission:

2> if the SECURITY MODE COMMAND message contained the IE "*Ciphering Mode Info*":

3> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE; and

3> clear the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO;

2> if the SECURITY MODE COMMAND message contained the IE "*Integrity Protection Mode Info*":

3> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to FALSE; and

3> clear the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> continue with any ongoing processes and procedures as if the SECURITY MODE COMMAND message had not been received;

2> only accept a message on SRB 2, with a COUNT-I that:

3> is higher than the COUNT-I used prior to receiving the SECURITY MODE COMMAND message incremented by one; and

3> does not take into account the HFN from the received SECURITY MODE COMMAND message;

2> if the MES has already submitted the SECURITY MODE COMPLETE message, use a COUNT-I value for transmission of the next message on SRB2 as stated below:

3> take the COUNT-I used prior to the transmission of the SECURITY MODE COMPLETE message;

3> increment that COUNT-I with 2;

3> apply that COUNT-I on the next message to transmit;

2> clear the variable SECURITY_MODIFICATION;

2> the procedure ends.

7.16.1.2.6 Invalid configuration

If the variable INVALID_CONFIGURATION is set to TRUE due to the received SECURITY MODE COMMAND message, the MES shall:

1> transmit a SECURITY MODE FAILURE message on the uplink SRB2 after setting the IEs as specified below:

2> set the IE "*RRC Transaction Identifier*" in the SECURITY MODE FAILURE message to the value of "RRC transaction identifier" in the entry for the SECURITY MODE COMMAND message in the table "Accepted transactions" in the variable TRANSACTIONS; and

2> clear that entry;

2> set the IE "*Failure Cause*" to the cause value "invalid configuration";

1> when the response message has been submitted to lower layers for transmission:

2> set the variable INVALID_CONFIGURATION to FALSE;

2> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to FALSE;

2> continue with any ongoing processes and procedures as if the invalid SECURITY MODE COMMAND message has not been received;

2> only accept a message on SRB 2, with a COUNT-I that:

3> is higher than the COUNT-I used prior to receiving the SECURITY MODE COMMAND message incremented by one; and

3> not take into account the HFN from the received SECURITY MODE COMMAND message;

1> and the procedure ends.

7.16.1.2.7 Reception of SECURITY MODE COMPLETE message by the GERAN

The GERAN shall apply integrity protection on the received SECURITY MODE COMPLETE message and all subsequent messages with the new integrity protection configuration, if changed. When GERAN has received a SECURITY MODE COMPLETE message and the integrity protection has successfully been applied, GERAN shall:

1> if the IE "*Ciphering Mode Info*" was included in the SECURITY MODE COMMAND message:

2> if new keys were received for the CN domain set in the IE "*CN Domain Identity*" in the SECURITY MODE COMMAND:

3> at the downlink and uplink activation time set all the bits of the hyper frame numbers of the downlink and uplink COUNT-C values respectively for all radio bearers for this CN domain and all signalling radio bearers to zero;

2> else (if new keys were not received):

3> at the downlink and uplink activation time use the value "START" in the most recently received IE "*START List*" or IE "*START*" that belongs to the CN domain as indicated in the IE "*CN Domain Identity*" to initialize all hyper frame numbers of the downlink and uplink COUNT-C values respectively for all the signalling radio bearers by:

4> setting the 20 most significant bits of the hyper frame numbers of the COUNT-C for all signalling radio bearers to the value "START" in the most recently received IE "*START List*" or IE "*START*" for that CN domain;

4> setting the remaining bits of the hyper frame numbers equal to zero;

1> if the IE "*Integrity Protection Mode Info*" was included in the SECURITY MODE COMMAND message:

2> if this was not the first SECURITY MODE COMMAND message for this RRC connection:

3> if new keys have been received for the CN domain set in the IE "*CN Domain Identity*" included in the transmitted SECURITY MODE COMMAND message:

4> at the downlink and uplink activation time initialize all hyper frame numbers of the downlink and uplink COUNT-I values respectively for all the signalling radio bearers other than SRB2 as follows:

5> set all bits of the hyper frame numbers of the uplink and downlink COUNT-I to zero;

3> if no new keys have been received for the CN domain set in the IE "*CN Domain Identity*" included in the transmitted SECURITY MODE COMMAND message:

4> at the downlink and uplink activation time use the value "START" in the most recently received IE "*START List*" or IE "*START*" that belongs to the CN domain as indicated in the IE "*CN Domain Identity*" to initialize all hyper frame numbers of the downlink and uplink COUNT-I values respectively for all the signalling radio bearers other than SRB2 by:

5> setting the 20 most significant bits of the hyper frame numbers of the downlink and uplink COUNT-I respectively for all signalling radio bearers to the value "START" in the most recently received IE "*START List*" or IE "*START*" for that CN domain;

5> setting the remaining bits of the hyper frame numbers equal to zero;

1> send an indication to upper layers that the new integrity protection configuration has been activated;

1> resume in the downlink, all suspended radio bearers and all signalling radio bearers;

1> allow the transmission of RRC messages on all signalling radio bearers with any RRC SN;

1> if the IE "*Integrity Protection Mode Command*" included in the SECURITY MODE COMMAND had the value "Start":

2> start applying integrity protection in the downlink for all signalling radio bearers;

1> if the IE "*Integrity Protection Mode Command*" included in the SECURITY MODE COMMAND had the value "Modify":

2> start applying the new integrity protection configuration in the downlink at the RRC sequence number, for each signalling radio bearers SRBn, except for signalling radio bearer SRB2, indicated by the entry for signalling radio bearer n in the "RRC message sequence number list" in the IE "*Downlink Integrity Protection Activation Info*";

2> continue applying the new integrity configuration for signalling radio bearer SRB2;

2> apply the new integrity protection configuration on the received signalling messages with RRC SN greater than or equal to the number associated with the signalling radio bearer in IE "*Uplink Integrity Protection Activation Info*";

1> apply the old ciphering configuration for the transmission of RLC PDUs with RLC sequence number less than the number indicated in the IE "*RB Downlink Ciphering Activation Time Info*" included in the IE "*Ciphering Mode Info*";

1> apply the new ciphering configuration for the transmission of RLC PDUs with RLC sequence number greater than or equal to the number indicated in IE "*Radio Bearer Downlink Ciphering Activation Time Info*" included in the IE "*Ciphering Mode Info*";

1> apply the old integrity protection configuration on the received signalling messages with RRC SN smaller than the number associated with the signalling radio bearer in IE "*Uplink Integrity Protection Activation Info*";

1> for radio bearers and signalling radio bearers using RLC-AM or RLC-UM:

2> send an indication to lower layers;

2> use the old ciphering configuration for received RLC PDUs with RLC sequence number less than the RLC sequence number indicated in the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" sent by the MES;

2> use the new ciphering configuration for received RLC PDUs with RLC sequence number greater than or equal to the RLC sequence number indicated in the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" sent by the MES;

2> if an RLC reset or re-establishment occurs after the SECURITY MODE COMPLETE message has been received by GERAN before the activation time for the new ciphering configuration has been reached, ignore the activation time and apply the new ciphering configuration immediately after the RLC reset or RLC re-establishment;

1> for radio bearers using RLC-TM:

2> send an indication to lower layers;

2> use the old ciphering configuration for the received RLC PDUs before the TDMA frame number as indicated in the IE "*Ciphering Activation Time for DCH*" in the IE "*Ciphering Mode Info*" as included in the SECURITY MODE COMMAND;

2> use the new ciphering configuration for the received RLC PDUs at the TDMA frame number as indicated in the IE "*Ciphering Activation Time for DCH*" in the IE "*Ciphering Mode Info*" as included in the SECURITY MODE COMMAND;

1> and the procedure ends.

7.16.1.2.8 Invalid SECURITY MODE COMMAND message

If the SECURITY MODE COMMAND message contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause "General error handling", the MES shall perform procedure specific error handling as follows:

1> transmit a SECURITY MODE FAILURE message on the uplink SRB2;

1> set the IE "*RRC Transaction Identifier*" in the SECURITY MODE FAILURE message to the value of "RRC transaction identifier" in the entry for the SECURITY MODE COMMAND message in the table "Rejected transactions" in the variable TRANSACTIONS; and

1> clear that entry;

1> set the IE "*Failure Cause*" to the cause value "protocol error";

1> include the IE "*Protocol Error Information*" with contents set to the value of the variable PROTOCOL_ERROR_INFORMATION;

1> when the response message has been submitted to lower layers for transmission:

2> continue with any ongoing processes and procedures as if the invalid SECURITY MODE COMMAND message has not been received;

2> only accept a message on SRB 2, with a COUNT-I that:

3> is higher than the COUNT-I used prior to receiving the SECURITY MODE COMMAND message incremented by one; and

3> not take into account the HFN from the received SECURITY MODE COMMAND message;

1> and the procedure ends.

7.17 Delivery of Non-Access stratum messages

7.17.1 Initial Direct transfer

7.17.1.0 Signalling flow

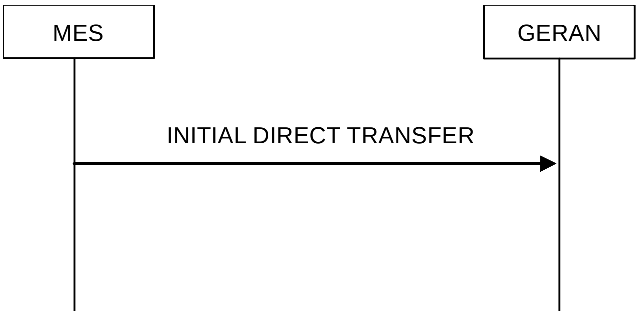

Figure 7.17.1.0.1: Initial Direct transfer in the uplink, normal flow

7.17.1.1 General

The Initial Direct Transfer procedure is used in the uplink to establish a signalling connection. It is also used to carry an initial upper layer (NAS) messages over the radio interface.

7.17.1.2 Initiation of Initial direct transfer procedure in the MES

In the MES, the Initial Direct Transfer procedure shall be initiated, when the upper layers request establishment of a signalling connection. This request also includes a request for the transfer of a NAS message.

Upon initiation of the Initial Direct Transfer procedure when the MES is in RRC-Idle mode, the MES shall:

1> set the variable ESTABLISHMENT_CAUSE to the cause for establishment indicated by upper layers;

1> perform an RRC Connection Establishment procedure, according to clause 7.5;

1> if the RRC Connection Establishment procedure was not successful:

2> indicate failure to establish the signalling connection to upper layers and end the procedure;

1> when the RRC Connection Establishment procedure is completed successfully:

2> continue with the Initial Direct Transfer procedure as below.

Upon initiation of the Initial Direct Transfer procedure when the MES is in RRC-GRA_PCH state, the MES shall:

1> perform a Cell Update procedure, according to clause 7.8, using the cause "uplink data transmission";

1> when the Cell Update procedure completed successfully:

2> continue with the Initial Direct Transfer procedure as below.

The MES shall, in the INITIAL DIRECT TRANSFER message:

1> set the IE "*NAS Message*" as received from upper layers; and

1> set the IE "*CN Domain Identity*" as indicated by the upper layers; and

2> set the IE "*Intra Domain NAS Node Selector*" as follows:

2> derive the IE "*Intra Domain NAS Node Selector*" from TMSI/PMTSI, IMSI, or IMEI; and

2> provide the coding of the IE "*Intra Domain NAS Node Selector*" according to the following priorities:

1) derive the routing parameter for IDNNS from TMSI (CS domain) or PTMSI (PS domain) whenever a valid TMSI/PTMSI is available;

2) base the routing parameter for IDNNS on IMSI when no valid TMSI/PTMSI is available;

3) base the routing parameter for IDNNS on IMEI only if no (U)SIM is inserted in the MES.

1> calculate the START according to clause 7.18.4 for the CN domain as set in the IE "*CN Domain Identity*"; and

2> include the calculated START value for that CN domain in the IE "*START*".

The MES shall:

1> transmit the INITIAL DIRECT TRANSFER message on the uplink using AM RLC on signalling radio bearer SRB 2;

1> when the INITIAL DIRECT TRANSFER message has been submitted to lower layers for transmission:

2> confirm the establishment of a signalling connection to upper layers; and

2> add the signalling connection with the identity indicated by the IE "*CN Domain Identity*" in the variable ESTABLISHED_SIGNALLING_CONNECTIONS; and

1> when the successful delivery of the INITIAL DIRECT TRANSFER message has been confirmed by RLC sub-layer:

2> the procedure ends.

When not stated otherwise elsewhere, the MES may also initiate the initial direct transfer procedure when another procedure is ongoing, and in that case the state of the latter procedure shall not be affected.

A new signalling connection request may be received from upper layers subsequent to the indication of the release of a previously established signalling connection to upper layers. From the time of the indication of release to upper layers until the MES has entered RRC-Idle mode, any such upper layer request to establish a new signalling connection shall be queued. This request shall be processed after the MES has entered RRC-Idle mode.

7.17.1.3 RLC re-establishment, inter-mode handover or inter-RAT change

If a re-establishment of RLC on SRB2 occurs before the successful delivery of the INITIAL DIRECT TRANSFER message has been confirmed by RLC, the MES shall:

1> retransmit the INITIAL DIRECT TRANSFER message on the uplink using SRB2.

If inter-RAT handover occurs before the successful delivery of the INITIAL DIRECT TRANSFER message has been confirmed by RLC, the MES shall:

1> retransmit the NAS message

7.17.1.4 Abortion of signalling connection establishment

If the MES receives a request from upper layers to release (abort) the signalling connection for the CN domain for which the initial direct transfer procedure is ongoing, the MES shall:

1> if the MES has not yet entered GERAN RRC-Connected mode:

  2> abort the RRC Connection Establishment procedure as specified in clause 7.5.1.6;

the procedure ends.

7.17.1.5 Reception of INITIAL DIRECT TRANSFER message by the GERAN

On reception of the INITIAL DIRECT TRANSFER message the NAS message should be routed using the IE "*CN Domain Identity*". GERAN may also use the IE "*Intra Domain NAS Node Selector*" for routing among the CN nodes for the addressed CN domain.

If no signalling connection exists towards the chosen node, then a signalling connection is established.

When the GERAN receives an INITIAL DIRECT TRANSFER message, it shall not affect the state of any other ongoing RRC procedures, when not stated otherwise elsewhere.

The GERAN should:

1> set the START value for the CN domain indicated in the IE "*CN Domain Identity*" to the value of the IE "*START*".

7.17.2 Downlink Direct transfer

7.17.2.0 Signalling flow

Figure 7.17.2.0.1: Downlink Direct transfer, normal flow

7.17.2.1 General

The Downlink Direct Transfer procedure is used in the downlink direction to carry upper layer (NAS) messages over the radio interface.

7.17.2.2 Initiation of downlink direct transfer procedure in the GERAN

In the GERAN, the Direct Transfer procedure is initiated when the upper layers request the transfer of a NAS message after the initial signalling connection is established. The GERAN may also initiate the Downlink Direct Transfer procedure when another RRC procedure is ongoing, and in that case the state of the latter procedure shall not be affected. The GERAN shall transmit the DOWNLINK DIRECT TRANSFER message on the downlink using AM RLC on signalling radio bearer SRB 2 or. The GERAN should:

1> if upper layers indicate "low priority" for this message:

2> Enqueue the message in the low priority queue;

1> if upper layers indicate "high priority" for this message:

2> Enqueue the message in the high priority queue.

The GERAN sets the IE "*CN Domain Identity*" to indicate, which CN domain the NAS message is originated from.

7.17.2.3 Reception of a DOWNLINK DIRECT TRANSFER message by the MES

Upon reception of the DOWNLINK DIRECT TRANSFER message, the MES RRC shall, using the IE "*CN Domain Identity*", route the contents of the IE "*NAS Message*" and the value of the IE "*CN Domain Identity*" to the upper layers.

The MES shall clear the entry for the DOWNLINK DIRECT TRANSFER message in the table "Accepted transactions" in the variable TRANSACTIONS.

When the MES receives a DOWNLINK DIRECT TRANSFER message, it shall not affect the state of any other ongoing RRC procedures when not stated otherwise elsewhere.

7.17.2.4 No signalling connection exists

If the MES receives a DOWNLINK DIRECT TRANSFER message, and the signalling connection identified with the IE "*CN Domain Identity*" does not exist according to the variable ESTABLISHED_SIGNALLING_CONNECTIONS, the MES shall:

1> ignore the content of the DOWNLINK DIRECT TRANSFER message;

1> transmit an RRC STATUS message on the uplink SRB2;

1> include the IE "*Identification of Received Message*"; and

1> set the IE "*Received Message Type*" to DOWNLINK DIRECT TRANSFER message; and

1> set the IE "*RRC Transaction Identifier*" to the value of "RRC transaction identifier" in the entry for the DOWNLINK DIRECT TRANSFER message in the table "Accepted transactions" in the variable TRANSACTIONS; and

1> clear that entry;

1> include the IE "*Protocol Error Information*" with the IE "*Protocol Error Cause*" set to "Message not compatible with receiver state".

When the RRC STATUS message has been submitted to lower layers for transmission, the MES shall:

1> continue with any ongoing processes and procedures as if the DOWNLINK DIRECT TRANSFER message has not been received.

7.17.2.5 Invalid DOWNLINK DIRECT TRANSFER message

If the MES receives a DOWNLINK DIRECT TRANSFER message, which contains a protocol error causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE according to clause 8 the MES shall perform procedure specific error handling as follows:

1> transmit an RRC STATUS message on the uplink SRB2;

1> include the IE "*Identification of Received Message*"; and

1> set the IE "*Received Message Type*" to DOWNLINK DIRECT TRANSFER; and

1> set the IE "*RRC Transaction Identifier*" to the value of "RRC transaction identifier" in the entry for the DOWNLINK DIRECT TRANSFER message in the table "Rejected transactions" in the variable TRANSACTIONS; and

1> clear that entry;

1> include the IE "*Protocol Error Information*" with contents set to the value of the variable PROTOCOL_ERROR_INFORMATION.

When the RRC STATUS message has been submitted to lower layers for transmission, the MES shall:

1> continue with any ongoing processes and procedures as if the invalid DOWNLINK DIRECT TRANSFER message has not been received.

7.17.3 Uplink Direct transfer

7.17.3.0 Signalling flow

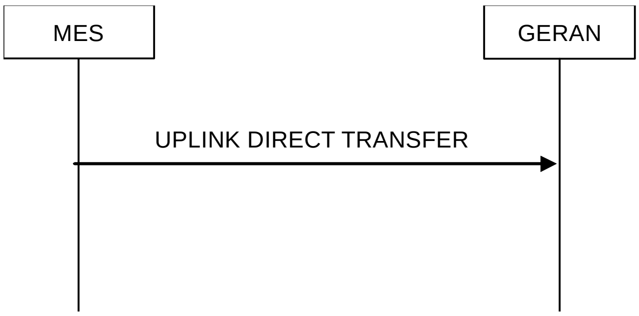

Figure 7.17.3.0.1: Uplink Direct transfer, normal flow

7.17.3.1 General

The Uplink Direct Transfer procedure is used in the uplink direction to carry all subsequent upper layer (NAS) messages over the radio interface belonging to a signalling connection.

7.17.3.2 Initiation of uplink direct transfer procedure in the MES

In the MES, the Uplink Direct Transfer procedure shall be initiated when the upper layers request a transfer of a NAS message on an existing signalling connection. When not stated otherwise elsewhere, the MES may initiate the Uplink Direct Transfer procedure when another procedure is ongoing, and in that case the state of the latter procedure shall not be affected.

Upon initiation of the Uplink Direct Transfer procedure in RRC-GRA_PCH state, the MES shall:

1> perform a Cell Update procedure, according to clause 7.8, using the cause "uplink data transmission";

1> when the Cell Update procedure has been completed successfully:

2> continue with the Uplink Direct Transfer procedure as below.

The MES shall transmit the UPLINK DIRECT TRANSFER message on the uplink using AM RLC on signalling radio bearer SRB2SRB2SRB2SRB2. The MES shall:

1> if upper layers indicate "low priority" for this message:

2> Enqueue the message in the low priority queue;

2> select signalling radio bearer SRB3 when signalling radio bearer SRB4 is not available;

1> if upper layers indicate "high priority" for this message:

2> Enqueue the message in the high priority queue.

The MES shall set the IE "*NAS Message"* as received from upper layers and set the IE "*CN Domain Identity*" as indicated by the upper layers.

When the successful delivery of the UPLINK DIRECT TRANSFER message has been confirmed by RLC sub-layer the procedure ends.

7.17.3.3 RLC re-establishment, inter-mode handover or inter-RAT change

If re-establishment of SRB 2 occurs before the successful delivery of the UPLINK DIRECT TRANSFER message has been confirmed by RLC, the MES shall:

1> retransmit the UPLINK DIRECT TRANSFER message on the uplink SRB 2.

If inter-RAT handover occurs before the successful delivery of the UPLINK DIRECT TRANSFER message has been confirmed by RLC, the MES shall:

1> retransmit the NAS message.

7.17.3.4 Reception of UPLINK DIRECT TRANSFER message by the GERAN

On reception of the UPLINK DIRECT TRANSFER message the NAS message should be routed using the value indicated in the IE "*CN Domain Identity*".

When the GERAN receives an UPLINK DIRECT TRANSFER message, it shall not affect the state of any other ongoing RRC procedures, when not stated otherwise elsewhere.

7.18 General procedures

7.18.1 Selection of initial MES identity

The purpose of the IE "*Initial MES Identity*" is to provide a unique MES identification at the establishment of an RRC connection. The MES shall include IMEI in the IE "*Initial MES Identity*".

NOTE: In the GMR1-3G system the RRC connection establishment is initiated on the random access channel using a 20-bit random S-RNTI. The initial MES identity is subsequently sent to the GERAN within the RRC Connection Setup Complete message.

7.18.2 Actions when entering RRC-Idle mode from RRC-Connected mode

When entering RRC-Idle mode from RRC-Connected mode, the MES shall:

1> clear or set variables upon leaving GERAN RRC-Connected mode as specified in clause 10.4;

1> attempt to select a suitable cell to camp on.

When leaving the RRC-Connected mode according to ETSI TS 101 376-5-7 [10], the MES shall:

1> perform cell selection.

While camping on a cell, the MES shall:

1> acquire system information according to the system information procedure in clause 7.3;

1> perform measurements according to the measurement control procedure specified in clause 7.9; and

1> if the MES is registered:

2> be prepared to receive paging messages according to the Paging procedure in clause 7.4.

If IE "*PLMN Identity*" within variable SELECTED_PLMN has the value "GSM-MAP", the MES shall:

1> delete any NAS system information received in RRC-Connected Mode;

1> acquire the NAS system information in packet system information 16; and

1> proceed according to clause 7.19.

When entering RRC-Idle mode, the MES shall:

1> if the USIM is present, for each CN domain:

2> if a new security key set was received for this CN domain but was not used either for integrity protection or ciphering during this RRC connection:

3> set the "START" value for this domain to zero; and

3> store this "START" value for this domain in the USIM.

2> else:

3> if the current "START" value, according to clause 7.18 for a CN domain, is greater than or equal to the value "THRESHOLD" of the variable START_THRESHOLD:

4> delete the ciphering and integrity keys that are stored in the USIM for that CN domain;

4> inform the deletion of these keys to upper layers;

3> else:

4> store the current "START" value for this CN domain on the USIM;

1> else:

2> if the SIM is present, for each CN domain:

3> if a new security key set was received for this CN domain but was not used either for integrity protection or ciphering during this RRC connection:

4> set the "START" value for this domain to zero; and

4> store this "START" value for this domain in the MES;

3> else, the MES shall:

4> if the current "START" value, according to clause 7.18 for this CN domain, is greater than or equal to the value "THRESHOLD" of the variable START_THRESHOLD:

5> delete the Kc key for this CN domain;

5> delete the ciphering and integrity keys that are stored in the MES for that CN domain;

5> set the "START" value for this CN domain to zero and store it in the MES;

5> inform the deletion of the key to upper layers;

3> else:

4> store the current "START" value for this CN domain in the MES.

7.18.2a Void

7.18.3 Maintenance of Hyper Frame Numbers

The MSBs of both the ciphering sequence numbers (COUNT-C) and integrity sequence numbers (COUNT-I), for the ciphering and integrity protection algorithms, respectively (see ETSI TS 133 102 [23]), are called the Hyper Frame Numbers (HFN). For TM RLC bearers an extended TDMA frame number is used, which is built by an HFN plus part of a TDMA frame number.

For integrity protection, the MES shall:

1> maintain COUNT-I as specified in clause 7.18.5.

The following hyper frame numbers types are defined:

1> MAC HFN:
11 MSB of COUNT-C for data sent over RLC TM;

1> RLC HFN:

2> if the RLC sequence number is of length 10 bits (see ETSI TS 101 376-4-14 [14]), then the HFN:

3> defines the 21 MSB of the COUNT-C parameter for data sent over RLC UM; and

3> defines the 21 MSB of the COUNT-C parameter for data sent over RLC AM;

2> if the RLC sequence number is of length 7 bits (see ETSI TS 101 376-4-14 [14]), then the HFN:

3> defines the 24 MSB of the COUNT-C parameter for data sent over RLC UM; and

3> defines the 24 MSB of the COUNT-C parameter for data sent over RLC AM;

1> RRC HFN:
28 MSB of COUNT-I.

For non-transparent mode RLC radio bearers, the MES shall:

1> maintain one uplink and one downlink COUNT-C per radio bearer and one uplink and one downlink COUNT-I per signalling radio bearer.

For all transparent mode RLC signalling radio bearers and radio bearers of the same CN domain, the MES shall:

1> maintain one COUNT-C, common for all signalling radio bearers and radio bearers in uplink and downlink;

1> if the activation time for a new ciphering configuration set by an RRC procedure is equal to zero:

2> apply the configured MAC HFN at this activation time, i.e. the configured HFN is not incremented;

1> maintain one uplink and one downlink COUNT-I per signalling radio bearer.

7.18.4 START value calculation

In RRC connected mode, if a Security Mode Command procedure has been successfully completed for a CN domain during the current RRC connection, the "START" value for that CN domain is calculated by MES and GERAN as:

Let $START_X$ = the "START" value for CN domain 'X' prior to the calculation below:

$START_X' = MSB_{20}$ (MAX {COUNT-C, COUNT-I | radio bearers and signalling radio bearers using CK_X and IK_X}) + 2.

- if $START_X'$= the maximum value = 20^2 - 1 = 1048575 then $START_X = START_X'$;

- if the current $START_X < START_X'$ then $START_X = START_X'$, otherwise $START_X$ is unchanged.

NOTE 1: Here, "most recently configured" means that if there are more than one key in use for a CN domain, due to non expiry of the ciphering and/or integrity protection activation time for any signalling radio bearers and/or radio bearers, do not include the COUNT-I/COUNT-C for these signalling radio bearers and/or radio bearers in the calculation of the $START_X$'.

COUNT-C corresponding to non-ciphered radio bearers (i.e. RBs with ciphering status set to "not started") shall not be included in the calculation of the $START_X$'. If a radio bearer is released and the radio bearer was ciphered, the values of the COUNT-C at the time the radio bearer is released shall be taken into account in the calculation of the $START_X$'.

If a Security Mode Command procedure has not been successfully completed for a CN domain during the current RRC connection, the MES shall use the latest transmitted "START" value for this CN domain.

NOTE 2: The STARTX calculated by GERAN is referred to as STARTn.

If STARTn is supplied by GERAN (CELL UPDATE CONFIRM, GRA UPDATE CONFIRM, RRC CONNECTION RELEASE message), then the MES shall use STARTn for initializing the COUNT-I and COUNT-C.

7.18.5 Integrity protection

7.18.5.0 General

If the "Status" in the variable INTEGRITY_ PROTECTION_INFO has the value "Started" then the MES and the GERAN shall:

1> perform integrity protection (and integrity checking) on all RRC messages, with the following exceptions:

RRC CONNECTION REJECT;

RRC CONNECTION SETUP;

RRC CONNECTION REQUEST;

RRC CONNECTION SETUP COMPLETE;

MEASURMENT REPORT.

If the "Status" in the variable INTEGRITY_ PROTECTION_INFO has the value "Not started" then integrity protection (and integrity checking) shall not be performed on any RRC message.

For each signalling radio bearer, the MES shall use two RRC hyper frame numbers:

1> "Uplink RRC HFN";

1> "Downlink RRC HFN";

and two message sequence numbers:

1> "Uplink RRC Message sequence number";

1> "Downlink RRC Message sequence number".

The above information is stored in the variable INTEGRITY_PROTECTION_INFO per signalling radio bearer (RB1-RB4).

Upon the first activation of integrity protection for an RRC connection, MES and GERAN initialize the "Uplink RRC Message sequence number" and "Downlink RRC Message sequence number" for all signalling radio bearers as specified in clauses 7.18.5.2 and 7.18.5.1.

The RRC message sequence number (RRC SN) is incremented for every integrity protected RRC message.

If the IE "*Integrity Protection Mode Info*" is present in a received message, the MES shall:

1> perform the actions in clause 7.19.4.5 before proceeding with the integrity check of the received message.

7.18.5.1 Integrity protection in downlink

If the MES receives an RRC message on signalling radio bearer with RB identity n, the "Status" in the variable INTEGRITY_PROTECTION_INFO has the value "Started" and the IE *"Integrity Check Info*" is present the MES shall:

1> check the value of the IE "*RRC Message Sequence Number*" included in the IE "*Integrity Check Info*";

2> if the "Downlink RRC Message sequence number" for signalling radio bearer RBn is not present in the variable INTEGRITY_PROTECTION_INFO:

3> initialize the "Downlink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO with the value of the IE "*RRC Message Sequence Number*" included in the IE "*Integrity Check Info*" of the received message;

2> if the "Downlink RRC Message sequence number" is present in the variable INTEGRITY_PROTECTION_INFO:

3> if the RRC message sequence number is equal to the "Downlink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO:

4> discard the message;

3> else if the RRC message sequence number is less than the "Downlink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO:

4> if ["RRC Message sequence number"- "Downlink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO] modulo 16 < 8:

5> increment "Downlink RRC HFN" for signalling radio bearer SRBn in the variable INTEGRITY_PROTECTION_INFO by one;NOTE: The actions above imply that also for the case the "Downlink RRC HFN" is re-initialized by a security mode control procedure, this "Downlink RRC HFN" value is incremented by one before it is applied for the integrity protection of any received message if the conditions above are fulfilled.

5> calculate an expected message authentication code in accordance with clause 7.18.5.3;

5> if the expected message authentication code and the received IE "*Message Authentication Code*" contained in the IE "*Integrity Check Info*" are the same, the integrity check is successful:

6> update the "Downlink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO with the value of the IE "*RRC Message Sequence Number*" included in the IE "*Integrity Check Info*" of the received RRC message;

5> else:

6> act as though the message was not received.

4> else:

5> calculate an expected message authentication code in accordance with clause 7.18.5.3;

5> if the expected message authentication code and the received IE "*Message Authentication Code*" contained in the IE "*Integrity Check Info*" are the same, the integrity check is successful:

6> update the "Downlink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO with the value of the IE "*RRC Message Sequence Number*" included in the IE "*Integrity Check Info*" of the received RRC message;

5> else:

6> act as though the message was not received.

3> else:

4> if ["RRC Message sequence number"- "Downlink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO] modulo 16 < 8:

5> calculate an expected message authentication code in accordance with clause 7.18.5.3;

5> if the expected message authentication code and the received IE "*Message Authentication Code*" contained in the IE "*Integrity Check Info*" are the same, the integrity check is successful:

6> update the "Downlink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO with the value of the IE "*RRC Message Sequence Number*" included in the IE "*Integrity Check Info*" of the received RRC message;

5> else:

6> act as though the message was not received.

4> else:

5> calculate an expected message authentication code in accordance with clause 7.18.5.3 using ("Downlink RRC HFN"-1);

5> if the expected message authentication code and the received IE "*Message Authentication Code*" contained in the IE "*Integrity Check Info*" are the same, the integrity check is successful:

5> else:

6> act as though the message was not received.

1> calculate an expected message authentication code in accordance with clause 7.18.5.3;

1> compare the expected message authentication code with the value of the received IE "*Message Authentication Code*" contained in the IE "*Integrity Check Info*";

2> if the expected message authentication code and the received message authentication code are the same, the integrity check is successful:

3> update the "Downlink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO with the value of the IE "*RRC Message Sequence Number*" included in the IE "*Integrity Check Info*" of the received RRC message;

2> if the calculated expected message authentication code and the received message authentication code differ:

3> act as though the message was not received.

If the MES receives an RRC message on signalling radio bearer with identity n, the "Status" in the variable INTEGRITY_PROTECTION_INFO has the value "Started" and the IE *"Integrity Check Info"* is not present the MES shall:

1> discard the message.

7.18.5.2 Integrity protection in uplink

Prior to sending an RRC message using the signalling radio bearer with radio bearer identity n, and the "Status" in the variable INTEGRITY_PROTECTION_INFO has the value "Started" the MES shall:

1> increment "Uplink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO with 1, even if the message is a retransmission of a previously transmitted message;

1> if the "Uplink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO equals zero:

2> the MES shall increment "Uplink RRC HFN" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO by one;

NOTE: The actions above imply that also for the case the "Uplink RRC HFN" is re-initialized by a security mode control procedure, this "Uplink RRC HFN" is incremented before it is applied in the integrity protection of any transmitted message if the conditions above are fulfilled.

1> calculate the message authentication code in accordance with clause 7.18.5.3;

1> replace the "Message authentication code" in the IE "*Integrity Check Info*" in the message with the calculated message authentication code;

1> replace the "RRC Message sequence number" in the IE "*Integrity Check Info*" in the message with contents set to the new value of the "Uplink RRC Message sequence number" for signalling radio bearer RBn in the variable INTEGRITY_PROTECTION_INFO.

In the response message for the procedure ordering the security reconfiguration, the MES indicates the activation time, for each signalling radio bearer. When the new integrity configuration is to be applied in uplink, GERAN should then start to apply the new integrity protection configuration according to the activation time for each signalling radio bearer (except for the signalling radio bearer which is used to send the message that is reconfiguring the security configuration) where the new configuration is to be applied starting from and including reception of the response message.

During cell update procedure and in case of RRC message packet loss, there could be ambiguity of whether the wraparound of the RRC message sequence number occurred before or after the transmission of the cell update, requiring integrity checking with and without increment "Uplink RRC HFN".

If the GERAN receives an RRC message on signalling radio bearer with RB identity n, the GERAN shall:

1> if "RRC Message sequence number" in the IE "*Integrity Check Info*" is smaller than the last received RRC message sequence number for signalling radio bearer RBn:

2> if the RRC message is the first message after a cell update transmission and "RRC Message sequence number" is not equal to zero:

3> calculate the message authentication code in accordance with clause 7.18.5.3;

3> if the expected message authentication code and the received IE "*Message Authentication Code*" contained in the IE "*Integrity Check Info*" are the same, the integrity check is successful;

3> else:

4> the GERAN shall increment "Uplink RRC HFN" for signalling radio bearer RBn;

4> calculate the message authentication code in accordance with clause 7.18.5.3;

4> if the expected message authentication code and the received IE "*Message Authentication Code*" contained in the IE "*Integrity Check Info*" are the same, the integrity check is successful;

4> else:

5> act as though the message was not received.

2> else:

3> if ["RRC Message sequence number"- last received RRC message sequence number for signalling radio bearer RBn] modulo 16 < 8:

4> the GERAN shall increment "Uplink RRC HFN" for signalling radio bearer RBn;

4> calculate the message authentication code in accordance with clause 7.18.5.3;

4> if the expected message authentication code and the received IE "*Message Authentication Code*" contained in the IE "*Integrity Check Info*" are the same, the integrity check is successful;

4> else:

5> act as though the message was not received.

3> else:

4> if the expected message authentication code and the received IE "*Message Authentication Code*" contained in the IE "*Integrity Check Info*" are the same, the integrity check is successful;

4> else:

5> act as though the message was not received.

1> else:

2> if ["RRC Message sequence number"- the last received RRC message sequence number for signalling radio bearer RBn] modulo 16 < 8:

3> calculate the message authentication code in accordance with clause 7.18.5.3;

3> if the expected message authentication code and the received IE "*Message Authentication Code*" contained in the IE "*Integrity Check Info*" are the same, the integrity check is successful;

3> else:

4> act as though the message was not received.

2> else:

3> calculate the message authentication code in accordance with clause 7.18.5.3 ("Uplink RRC HFN"-1);

3> if the expected message authentication code and the received IE "*Message Authentication Code*" contained in the IE "*Integrity Check Info*" are the same, the integrity check is successful;

3> else:

4> act as though the message was not received.

7.18.5.3 Calculation of message authentication code

The MES shall calculate the message authentication code in accordance with ETSI TS 133 102 [23]. The construction of the input parameter MESSAGE (see ETSI TS 133 102 [23]) for the integrity algorithm shall be constructed by:

1> setting the "Message authentication code" in the IE "Integrity check info" in the message to the value of the IE "RB identity" for the signalling radio bearer;

1> setting the "RRC Message sequence number" in the IE "Integrity check info" in the message to zero;

1> encoding the message;

1> appending RRC padding (if any) as a bit string to the encoded bit string as the least significant bits. For usage on an RRC message transmitted or received on the radio bearer with identity n, the MES shall:

1> construct the input parameter COUNT-I (see ETSI TS 133 102 [23]) by appending the following IEs from the IE "*Signalling Radio Bearer Specific Integrity Protection Information*" for radio bearer n in the variable INTEGRITY_PROTECTION_INFO:

2> for uplink:

3> "Uplink RRC HFN", as the MSB, and "Uplink RRC Message sequence number", as LSB;

2> for downlink:

3> "Downlink RRC HFN", as the MSB, and the IE "*RRC Message Sequence Number*" included in the IE "*Integrity Check Info*", as LSB.

7.18.6 Physical channel establishment

7.18.6.0 General

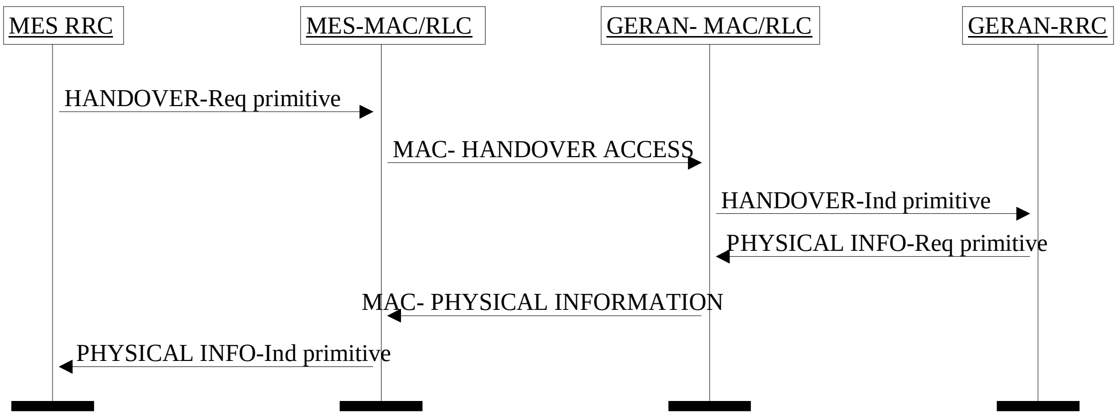

Figure 7.18.6.0.1: Handover Access procedure

The Handover Access procedure initiation in RRC-Cell_Dedicated state is done by sending a HANDOVER-Req primitive to the MES MAC layer as described in ETSI TS 101 376-4-14 [14]. The MES MAC uses this procedure to initiate access in the new cell. The reception of a HANDOVER ACCESS message at GERAN MAC is indicated to GERAN RRC by sending the HANDOVER-Ind primitive as specified in ETSI TS 101 376-4-14 [14].

The Physical Information procedure initiation is done by sending a PHYSICAL INFO-Req primitive to the GERAN MAC layer as specified in ETSI TS 101 376-4-14 [14] upon receipt of a HANDOVER-Ind primitive from the GERAN MAC layer. When the network has the necessary MES's RF characteristics it sends PHYSICAL INFORMATION message as specified in clause 7.18.6.2. The reception of a PHYSICAL INFORMATION message at MES MAC is indicated to the MES RRC by sending the PHYSICAL INFO-Ind primitive.

Four procedures are defined: Finely synchronized cell, Non-synchronized cell, Pseudo-synchronized cell and Pre-synchronized cell. The support of all of them except the pseudo-synchronized cell case is mandatory in the MES. A pseudo-synchronized establishment can be commanded only to a MES that can support it, as indicated in the classmark.

7.18.6.1 Finely synchronized cell case

When MES receives the RADIO BEARER RECONFIGURATION message; and

1> if the IE "*Timing Advance*" with the new cell is not out of range, i.e. smaller than or equal to the maximum timing advance that can be coded as specified in ETSI TS 101 376-4-8 [7]; or

1> if the new cell does accept out of range timing advance as indicated in the RADIO BEARER RECONFIGURATION message, the MES shall:

2> after having switched to the assigned channels, send the HANDOVER ACCESS message as specified in ETSI TS 101 376-4-14 [14] The transmission of this message is optional if so indicated by the network in the RADIO BEARER RECONFIGURATION message.

The MES shall not transmit the HANDOVER ACCESS message in those cells that support extended TA values if TA value in the new cell is greater than 63 and the RADIO BEARER RECONFIGURATION message indicates that the transmission of the HANDOVER ACCESS messages is optional.

Then the MES shall:

1> activate the channels in sending and receiving mode.

If applicable, ciphering is immediately started.

7.18.6.2 Non synchronized cell case

Upon reception of the RADIO BEARER RECONFIGURATION message and after having switched to the assigned channels, the MES shall:

1> send repeatedly the HANDOVER ACCESS message as specified in ETSI TS 101 376-4-14 [14];

1> start timer T3124 at the start point of the timeslot in which the HANDOVER ACCESS message is sent the first time;

1> then, activate the channels in receiving mode; If applicable, deciphering is then immediately started.

Upon receipt of a HANDOVER-ind primitive the GERAN RRC shall:

1> set the value of the Timing Advance Value parameter in the PHYSICAL INFO-Req primitive to the timing advance value received from the GERAN MAC layer;

1> initiate the transmission of PHYSICAL INFORMATION message by transmitting a PHYSICAL INFO-Req service primitive to the GERAN MAC sublayer.

When the network has the necessary MES's RF characteristics it shall send a PHYSICAL INFORMATION message to the MES as specified in ETSI TS 101 376-4-14 [14]. If applicable, ciphering and deciphering is immediately started.

The network shall start timer T3143 immediately after having sent the PHYSICAL INFORMATION message. If this timer times out before the reception of the RADIO BEARER RECONFIGURATION COMPLETE message from the MES, the network shall send the PHYSICAL INFORMATION message once more and shall restart timer T3143. The network shall not send the PHYSICAL INFORMATION message more than N3143 times. The value of T3143 and N3143 is an implementation issue.

At the mobile side, when the MAC layer indicates the reception of a PHYSICAL INFORMATION message, the MES shall:

1> stop timer T3124;

1> stop sending HANDOVER ACCESS messages;

1> activate the physical channels in sending and receiving mode.

If the allocated channel is a DCH/S, the performance of the MES shall enable the MES to accept a correct PHYSICAL INFORMATION message sent by the network in any block while T3124 is running.

7.18.6.3 Pseudo-synchronized cell case

The details of the use of this procedure are described in ETSI TS 101 376-5-7 [10].

If the RADIO BEARER RECONFIGURATION message is received by the MES and if the IE "*Timing Advance*" and the IE "*Real Time Difference*" are included in the message, then MES shall:

1> compute the timing advance to be used with the new cell from the real time difference value given in the RADIO BEARER RECONFIGURATION message.

The MES shall switch to the new physical channel and proceed as follows:

1> if the "*Timing Advance*" IE is received in the RADIO BEARER RECONFIGURATION; and

1> if the MES knows that the timing advance with the new cell is not out of range, i.e. smaller or equal to the maximum timing advance that can be coded as specified in ETSI TS 101 376-4-8 [7]; or

1> if the new cell accepts an out of range timing advance as indicated in the RADIO BEARER RECONFIGURATION message after having switched to the assigned channels, the MES shall:

2> send the HANDOVER ACCESS message as specified in ETSI TS 101 376-4-14 [14]. The transmission of this message is optional if so indicated by the network in the RADIO BEARER RECONFIGURATION message.

The MES shall not transmit the HANDOVER ACCESS message in those cells that support extended TA values if TA value in new cell is greater than 63 and the RADIO BEARER RECONFIGURATION message indicates that the transmission of the HANDOVER ACCESS messages is optional. Then MES shall:

1> activate the channels in sending and receiving mode while sending the HANDOVER ACCESS message.

If applicable, ciphering is immediately started.

7.18.6.4 Pre-synchronized cell case

The details of the use of this procedure are described in ETSI TS 101 376-5-7 [10].

Upon reception of the RADIO BEARER RECONFIGURATION message, the MES shall:

1> switch to the new channel; and

1> send the HANDOVER ACCESS message as specified in ETSI TS 101 376-4-14 [14]. The transmission of this message is optional if so indicated by the network in the RADIO BEARER RECONFIGURATION message.

The MES shall not transmit the HANDOVER ACCESS message in those cells that support extended TA values if TA value in new cell is greater than 63 and the RADIO BEARER RECONFIGURATION message indicates that the transmission of the HANDOVER ACCESS messages is optional. Then MES shall activate the channels in sending and receiving mode during the transmission of the HANDOVER ACCESS message. The timing advance value to be used with the new cell is:

1> either the value contained in the RADIO BEARER RECONFIGURATION message if the timing advance information element is present; or

1> the default value for pre-synchronized handover as defined in ETSI TS 101 376-5-7 [10], if the timing advance information element is not included in the RADIO BEARER RECONFIGURATION message. The MES may activate the channels in receiving mode while sending HANDOVER ACCESS message.

If applicable, ciphering is immediately started.

7.18.7 Void

7.18.8 Link failure and Radio link failure criteria and actions upon link or radio link failure

When a radio link failure occurs signalled by RLC entity or the MAC sublayer or the physical layer (see ETSI TS 101 376-5-6 [9]), the MES shall:

1> clear the dedicated physical channel or shared basic physical channel configuration;

1> perform actions as specified for the ongoing procedure;

1> if no procedure is ongoing or no actions are specified for the ongoing procedure:

2> perform a Cell Update procedure according to clause 7.8 using the cause "radio link failure".

7.18.9 Unsupported configuration

The MES should set the variable UNSUPPORTED_CONFIGURATION to TRUE if the received message is not according to the MES capabilities.

7.18.10 Invalid RLC/MAC control message notification

When notification is received of the reception of an invalid RLC/MAC acknowledgement message on DCH, the MES shall:

1> re-establish all RLC entities for the radio bearers currently established on the DCH(s);

1> clear the dedicated physical channel configuration;

1> perform actions as specified for the ongoing procedure.

7.18.11 Actions related to Radio Bearer mapping

When the MES receives the IE "*RB Mapping Info*" and/or the IE "*Transport Format Set*", when the MES performs a cell reselection or a state transition, or when the MES releases a RB, the MES shall for each of the configured Radio Bearers:

1> configure the MAC with the appropriate transport format set (with computed transport block sizes) for the transport channel used by that RB;

1> determine the sets of RLC sizes that apply to the RLC entity used by that RB, based on the IE "*RLC Size List*" included in the applicable "Transport format set" (either the ones received in the same message or the ones stored if none were received);

1> if that RB is using RLC AM and the RLC size list applicable to the RLC entity transporting data PDUs is different from the one derived from the previously stored configuration:

2> if the old RLC size list is not contained in the new one then:

3> re-establish the RLC entity;

3> configure the corresponding RLC entity with the new RLC size list;

2> else configure the corresponding RLC entity with the new RLC size list;

2> for each RLC AM radio bearer in the CN domain as indicated in the IE *"CN Domain Identity*" in the IE "*RAB Info*" in the variable ESTABLISHED_RABS whose RLC size is changed; and

2> for each RLC AM signalling radio bearer in the CN domain as indicated in the IE "*CN Domain Identity*" in the variable LATEST_CONFIGURED_CN_DOMAIN whose RLC size is changed:

3> if the IE "*Status*" in the variable CIPHERING_STATUS of this CN domain is set to "Started":

4> set the HFN values for the corresponding RLC entity equal to the value of the IE "*START*" for this CN domain that will be included in the CELL UPDATE message following cell reselection;

4> if the RLC re-establishment is caused by a CELL UPDATE CONFIRM:

5> set the HFN values for the corresponding RLC entity equal to the value of the IE "*START*" included in the latest transmitted CELL UPDATE message for this CN domain;

4> if the RLC re-establishment is caused by a reconfiguration message:

5> set the HFN values for the corresponding RLC entity equal to the value of the IE "*START*" that will be included in the reconfiguration complete message for this CN domain;

1> if that RB is using RLC UM:

2> indicate the largest applicable RLC size to the corresponding RLC entity;

1> configure the MAC with the set of applicable RLC Sizes for each of the RLC entity used for that RB;

1> if there is no RLC information applicable for the transport channels to be used:

2> set the variable INVALID_CONFIGURATION to TRUE.

7.18.12 Network response times for DCH allocation

Not applicable for GMR-1 3G.

7.19 Generic actions on receipt and absence of an information element

7.19.1 CN information info

If the IE "*CN Information Info*" is present in a message, the MES shall:

1> if present, forward the content of the IE "*PLMN Identity*" to upper layers;

1> if present, forward the content of the IE "*CN Common GSM-MAP NAS System Information*" to upper layers;

1> if the IE "*CN Domain Related Information*" is present:

2> forward each occurrence of the IE "*CN Domain Specific GSM-MAP NAS System Info*" together with the IE "*CN Domain Identity*" to upper layers;

2> if an IE "*CN Domain Specific GSM-MAP NAS System Info*" is not present for a particular CN domain:

3> indicate to upper layers that no CN system information is available for that CN domain.

7.19.2 Signalling connection release indication

If the IE "*Signalling Connection Release Indication*" is present in a message, the MES shall:

1> if all radio access bearers for the CN domain identified with the value of the IE "*Signalling Connection Release Indication*" would have been released in the variable ESTABLISHED_RABS after processing of the received message:

2> indicate release of the signalling connection identified with the value of the IE "*Signalling Connection Release Indication*" to the upper layers;

2> remove the signalling connection identified with the value of the IE "*Signalling Connection Release Indication*" from the variable ESTABLISHED_SIGNALLING_CONNECTIONS;

1> if radio access bearers for the CN domain identified with the value of the IE "*Signalling Connection Release Indication*" would remain in the variable ESTABLISHED_RABS after processing of the received message:

2> set the variable INVALID_CONFIGURATION to TRUE.

7.19.2a MES Timers and Constants in Connected Mode

If the IEs "*MES Timers and Constants in Connected Mode* " and/or "*MES Additional Timers and Constants in Connected Mode"* are present in a message, the MES shall:

1> store the values of the timers and constants in the IE(s) in the variable TIMERS_AND_CONSTANTS, replacing any previously stored values; and

2> for each updated timer value:

3> start using the new value next time the timer is started.

7.19.3 GERAN mobility information elements

7.19.3.1 GRA identity

The MES shall:

1> if the IE "*GRA Identity*" is included in a received message:

2> if the IE "*RRC State Indicator*" is included and set to "GRA_PCH":

3> store this GRA identity in the variable GRA_IDENTITY;

3> after sending a possible message to GERAN and entering GRA_PCH state as specified elsewhere, read system information in the selected cell;

3> if the stored GRA identity in the variable GRA_IDENTITY is not included in the list of GRA identities in System Information in the selected cell, the list of GRA identities in system information is empty or if the system information cannot be found, a confirmation error of GRA identity list has occurred:

4> if no GRA Update procedure is ongoing:

5> initiate a GRA Update procedure after entering GRA_PCH state; see clause 7.8;

4> if a GRA Update procedure is ongoing:

5> take actions as specified in clause 7.8.

1> if the IE "*GRA Identity*" is not included in a received message:

2> the IE "*RRC State Indicator*" is included and set to "GRA_PCH":

3> after sending a possible message to GERAN and entering GRA_PCH state as specified elsewhere, read System Information in the selected cell;

3> if System Information in the selected cell contains a single GRA identity:

4> store this GRA identity in the variable GRA_IDENTITY;

3> if the system information cannot be found, a confirmation error of GRA identity list has occurred:

4> if no GRA Update procedure is ongoing:

5> initiate a GRA Update procedure after entering RRC-GRA_PCH state see clause 7.8;

4> if a GRA Update procedure is ongoing:

5> take actions as specified in clause 7.8.

7.19.3.2 Mapping info

If the IE "*Mapping Info*" is received, the MES shall in the present document:

1> ignore the contents of this IE.

7.19.4 MES information elements

7.19.4.1 Downlink Activation time

If the MES receives a message containing the IE "Downlink *Activation time*" with a value other than 0, the MES shall:

1> select MAC slot m of the Downlink FN (TDMA Frame Number) indicated by the IE "Downlink *Activation Time*" as the Downlink activation time T; where m is the MAC slot on which the RRC message is fully received;

1> select MAC slot m of the Uplink FN = Downlink FN + USF_DELAY as the Uplink activation time T; where m is the MAC slot on which the RRC message is fully received;

1> at the activation time T:

2> for a physical channel reconfiguration caused by the received message:

3> release the physical channel configuration, which was present before T;

3> initiate the establishment of the physical channel configuration as specified for the physical channel information elements in the received message as specified elsewhere;

2> for actions, other than a physical channel reconfiguration, caused by the received message:

3> perform the actions for the information elements in the received message as specified elsewhere.

If the MES receives a message containing the IE "*Activation time*" with the value 0 (meaning "Now") and no radio bearers are getting reconfigured, the MES shall:

1> select MAC slot m of frame N as the Downlink activation time T; where m and frame N are the MAC slot and frame number respectively on which the RRC message is fully received;

1> select MAC slot m of the Uplink FN = N + USF_DELAY as the Uplink activation time T; where m and frame N are the MAC slot and frame number respectively on which the RRC message is fully received;

1> as an immediate reaction to the reception of the message (see ETSI TS 101 376-5-7 [10] for timing constraints):

2> perform the actions for the information elements in the received message as specified elsewhere.

If the MES receives a message containing the IE "Downlink *Activation time*" with the value 0 (meaning "Now") and radio bearers are getting reconfigured, the MES shall:

1> when RLC acknowledgement of CHANNEL CHANGE PREPARATION COMPLETE message is received:

2> for a physical channel reconfiguration caused by the received message:

3> release the physical channel configuration;

3> initiate the establishment of the physical channel configuration as specified for the physical channel information elements in the received message as specified elsewhere;

2> for actions, other than a physical channel reconfiguration, caused by the received message:

3> perform the actions for the information elements in the received message as specified elsewhere.

NOTE: If the MES was in RRC-Idle mode or RRC-CELL_Shared state upon reception of the message, and the value of the IE "Downlink *Activation Time*" in the received message is different from "Now", regardless of the state the MES enters after reception of the message the MES behaviour is unspecified.

7.19.4.2 DRX parameters

7.19.4.2.1 Void

7.19.4.2.2 GERAN DRX cycle length coefficient

DRX cycle length is not used in GMR-1 3G. No actions are required by the MES.

7.19.4.2.3 Paging Group

In DRX mode, the MES shall compute its paging group as specified in ETSI TS 101 376-5-2 [8].

The paging group is indicated to lower layers via primitives.

Primitives between RLC/MAC and RRC shall be described in ETSI TS 101 376-4-14 [14].

7.19.4.3 Generic state transition rules depending on received information elements

The IE "*RRC State Indicator*" indicates the state the MES shall enter. The MES shall enter the state indicated by the IE "*RRC State Indicator*" even if the received message includes other IEs relevant only for states other than indicated by the IE "*RRC State Indicator*". E.g. if the RRC state indicator is set to "RRC-Cell_Shared" while other IEs provide information about a configuration including dedicated channels, the MES shall enter RRC-Cell_Shared state. If however the MES has no information about the configuration corresponding to the state indicated by the IE "*RRC State Indicator*", it shall consider the requested configuration as invalid.

The MES shall, if the IE "*RRC State Indicator*" in the received message has the value:

1> "RRC-Cell_Shared":

2> enter RRC-Cell_Shared state as dictated by the procedure governing the message received;

1> "RRC-CELL_Dedicated":

2> if neither DCH is assigned in the message nor is the MES is RRCRRC-CELL_Dedicated state:

3> set the variable INVALID_CONFIGURATION to TRUE;

2> else:

3> enter RRC-Cell_Dedicated state as dictated by the procedure governing the message received;

1> "RRC-GRA_PCH":

2> if the received message is RRC CONNECTION SETUP and IE "*RRC State Indicator*" is set to RRC-GRA_PCH:

3> set the variable INVALID_CONFIGURATION to TRUE;

2> else:

3> enter RRC-GRA_PCH state as dictated by the procedure governing the message received.

7.19.4.4 Ciphering mode info

The IE "*Ciphering Mode Info*" defines the new ciphering configuration. At any given time, the MES needs to store at most two different ciphering configurations (keyset and algorithm) per CN domain at any given time in total for all radio bearers, and three configurations in total for all signalling radio bearers.

If the IE "*Ciphering Mode Info*" is present and if the IE "*Reconfiguration*" in the variable CIPHERING_STATUS is set to TRUE, the MES shall:

1> ignore this attempt to change the ciphering configuration; and

1> set the variable INCOMPATIBLE_SECURITY_CONFIGURATION to TRUE.

If the IE "*Ciphering Mode Info*" is present and if the IE "*Reconfiguration*" in the variable CIPHERING_STATUS is set to FALSE, the MES shall:

1> if none of the IE "*Status*" in the variable CIPHERING STATUS has the value "Started", and this IE "*Ciphering Mode Info*" was included in a message that is not the message SECURITY MODE COMMAND message; or

1> if the IE "*Ciphering Mode Info*" was received in the message SECURITY MODE COMMAND message and there does not exist exactly one ciphering activation time in the IE "*Radio Bearer Downlink Ciphering Activation Time Info*" for each established RLC-AM and RLC-UM radio bearers included in the IE "*RB Information*" in the ESTABLISHED_RABS for the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN; or

1> if the IE "*Ciphering Mode Info*" was received in the message SECURITY MODE COMMAND message and the IE "*Ciphering Activation Time for DCH*" is not included in the message, and there exist radio bearers using RLC-TM according to the IE "*RB Information*" in the IE "ESTABLISHED_RABS" for the CN domain as indicated in the variable LATEST_CONFIGURED_CN_DOMAIN; or

1> if the IE "*Ciphering Mode Info*" was received in the message SECURITY MODE COMMAND message and there does not exist exactly one ciphering activation time in the IE "*Radio Bearer Downlink Ciphering Activation Time Info*" for each established signalling radio bearer, excluding SRB2, included in the IE "*Signalling Radio Bearer Information*" in the ESTABLISHED-RABS:

2> ignore this attempt to change the ciphering configuration;

2> set the variable INVALID_CONFIGURATION to TRUE;

2> perform the actions as specified in clause 7.16.1.2.6;

If the IE "*Ciphering Mode Info*" is present and if the IE *"Reconfiguration*" in the variable CIPHERING_STATUS is set to FALSE, the MES shall:

1> set the IE "*Reconfiguration*" in the variable CIPHERING_STATUS to TRUE;

1> set the IE "*Status*" in the variable CIPHERING_STATUS of the CN domains for which the IE "*Status*" of the variable SECURITY_MODIFICATION is set to "Affected" to "Started";

1> apply the new ciphering configuration in the lower layers for all RBs that belong to a CN domain for which the IE "*Status*" of the variable SECURITY_MODIFICATION is set to "Affected" and all signalling radio bearers:

2> using the ciphering algorithm (UEA (see ETSI TS 133 102 [23])) if indicated by the IE "*Ciphering Algorithm*" as part of the new ciphering configuration;

2> using the ciphering algorithm (AES-256 (defined in FIPS PUB 197 [32])) if indicated by the IE "*Ciphering Algorithm*" as part of the new ciphering configuration;

2> for each radio bearer that belongs to a CN domain for which the IE "*Status*" of the variable SECURITY_MODIFICATION is set to "Affected" and all signalling radio bearers:

3> use the value of the IE "*RB Identity*" in the variable ESTABLISHED_RABS as the value of BEARER (see ETSI TS 133 102 [23]) in the ciphering algorithm;

1> for the downlink and the uplink, the new ciphering configuration shall be applied as follows:

2> if the ciphering configuration for a radio bearer or signalling radio bearer from a previously received SECURITY MODE COMMAND message has not yet been applied because of the corresponding activation times not having been reached and the current received message includes the IE "*Downlink Counter Synchronization Info*" or the current received message is a RADIO BEARER RECONFIGURATION message and includes the IE "*New G-RNTI*":

3> if the previous SECURITY MODE COMMAND message was received due to new keys being received:

4> consider the new ciphering configuration to include the received new keys;

3> else if the previous SECURITY MODE COMMAND caused a change in LATEST_CONFIGURED_CN_DOMAIN;

4> consider the new ciphering configuration to include the keys associated with the LATEST_CONFIGURED_CN_DOMAIN;

2> apply the new ciphering configuration in uplink and downlink immediately following RLC re-establishment;

2> if the IE "*Ciphering Activation Time for DCH*" is present in the IE "*Ciphering Mode Info*" and the MES was in Cell_Dedicated state prior to this procedure:

3> for radio bearers using RLC-TM:

4> apply the old ciphering configuration for the TDMA frame number less than the number indicated by the IE "*Ciphering Activation Time for DCH*";

4> apply the new ciphering configuration for the TDMA frame number greater than or equal to the number indicated in IE "*Ciphering Activation Time for DCH*";

2> if the IE "*Radio Bearer Downlink Ciphering Activation Time Info*" is present:

3> apply the following procedure for each radio bearer and signalling radio bearers using RLC-AM or RLC-UM indicated by the IE "*RB Identity*":

4> suspend uplink transmission on the radio bearer or the signalling radio bearer (except for the SRB where the response message is transmitted) according to the following:

5> do not transmit RLC PDUs with sequence number greater than or equal to the uplink activation time, where the uplink activation time is selected according to the rules below;

4> select an "RLC sequence number" at which (activation) time the new ciphering configuration shall be applied in uplink for that radio bearer according to the following:

5> consider an ciphering activation time in uplink to be pending until the RLC sequence number of the next RLC PDU to be transmitted for the first time is equal to or larger than the selected activation time;

5> for each radio bearer and signalling radio bearer that has no pending ciphering activation time in the uplink as set by a previous procedure changing the security configuration:

6> set a suitable value that would ensure a minimized delay in the change to the latest ciphering configuration;

5> for each radio bearer and signalling radio bearer that has a pending ciphering activation time in uplink as set by a previous procedure changing the security configuration:

6> for radio bearers and signalling radio bearers except SRB2, set the same value as the pending ciphering activation time;

4> store the selected "RLC send sequence number" for that radio bearer in the entry for the radio bearer in the variable RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO.

4> switch to the new ciphering configuration according to the following:

5> use the old ciphering configuration for the transmitted and received RLC PDUs with RLC sequence number smaller than the corresponding RLC sequence number indicated in the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" sent to GERAN and the received IE "*Radio Bearer Downlink Ciphering Activation Time Info*" received from GERAN, respectively;

5> use the new ciphering configuration for the transmitted and received RLC PDUs with RLC sequence numbers greater than or equal to the corresponding RLC sequence number indicated in the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" sent to GERAN and in the received IE "*Radio Bearer Downlink Ciphering Activation Time Info*" received from GERAN, respectively;

5> for a radio bearer using RLC-AM, when the RLC sequence number indicated in the IE "*Radio Bearer Downlink Ciphering Activation Time Info*" falls below the RLC receiving window and the RLC sequence number indicated in the IE "*Radio Bearer Uplink Ciphering Activation Time Info*" falls below the RLC transmission window, the MES may release the old ciphering configuration for that radio bearer;

5> if an RLC reset or re-establishment occurs before the activation time for the new ciphering configuration has been reached, ignore the activation time and apply the new ciphering configuration both in uplink and downlink immediately after the RLC reset or RLC re-establishment.

If the IE "*Ciphering Mode Info*" is not present, the MES shall:

1> for the downlink and the uplink, apply the ciphering configuration as follows:

2> if the ciphering configuration for a AM or UM radio bearer or signalling radio bearer from a previously received SECURITY MODE COMMAND has not yet been applied because of the corresponding activation times not having been reached and the current received message includes the IE "*DL Counter Synch Info*" or the current received message is a RADIO BEARER RECONFIGURATION message and includes the IE "*New G-RNTI*":

3> if the previous SECURITY MODE COMMAND was received due to new keys being received:

4> consider the ciphering configuration to include the received new keys.

3> else if the previous SECURITY MODE COMMAND caused a change in LATEST_CONFIGURED_CN_DOMAIN:

4> consider the ciphering configuration to include the keys associated with the LATEST_CONFIGURED_CN_DOMAIN;

3> apply the ciphering configuration in uplink and downlink immediately following RLC re-establishment.

2> else:

3> not change the ciphering configuration.

7.19.4.5 Integrity protection mode info

7.19.4.5.1 General

The IE "*Integrity Protection Mode Info"* defines the new integrity protection configuration. At any given time, the MES needs to store at most three different integrity protection configurations (keysets) in total for all signalling radio bearers for all CN domains.

If the IE "*Integrity Protection Mode Info*" is present and if the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO is set to TRUE, the MES shall:

1> ignore this second attempt to change the integrity protection configuration; and

1> set the variable INCOMPATIBLE_SECURITY_RECONFIGURATION to TRUE.

If IE "*Integrity Protection Mode Command*" has the value "Start" and the IE "*Status*" in the variable INTEGRITY_PROTECTION_INFO has the value "Not started", and the IE "*Integrity Protection Mode Command Info*" was not included in the message SECURITY MODE COMMAND message; or

If IE "*Integrity Protection Mode Command*" has the value "Start" and the IE "*Status*" in the variable INTEGRITY_PROTECTION_INFO has the value "Not started", and the IE "*Integrity Protection Mode Info*" was included in the message SECURITY MODE COMMAND message, and the IE "*Integrity Protection Algorithm*" is not included; or

If the IE "*Integrity Protection Mode Command*" has the value "Modify" and the IE "*Status*" in the variable INTEGRITY_PROTECTION_INFO has the value "Not Started"; or

If IE "*Integrity Protection Mode Command*" has the value "Start" and the IE "*Status*" in the variable INTEGRITY_PROTECTION_INFO has the value "Started", and the IE "Integrity protection mode command info" was included in the message SECURITY MODE COMMAND message; or

If the IE "*Integrity Protection Mode Command*" has the value "Modify" and there does not exist exactly one integrity protection activation time in the IE "*Downlink Integrity Protection Activation Info*" for each established signalling radio bearer included in the IE "*Signalling Radio Bearer Information*" in the variable ESTABLISHED_RABS; or

If IE "*Integrity Protection Mode Command*" has the value "Modify" and the IE "*Status*" in the variable INTEGRITY_PROTECTION_INFO has the value "Started", and the IE "*Integrity Protection Mode Info*" was not included in the message SECURITY MODE COMMAND message:

the MES shall:

1> ignore this attempt to change the integrity protection configuration; and

1> set the variable INVALID_CONFIGURATION to TRUE.

If the IE "Integrity protection mode info" is not present, the MES shall:

1> not change the integrity protection configuration. If the IE "*Integrity Protection Mode Info*" is present and if the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO is set to FALSE, the MES shall:

2> set the IE "*Reconfiguration*" in the variable INTEGRITY_PROTECTION_INFO to TRUE;

2> perform the actions in accordance with clauses 7.19.4.5.2, 7.19.4.5.3 and 7.19.4.5.4.

7.19.4.5.2 Initialization of Integrity Protection

The MES shall:

1> if IE "*Integrity Protection Mode Command*" has the value "start" and the IE "*Status*" in the variable INTEGRITY_PROTECTION_INFO has the value "Not started", and this IE was included in the message SECURITY_MODE_COMMAND:

2> initialize the information for all signalling radio bearers in the variable INTEGRITY_PROTECTION_INFO according to the following:

3> set the IE "*Uplink RRC Message Sequence Number*" in the variable INTEGRITY_PROTECTION_INFO to zero;

3> do not set the IE "*Downlink RRC Message Sequence Number*" in the variable INTEGRITY_PROTECTION_INFO;

3> set the variable INTEGRITY_PROTECTION_ACTIVATION_INFO to zero for each signalling radio bearer in the variable ESTABLISHED_RABS;

NOTE: The IE "*Integrity Protection Activation Info*" and "*RRC Message Sequence Number*" included in the IE "*Integrity Check Info*" in the transmitted message do not have identical values, but integrity protection is applied from the first transmitted message.

2> set the IE "*Status*" in the variable INTEGRITY_PROTECTION_INFO to the value "Started";

2> perform integrity protection on the received message, applying the new integrity protection configuration, as described in clause 7.18.5 by:

3> using the algorithm (UIA (see ETSI TS 133 102 [23])) indicated by the IE "*Integrity Protection Algorithm*" contained in the IE "*Integrity Protection Mode Info*";

3> using the IE "*Integrity Protection Initialization Number*", contained in the IE "*Integrity Protection Mode Info*" as the value of FRESH (see ETSI TS 133 102 [23]);

2> start applying the new integrity protection configuration in the downlink for each signalling radio bearer in the IE "*Established RABS*" except SRB2 at the next received RRC message;

2> start applying the new integrity protection configuration in the downlink for signalling radio bearer SRB2 from and including the received SECURITY MODE COMMAND message;

2> start applying the new integrity protection configuration in the uplink for signalling radio bearer SRB2 from and including the transmitted SECURITY MODE COMPLETE message;

2> start applying the new integrity protection configuration in the uplink for signalling radio bearers other than SRB2 at the uplink activation time included in the IE "*Uplink Integrity Protection Activation Info*".

7.19.4.5.3 Integrity Protection Re-configuration for SBSS Relocation

The MES shall:

1> if IE "*Integrity Protection Mode Command*" has the value "start" and the IE "*Status*" in the variable INTEGRITY_PROTECTION_INFO has the value "Started" and this IE was not included SECURITY MODE COMMAND:

NOTE: This case is used in SBSS relocation.

2> perform integrity protection on the received message, applying the new integrity protection configuration, as described in clause 7.18.5 by:

3> using the algorithm (UIA (see ETSI TS 133 102 [23])) indicated by the IE "*Integrity Protection Algorithm*" contained in the IE "*Integrity Protection Mode Info*";

3> using the IE "*Integrity Protection Initialization Number*", contained in the IE "*Integrity Protection Mode Info*" as the value of FRESH (see ETSI TS 133 102 [23]);

2> let SRBm be the signalling radio bearer where the reconfiguration message was received and let SRBn be the signalling radio bearer where the response message is transmitted;

2> for the downlink, for each signalling radio bearer, if for the signalling radio bearer, a security configuration triggered by a previous SECURITY MODE COMMAND message has not yet been applied, due to the activation time for the signalling radio bearer not having been reached:

3> set "Down link RRC Message sequence number" for this signalling radio bearer in the variable INTEGRITY_PROTECTION_INFO to (activation time - 1), where the activation time is the corresponding activation time for this signalling radio bearer:

3> if the previous SECURITY MODE COMMAND message was received due to new keys being received:

4> consider the new integrity protection configuration to include the received new keys;

3> else if the previous SECURITY MODE COMMAND caused a change in LATEST_CONFIGURED_CN_DOMAIN:

4> consider the new Integrity Protection configuration to include the keys associated with the LATEST_CONFIGURED_CN_DOMAIN associated with the previously received SECURITY MODE COMMAND message;

2> start applying the new integrity protection configuration in the downlink for each signalling radio bearer in the variable ESTABLISHED_RABS except RBm at the next received RRC message for the corresponding signalling radio bearer;

2> start applying the new integrity protection configuration in the downlink for signalling radio bearer RBm from and including the received configuration message;

2> start applying the new integrity protection configuration in the uplink for signalling radio bearer RBn from and including the transmitted response message;

2> start applying the new integrity protection configuration in the uplink for signalling radio bearers other than RBn from the first message onwards.

7.19.4.5.4 Integrity Protection modification in case of new keys or initialization of signalling connection

The MES shall:

1> if IE "*Integrity Protection Mode Command*" has the value "modify" and the IE "*Status*" in the variable INTEGRITY_PROTECTION_INFO has the value "Started" and this IE was included SECURITY_MODE_COMMAND:

2> store the (oldest currently used) integrity protection configuration until activation times have elapsed for the new integrity protection configuration to be applied on all signalling radio bearers;

2> start applying the new integrity protection configuration in the downlink at the RRC sequence number, for each radio bearer n, indicated by the entry for radio bearer n in the "RRC message sequence number list" in the IE "*Downlink Integrity Protection Activation Info*", included in the IE "*Integrity Protection Mode Info*";

2> perform integrity protection on the received message, applying the new integrity protection configuration, as described in clause 7.18.5;

3> if present, use the algorithm indicated by the IE "*Integrity Protection Algorithm*" (UIA (see ETSI TS 133 102 [23]));

2> set the content of the variable INTEGRITY_PROTECTION_ACTIVATION_INFO according to the following:

3> for each established signalling radio bearer, stored in the variable ESTABLISHED_RABS:

4> select a value of the RRC sequence number at which (activation) time the new integrity protection configuration shall be applied in uplink for that signalling radio bearer according to the following:

5> for each signalling radio bearer:

6> set the activation time for the new integrity protection configuration to the next RRC SN;

4> prohibit the transmission of RRC messages on all signalling radio bearers, except for SRB2, with RRC SN greater than or equal to the value in the "RRC message sequence number list" for the signalling radio bearer in the IE "*Uplink Integrity Protection Activation Info*" of the variable INTEGRITY_PROTECTION_ACTIVATION_INFO.

2> start applying the new integrity protection configuration in the uplink at the RRC sequence number, for each SRBn, except for signalling radio bearer SRB2, indicated by the entry for radio bearer n in the "RRC message sequence number list" in the IE "*Uplink Integrity Protection Activation Info*", included in the variable INTEGRITY_PROTECTION_ACTIVATION_INFO;

2> start applying the new integrity protection configuration in the uplink at the RRC sequence number for signalling radio bearer SRB2, as specified for the procedure initiating the integrity protection reconfiguration;

2> start applying the new integrity protection configuration in the downlink at the RRC sequence number, for each SRBn, except for signalling radio bearer SRB2, indicated by the entry for signalling radio bearer n in the "*RRC Message Sequence Number List*" in the IE "*Downlink Integrity Protection Activation Info*";

For signalling radio bearers that have a pending activation time as set for integrity protection by a previous procedure changing the integrity protection configuration, the GERAN shall set this value in IE "*Downlink Integrity Protection Activation Info*".

2> start applying the new integrity protection configuration in the downlink at the RRC sequence number for signalling radio bearer SRB2, as specified for the procedure initiating the integrity protection reconfiguration.

7.19.4.6 Integrity check info

If the IE "Integrity check info" is present the MES shall:

1> act as described in clause 7.18.5.1.

7.19.4.7 New G-RNTI

If the IE "*New G-RNTI*" is included in a received message, the MES shall:

1> store the value in the variable G_RNTI, replacing any old stored value.

7.19.4.8 RRC Transaction Identifier

The IE "*RRC Transaction Identifier*" may be used, together with the message type, for identification of an invocation of a downlink procedure (transaction). The MES behaviour for accepting or rejecting transactions based on the message type and the IE "*RRC Transaction Identifier*" is specified below.

If the IE "*RRC Transaction Identifier*" is included in a received message, the MES shall perform the actions below. The MES shall:

If the received message is any of the messages:

- RADIO BEARER SETUP; or
- RADIO BEARER RECONFIGURATION; or
- RADIO BEARER RELEASE;

the MES shall:

1> if the variable ORDERED_RECONFIGURATION is set to FALSE; and

1> if the variable CELL_UPDATE_STARTED is set to FALSE; and

1> if the received message does not contain a protocol error according to clause 8 and the variable PROTOCOL_ERROR_REJECT is set to FALSE:

2> accept the transaction; and

2> store the IE "*Message Type*" and the IE "*RRC Transaction Identifier*" of the received message in the table "Accepted transactions" in the variable TRANSACTIONS;

1> else:

2> if the variable ORDERED_RECONFIGURATION is set to TRUE; or

2> if the variable CELL_UPDATE_STARTED is set to TRUE; or

2> if the received message contains a protocol error according to clause 8 causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE:

3> if the IE "*RRC Transaction Identifier*" of the received message is identical to the "RRC Transaction Identifier" stored for the same "Message Type" as the received message in the table "Accepted transactions" in the variable TRANSACTIONS:

4> ignore the transaction; and

4> continue with any ongoing processes and procedures as the message was not received;

4> and end the procedure;

3> else:

4> reject the transaction; and

4> if the IE "*Message Type*" of the received message is not present in the table "Rejected transactions" in the variable TRANSACTIONS:

5> store the IE "*Message Type*" and the IE "*RRC Transaction Identifier*" of the received message in the table "Rejected transactions" in the variable TRANSACTIONS.

Else:

If the received message is any of the messages:

- RRC CONNECTION SETUP; or
- CELL UPDATE CONFIRM; or
- GRA UPDATE CONFIRM;

the MES shall:

1> if the IE "*Message Type*" of the received message is not present in the table "Accepted transactions" in the variable TRANSACTIONS:

2> if the received message does not contain a protocol error according to clause 8 and the variable PROTOCOL_ERROR_REJECT is set to FALSE:

3> accept the transaction; and

3> store the IE "*Message Type*" and the IE "*RRC Transaction Identifier*" of the received message in the table "Accepted transactions" in the variable TRANSACTIONS;

2> else:

2> if the received message contains a protocol error according to clause 8 causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE:

3> reject the transaction; and

3> if the IE "*Message Type*" of the received message is not present in the table "Rejected transactions" in the variable TRANSACTIONS;

3> store the IE "*Message Type*" and the IE "*RRC Transaction Identifier*" of the received message in the table "Rejected transactions" in the variable TRANSACTIONS.

1> else:

1> if the IE "*Message Type*" of the received message is present in the table "Accepted transactions" in the variable TRANSACTIONS:

2> if the IE "*RRC Transaction Identifier*" of the received message is identical to the "RRC Transaction Identifier" stored for the "Message Type" in the table "Accepted transactions" in the variable TRANSACTIONS:

3> ignore the transaction; and

3> continue with any ongoing processes and procedures as the message was not received; and

3> end the procedure;

2> else:

2> if the IE "*RRC Transaction Identifier*" of the received message is different from the "RRC transaction identifier" stored for the "Message Type" in the table "Accepted transactions" in the variable TRANSACTIONS:

3> if the received message does not contain a protocol error according to clause 8 and the variable PROTOCOL_ERROR_REJECT is set to FALSE:

4> ignore the once accepted transaction and instead accept the new transaction; and

4> store the IE "*Message Type"* and the IE "*RRC Transaction Identifier*" of the received message in the table "Accepted transactions" in the variable TRANSACTIONS, replacing the previous entry;

NOTE: The MES is expected to process the first RRC CONNECTION SETUP/CELL UPDATE CONFIRM/GRA UPDATE COMFIRM message that it receives after transmitting an RRC CONNECTION REQUEST/CELL UPDATE/GRA UPDATE message. If the MES receives further RRC CONNECTION SETUP/CELL UPDATE CONFIRM/GRA UPDATE COMFIRM messages without having transmitted another RRC CONNECTION REQUEST/CELL UPDATE/GRA UPDATE message, the MES is not required to process these messages.

3> else:

3> if the received message contains a protocol error according to clause 8 causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE:

4> reject the transaction; and

4> if the IE "*Message Type*" of the received message is not present in the table "Rejected transactions" in the variable TRANSACTIONS:

5> store the IE "*Message Type*" and the IE "*RRC Transaction Identifier*" of the received message in the table "Rejected transactions" in the variable TRANSACTIONS.

Else:

If the received message is any other message, the MES shall:

1> if the IE "*Message Type*" of the received message is not present in the table "Accepted transactions" in the variable TRANSACTIONS:

2> if the received message does not contain a protocol error according to clause 8 and the variable PROTOCOL_ERROR_REJECT is set to FALSE:

3> accept the transaction; and

3> store the IE "*Message Type*" and the IE "*RRC Transaction Identifier*" of the received message in the table "Accepted transactions" in the variable TRANSACTIONS;

2> else:

2> if the received message contains a protocol error according to clause 8 causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE:

3> reject the transaction; and

3> store the IE "*Message Type*" and the IE "*RRC Transaction Identifier*" of the received message in the table "Rejected transactions" in the variable TRANSACTIONS;

1> else:

1> if the IE "*Message Type*" of the received message is present in the table "Accepted transactions" in the variable TRANSACTIONS:

2> if the IE "*RRC Transaction Identifier*" of the received message is identical to the "RRC transaction identifier" stored in any entry for the "Message Type" in the table "Accepted transactions" in the variable TRANSACTIONS:

3> ignore the transaction; and

3> continue with any ongoing processes and procedures as the message was not received; and

3> end the procedure;

2> else:

2> if the IE "*RRC Transaction Identifier*" of the received message is different from the "RRC transaction identifier" stored in all entries for the "Message Type" in the table "Accepted transactions" in the variable TRANSACTIONS:

3> if the received message does not contain a protocol error according to clause 9 and the variable PROTOCOL_ERROR_REJECT is set to FALSE:

4> accept the additional transaction; and

4> store the IE "*Message Type*" and the IE "*RRC Transaction Identifier*" of the received message in the table "Accepted transactions" in the variable TRANSACTIONS, in addition to the already existing entries;

3> else:

3> if the received message contains a protocol error according to clause 8 causing the variable PROTOCOL_ERROR_REJECT to be set to TRUE:

4> reject the transaction; and

4> store the IE "*Message Type"* and the IE "*RRC Transaction Identifier*" of the received message in the table "Rejected transactions" in the variable TRANSACTIONS.

7.19.4.9 Capability Update Requirement

If the IE "*Capability Update Requirement*" is included the MES shall:

1> if the IE "*MES GERAN A/Gb mode Radio Access Capability Update Requirement*" is set to "required":

2> if the MES supports the GERAN *A/Gb mode*:

3> include its GERAN *A/Gb mode* radio access capability in the IE "*MES GERAN A/Gb mode Radio Access Capability*" of the variable MES_CAPABILITY_REQUESTED;

1> if one or more of the 3 the IEs "*UE Radio Access FDD Capability Update Requirement*" or "*UE Radio Access 3,84 Mcps TDD Capability Update Requirement*" or "*UE Radio Access 1,28 Mcps TDD Capability Update Requirement*" is set to "required":

2> include its UE UTRAN Radio Access Capability in the IE "*UE UTRAN Radio Access Capability*" and its UE UTRAN Radio Access Capability Extension if present in the IE "*UE UTRAN Radio Access Capability Extension*" of the variable MES_CAPABILITY_REQUESTED as specified in of ETSI TS 125 331 [21];

1> if the IE "*UE CDMA2000 Radio Access Capability Update Requirement List*" is set to "required":

2> if the MES supports the CDMA2000 RAT:

3> include its UE CDMA2000 radio access capability in the IE "*UE CDMA2000 Radio Access Capability*" of the variable MES_CAPABILITY_REQUESTED.

If the IE "*Capability Update Requirement*" is not present, the MES shall:

1> assume no capabilities were required and act in accordance with the above.

7.19.4.10 Position Update Timers

If the IE "*Position Update Information*" is included the MES shall:

1> if this IE applies to position reporting in RRC Cell Shared and RRC Cell Dedicated states, then save the values in this IE and use them to control autonomous position reporting while in RRC Cell Shared or RRC Cell Dedicated state. See clause 7.13.2a;

1> if this IE applies to position reporting in RRC-GRA_PCH state and RRC Idle mode, then save the values in this IE and apply them to GPS determination and reporting procedures once it transitions to RRC-GRA_PCH state or RRC Idle mode. See ETSI TS 101 376-4-8 [7].

7.19.4.11 STARTn

If the IE "*STARTn*" is included the MES shall:

Compare the START value maintained at MES with the STARTn supplied by GERAN.

If the difference is more than 2^8, the MES shall:

1> discard the message in which STARTn was received;

1> locally release the RRC connection;

1> delete the ciphering and integrity keys that are stored in the USIM for that CN domain;

1> inform the deletion of these keys to upper layers.

Else:

1> initialize HFN component of all radio bearers with STARTn.

7.19.4.12 Ciphering Key

If the "*Ciphering Key"* field is included the MES shall:

1> Use the ciphering key set in the message for the downlink TBFs associated with the radio bearers in the "*RB Ciphering Synchronization"*;

1> Use "*RB Ciphering Synchronization"* to synchronize HFN for downlink TBFs associated with the radio bearers in the *RB Ciphering Synchronization*;

1> Use 0 instead of RBid as in the input to the ciphering algorithm for downlink TBF;

1> Use ciphering key calculated during security command procedure for all uplink TBFs.

7.19.5 Radio bearer information elements

7.19.5.1 Signalling RB information to setup list

Not supported in GMR-1 3G.

7.19.5.2 RAB Information for Setup

If the IE "*RAB Information For Setup*" is included, the procedure is used to establish radio bearers belonging to a radio access bearer, and the MES shall:

1> if several IEs "*RAB Information For Setup*" are included and the included IEs "CN domain identity" in the IE "*RAB Info*" do not all have the same value:

2> set the variable INVALID_CONFIGURATION to TRUE;

1> if the radio access bearer identified with the IE "*RAB Info*" does not exist in the variable ESTABLISHED_RABS:

2> create a new entry for the radio access bearer in the variable ESTABLISHED_RABS;

2> store the content of the IE "*RAB Info*" in the entry for the radio access bearer in the variable ESTABLISHED_RABS;

2> indicate the establishment of the radio access bearer to the upper layer entity using the IE "CN *Domain Identity*", forwarding the content of the IE "*RAB Identity*";

2> calculate the START value only once during this procedure (the same START value shall be used on all new radio bearers created for this radio access bearer) according to clause 7.18 for the CN domain as indicated in the IE "*CN Domain Identity*" in the IE "*RAB Info*" part of the IE "*RAB Information To Setup*";

2> store the calculated START value in the variable START_VALUE_TO_TRANSMIT;

1> for each radio bearer in the IE "*RB Information To Setup*":

2> if the radio bearer identified with the IE "*RB Identity*" does not exist in the variable ESTABLISHED_RABS for another radio access bearer than the one identified with the IE "*RAB Info*":

3> perform the actions specified in clause 7.19;

3> store information about the new radio bearer in the entry for the radio access bearer identified by "RAB info" in the variable ESTABLISHED_RABS;

2> if the radio bearer identified with the IE "*RB Identity*" already exists in the variable ESTABLISHED_RABS for another radio access bearer than the one identified with the IE "*RAB Info*":

3> set the variable INVALID_CONFIGURATION to TRUE.

7.19.5.3 RAB Information to Reconfigure

If the IE "*RAB Information to Reconfigure*" is included then the MES shall:

1> if the entry for the radio access bearer identified by the IE "*CN Domain Identity*" together with the IE "*RAB Identity*" in the variable ESTABLISHED_RABS already exists:

2> perform the action for the IE "*NAS Synchronization Indicator*", according to clause 7.19.5.13;

1> else:

2> set the variable INVALID_CONFIGURATION to TRUE.

7.19.5.4 RB information to setup

If the IE "*RB Information To Setup*" is included, the MES shall apply the following actions on the radio bearer identified with the value of the IE "RB identity". The MES shall:

1> use the same START value to initialize the hyper frame number components of COUNT-C variables for all the new radio bearers to setup;

1> perform the actions for the IE "*PDCP Info*", if present, according to clause 7.19.5.10, applied for the radio bearer;

1> perform the actions for the IE "*RLC Info*", according to clause 7.19.5.9, applied for the radio bearer;

1> if IE "*Physical Channel Configuration*" is included;

2> perform the actions as specified in clause 7.19.5.14 applied for the radio bearer;

1> if the IE "*Downlink RLC info*" in the IE "*RLC info*" is set to "TM RLC":

2> configure delivery of erroneous SDUs in lower layers according to indication from upper layer as in ETSI TS 101 376-4-8 [7];

1> if the IE "*Uplink RLC info*" or the IE "*Downlink RLC info*" in the IE "*RB Information to Setup*" is set to "AM RLC" or "UM RLC":

2> initialize the 20 MSB of the hyper frame number component of COUNT-C for this radio bearer with the START value in the variable START_VALUE_TO_TRANSMIT;

2> set the remaining LSB of the hyper frame number component of COUNT-C for this radio bearer to zero;

2> start incrementing the COUNT-C values;

1> if the IE "*Uplink RLC info*" and the IE "*Downlink RLC info*" in the IE "*RB Information to Setup*" is set to "TM RLC":

2> if there is at least one transparent mode radio bearer is included in the IE "*RB information to setup*":

3> if the IE "*Status*" in the variable CIPHERING_STATUS of the CN domain as indicated in the IE "*CN domain identity*" in the IE "*RAB info*" in the variable ESTABLISHED_RABS is set to "Not Started":

4> at the activation time as specified in the IE "*Ciphering activation time for DCH*" if included in the IE "*Ciphering mode info*" in the command message or, if this IE is not included, as specified in the IE "*COUNT-C activation time*" included in the response message:

5> initialize the 20 most significant bits of the hyper frame number component of COUNT-C of the transparent mode radio bearers of this CN domain with the START value in the variable START_VALUE_TO_TRANSMIT;

5> set the remaining LSB of the hyper frame number component of COUNT-C to zero;

5> do not increment the COUNT-C value of the transparent mode radio bearers for this CN domain;

3> if the IE "*Status*" in the variable CIPHERING_STATUS of the CN domain as indicated in the IE "*CN domain identity*" in the IE "*RAB info*" in the variable ESTABLISHED_RABS is set to "Started":

4> at the activation time as specified in the IE "*Activation Time*" in the RADIO BEARER SETUP message:

5> initialize the 20 most significant bits of the hyper frame number component of COUNT-C of the transparent mode RLC radio bearer to the value of the latest transmitted START for this CN domain, while not incrementing the value of the HFN component of COUNT-C at each TDMA frame number cycle; and

5> set the remaining LSB of the hyper frame number component of COUNT-C to zero;

5> start to perform ciphering on the radio bearer in lower layers while not incrementing the HFN;

4> at the activation time as specified in the IE "*Ciphering activation time for DCH*" if included in the IE "*Ciphering mode info*" in the command message or, if this IE is not included, as specified in the IE "COUNT-C activation time" included in the response message:

5> initialize the 20 most significant bits of the hyper frame number component of COUNT-C of the transparent mode radio bearers of this CN domain with the START value in the variable START_VALUE_TO_TRANSMIT;

5> set the remaining LSB of the hyper frame number component of COUNT-C to zero;

5> start incrementing the COUNT-C value of the transparent mode radio bearers for this CN domain as normal, at each TDMA frame number cycle value, i.e. the HFN component is no longer fixed in value but incremented at each TDMA frame number cycle;

1> if the IE "*Status*" in the variable CIPHERING_STATUS of the CN domain as indicated in the IE "*CN Domain Identity*" in the IE "*RAB Info*" in the variable ESTABLISHED_RABS is set to "Started":

2> start to perform ciphering on the radio bearer in lower layers, using the value of the IE "*RB Identity*" as the value of BEARER in the ciphering algorithm.

NOTE: The GERAN does not use the IE "*RB Information To Setup*" to setup radio bearers with RB identity in the range 1-4.

7.19.5.5 RB information to be affected

If the IE "RB *Information To Be Affected*" is included, the MES shall apply the actions on the radio bearer identified with the value of the IE "RB *Identity*".

7.19.5.6 RB information to reconfigure

If the IE "*RB Information To Reconfigure*" is included, the MES shall apply the following actions on the radio bearer identified with the value of the IE "*RB Identity*". The MES shall:

1> perform the actions for the IE "*PDCP Info*", if present, according to clause 7.19.5.11, applied for the radio bearer;

1> perform the actions for the IE "*RLC Info"*, according to clause 7.19.5.10, applied for the radio bearer;

1> if IE "*Physical Channel Configuration*" is included:

2> perform the actions as specified in clause 7.19.5.14 applied for the radio bearer;

1> if the IE "*PDCP SN Info*" is included:

2> perform the actions as specified in clause 7.19.5.12 applied for the radio bearer;

1> if the IE "*RB Stop/Continue*" is included; and

2> if the "*RB Identity*" has a value greater than 2; and

3> if the value of the IE "*RB Stop/Continue*" is "stop":

4> configure the RLC entity for the radio bearer to stop;

4> set the IE "*RB Started*" in the variable ESTABLISHED_RABS to "stopped" for that radio bearer;

3> if the value of the IE "*RB Stop/Continue*" is "continue":

4> configure the RLC entity for the radio bearer to continue;

4> set the IE "*RB Started*" in the variable ESTABLISHED_RABS to "started" for that radio bearer;

2> if the IE "*RB Identity*" is set to a value less than 2:

3> set the variable INVALID_CONFIGURATION to TRUE.

7.19.5.7 RB Information to Release

If the IE "*RB Information to Release*" is included, the MES shall apply the following actions on the radio bearer identified with the value of the IE "*RB Identity*". The MES shall:

1> release the PDCP and RLC entities dedicated for that radio bearer;

1> if IE "*Physical Channel Configuration*" is included:

2> perform the actions as specified in clause 7.19.5.14 applied for the radio bearer;

1> if the information about the radio bearer is stored in the variable ESTABLISHED_RABS:

2> delete the information about the radio bearer from the variable ESTABLISHED_RABS;

2> when all radio bearers belonging to the same radio access bearer have been released:

3> indicate release of the radio access bearer to upper layers providing the "CN domain identity" together with the "*RAB Identity*" stored in the variable ESTABLISHED_RABS;

3> delete all information about the radio access bearer from the variable ESTABLISHED_RABS.

7.19.5.8 RB with PDCP Information

If the IE "*RB with PDCP Information*" is included, the MES shall apply the following actions on the radio bearer identified with the value of the IE "*RB Identity*". The MES shall:

1> for the IE "*PDCP SN Info":*

2> perform the actions as specified in clause 7.19.5.12.

7.19.5.9 Void

7.19.5.9a RB Mapping Info

Not supported in GMR-1 3G.

7.19.5.10 RLC Info

If the IE "*RLC Info*" is included, the MES shall:

1> configure the transmitting and receiving RLC entities in the MES for that radio bearer accordingly.

7.19.5.11 PDCP Info

For IETF RFC 3095 [i.5]:

1> the chosen MAX_CID shall not be greater than the value "Maximum Number of ROHC Context Sessions" as indicated in the IE "*PDCP Capability*";

1> the configuration for the PACKET_SIZES_ALLOWED governs which packet sizes IETF RFC 3095 [i.5] is allowed to use.

If IE "*PDCP Info*" is included, the MES shall:

1> if the radio bearer is connected to a CS domain radio access bearer:

2> set the variable INVALID_CONFIGURATION to TRUE;

1> if the IE "*PDCP PDU Header*" is set to the value "absent":

2> if the IE "*Support for Lossless Serving RNC Relocation*" is true:

3> set the variable INVALID_CONFIGURATION to TRUE;

1> if the IE "*PDCP PDU Header*" is set to the value "present":

2> if the IE "*Support for Lossless Serving RNC Relocation*" is false:

3> if the structure "Header Compression Information" is absent:

4> set the variable INVALID_CONFIGURATION to TRUE;

1> if the structure "Header compression information" is absent:

2> not use Header compression after the successful completion of this procedure;

2> remove any stored configuration for the structure "Header compression information";

1> if the structure "Header compression information" is present:

2> if IETF RFC 2507 [i.6] is used:

3> if the MES capability "Maximum header compression context space", as specified in ETSI TS 125 306 [25], is exceeded with this configuration:

4> set the variable INVALID_CONFIGURATION to TRUE;

1> if the structure "Header compression information" is present in the reconfiguration message:

2> only use header compression algorithms present in the structure "Header compression information" in that message for the configured radio bearer;

2> use the order in which the header compression algorithms are received in the message as the order that shall be used by PDCP for mapping of PID values (see ETSI TS 101 376-4-15 [24]);

1> if the IE "Data compression support" is set to supported:

2> if "Downlink Data Compression Parameters" is present:

3> if the MES capability does not support the data compression parameters included in "Downlink Data Compression Parameters":

4> set the variable INVALID_CONFIGURATION to TRUE;

3> if the MES capability supports the data compression parameters included in "Downlink Data Compression Parameters":

4> use data compression parameters included in "Downlink Data Compression Parameters" for downlink direction of the configured radio bearer;

2> if "Downlink Data Compression Parameters" is not present:

3> use default data compression parameters for downlink direction of the configured radio bearer:

2> if "Uplink Data Compression Parameters" is present:

3> if the MES capability does not support the data compression parameters included in "Uplink Data Compression Parameters":

4> set the variable INVALID_CONFIGURATION to TRUE;

3> if the MES capability supports the data compression parameters included in "Uplink Data Compression Parameters":

4> use data compression parameters included in "Uplink Data Compression Parameters" for uplink direction of the configured radio bearer;

2> if "Uplink Data Compression Parameters" is not present:

3> use default data compression parameters for uplink direction of the configured radio bearer:

1> if the IE "Data compression support" is set to not supported:

2> not use data compression after the successful completion of this procedure;

2> remove any stored data compression configuration;

1> if the IE "Data compression support" is set to supported:

2> if "Downlink Data Compression Parameters" is present:

3> if the MES capability does not support the data compression parameters included in "Downlink Data Compression Parameters":

4> set the variable INVALID_CONFIGURATION to TRUE;

3> if the MES capability supports the data compression parameters included in "Downlink Data Compression Parameters":

4> use data compression parameters included in "Downlink Data Compression Parameters" for downlink direction of the configured radio bearer;

2> if "Downlink Data Compression Parameters" is not present:

3> use default data compression parameters for downlink direction of the configured radio bearer:

2> if "Uplink Data Compression Parameters" is present:

3> if the MES capability does not support the data compression parameters included in "Uplink Data Compression Parameters":

4> set the variable INVALID_CONFIGURATION to TRUE;

3> if the MES capability supports the data compression parameters included in "Uplink Data Compression Parameters":

4> use data compression parameters included in "Uplink Data Compression Parameters" for uplink direction of the configured radio bearer;

2> if "Uplink Data Compression Parameters" is not present:

3> use default data compression parameters for uplink direction of the configured radio bearer:

1> if the IE "Data compression support" is set to not supported:

2> not use data compression after the successful completion of this procedure;

2> remove any stored data compression configuration;

1> configure the PDCP entity for that radio bearer accordingly;

1> configure the RLC entity for that radio bearer according to the value of the IE "*Support for Lossless Serving RNC Relocation*";

1> set the PROFILES parameter, used by inband ROHC profile negotiation, for this PDCP entity for both UL and DL equal to the list of ROHC profiles received in the IE "*PDCP info*". A MES complying with the present document shall support ROHC profiles 0x0000 (ROHC uncompressed), 0x0001 (ROHC RTP), 0x0002 (ROHC UDP) and 0x0003 (ROHC ESP) (IANA ROHC profile identifier definition).

7.19.5.11a PDCP context relocation info

If the IE "PDCP context relocation info" is included, the MES shall, for each radio bearer included in this IE:

1> if the IE "*Downlink RFC3095 Context Relocation Indication*" is set to TRUE:

2> perform the actions as specified in ETSI TS 101 376-4-15 [24] for all IETF RFC 3095 [i.5] contexts associated to that radio bearer in the downlink;

1> if the IE "*Uplink RFC3095 Context Relocation Indication*" is set to TRUE:

2> perform the actions as specified in ETSI TS 101 376-4-15 [24] for all IETF RFC 3095 [i.5] contexts associated to that radio bearer in the uplink.

7.19.5.12 PDCP SN Info

If the IE "*PDCP SN Info*" is included, the MES shall:

1> transfer the sequence number to the PDCP entity for the radio bearer;

1> configure the RLC entity for the radio bearer to stop;

1> include the current PDCP receive sequence number and the radio bearer identity for the radio bearer in the variable PDCP_SN_INFO.

7.19.5.13 NAS Synchronization Indicator

If the IE "*NAS Synchronization Indicator*" is present in a message, the MES shall:

1> forward the content to upper layers along with the IE "*CN Domain Identity*" of the associated RAB stored in the variable ESTABLISHED_RABS at the CFN indicated in the IE "*Activation Time*" in order to synchronize actions in NAS and AS.

7.19.5.14 Physical Channel Configuration

If the IE "*Physical Channel Configuration*" is included, the MES shall:

1> if the IE "*PDCH Description*" is included;

2> perform the action specified in clause 7.19.6.2;

2> start timer T3190;

1> if the IE "*DCH Description*" is included:

2> perform the action specified in clause 7.19.6.1.

7.19.5.15 RLC Sequence Number

If the IE "*RLC Sequence Number*" is included:

1> if the IE "*Physical Channel Description*" in RADIO BEARER SETUP or RADIO RECONFIGURATION message specifies a change in uplink or uplink and downlink physical channel type for all radio bearers, then:

2> the MES shall remove all upper layer PDUs that are completely acknowledged by the RLC sequence number from transmission queue;

2> for those upper layer PDUs that remain unacknowledged, the MES shall assume that the entire upper layer PDU requires retransmission (even if some segments are already acknowledged). The MES shall flush segmentation queue and re-segment the upper layer PDU for transmission over new uplink physical channel;

1> else:

2> ignore "*RLC Sequence Number*" IE.

7.19.6 Physical channel parameters

7.19.6.1 DCH Description

If the MES receives the one of the messages RADIO BEARER SETUP, RADIO BEARER RECONFIGURATION, RADIO BEARER RELEASE or CELL UPDATE CONFIRM message and if IE "*DCH Description*" is present, the MES shall:

1> set the values of Power Control Parameter, Channel info, MAC slot allocation and Frequency parameters for the new/modified radio bearers:

2> in the event of MES being unable to use the provided values, MES shall set the INVALID_CONFIGURATION to TRUE, in case that MES enters the RRC-Cell_Dedicated state-MAC-Dedicated state;

else set the INVALID_CONFIGURATION to TRUE, in case that MES enters the RRC-Cell_Dedicate state-MAC-Dedicated state.

If MES receives the RADIO BEARER RECONFIGURATION and if the IE "*Handover struct*" is present, the MES shall:

1> use handover reference value used for access identification. The choice of the handover reference by the network is out of the scope of the present document and left to the manufacturers;

else:

1> set the variables INVALID_CONFIGURATION to TRUE.

If MES receives the RADIO BEARER RECONFIGURATION and if the IE "*Synchronization parameters*" is present then the MES shall:

1> use this in the new cell.

If the RADIO BEARER RECONFIGURATION message instructs the MES to use a frequency that it is not capable of, then the MES shall:

1> set the variable UNSUPPORTED_CONFIGURATION to TRUE;

1> remain on the current channel(s).

If the MES receives RADIO BEARER SETUP message or RADIO BEARER RECONFIGURATION message with "*MAC Slot Allocation"* field set to all zeros for some radio bearers, the MES shall:

1> set up the radio bearers without establishing the corresponding TBF (i.e. TBF released and no resources assigned).

7.19.6.2 PDCH parameters

The reconfiguration message can contain either the description of the uplink TBF or the downlink TBF. The information on the power to be used on the target TBF shall not affect the power used on the old channel(s). The network may assign a radio resource on one or more PDCHs to be used for the TBF. The amount of radio resource to be reserved is a network dependent choice.

The IE "*PDCH Description*" message may indicate a frequency change in progress, with a starting time and possibly alternative channel descriptions.

The RADIO BEARER SETUP or RADIO BEARER RECONFIGURATION or RADIO BEARER RELEASE message may indicate a frequency change in progress, with a starting time and possibly alternative channel descriptions. If the MES is in RRC-Cell_Dedicated state, MAC Dedicated or MAC DTM state and if MES receives the reconfiguration message and if the message contains only the description of a TBF to be used after the starting time, the MES shall:

1> wait until the starting time before using the TBF;

1> if the starting time has already elapsed, the mobile shall:

2> use the TBF immediately after the reception of the message (see ETSI TS 101 376-5-7 [10] for the timing constraints);

1> if the message contains both the description of a TBF to be used after the indicated time and of a TBF to be used before, the MES shall:

2> use the TBF as an immediate reaction to the reception of the message;

1> if the moment the MES is ready to access is before the indicated time, the MES shall:

2> use the TBF described for before the starting time.

If the MES receives RADIO BEARER SETUP message or RADIO BEARER RECONFIGURATION message with "*MAC Slot Allocation"* field set to all zeros for some radio bearers, the MES shall:

1> set up the radio bearers without establishing the corresponding TBF (i.e. TBF released and no resources assigned).

7.19.7 Transport channel information elements

Not supported in GMR-1 3G.

7.20 Key Exchange Procedure

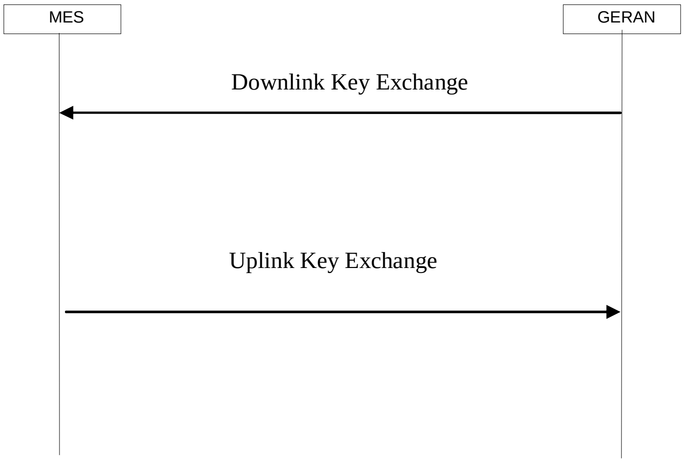

Figure 7.20.1: Key Exchange Procedure

7.20.1 General

This procedure allows the GERAN and the MES to derive a shared secret key by exchanging public keys. The derived shared secret key gets activated by security mode command procedure. The MES shall have at most one security mode command procedure pending shared secret key. A key exchange procedure will always result in a new shared security key. The new derived shared security key overwrites any other pending shared security key if one existed prior to the procedure. The shared secret key derivation method is indicated in the Downlink Key Exchange message. If the ciphering algorithm requires a 256-bit key, both the GERAN and MES apply SHA-256 on the derived shared key to obtain a 256-bit key. The SHA-256 function is defined in IETF RFC 6234 [34].

8 Handling of unknown, unforeseen, and erroneous protocol data

8.1 General

This clause specifies procedures for the handling of unknown, unforeseen, and erroneous protocol data by the receiving entity. These procedures are called "error handling procedures", but in addition to provide recovery mechanisms for error situations they define a compatibility mechanism for future extensions of the protocol.

The error handling procedures specified in this clause shall apply to all RRC messages. When there is a different handling for the same message received on different logical channels, this is specified.

For system information, the error handling procedures applied on system information messages are specified below.

When the MES receives an RRC message, it shall set the variable PROTOCOL_ERROR_REJECT to FALSE and then perform the checks in the order as defined below.

The error cases specified in the following include handling upon reception of spare values. This behaviour also applies in case the actual value of the IE results from mapping the originally sent IE value. Moreover, in certain error cases, as specified in the following, default values apply. In this case, the default values specified within the procedure specifications apply.

8.2 CSN.1 violation or encoding error

If the MES receives an RRC message on SRB 2, SRB 3 or SRB 4 for which the encoded message does not result in any valid syntax value (or "encoding error"), it shall perform the following. The MES shall:

1> set the variable PROTOCOL_ERROR_REJECT to TRUE;

1> transmit an RRC STATUS message on SRB2. The IE "*Protocol Error Information*" shall contain an IE "*Protocol Error Cause*" set to "CSN.1 violation or encoding error";

1> when RRC STATUS message has been submitted to lower layers for transmission:

2> continue with any ongoing processes and procedures as if the invalid message had not been received.

If the MES receives an RRC message sent via a radio access technology other than GERAN, for which the encoded message does not result in any valid syntax, the MES shall:

1> set the variable PROTOCOL_ERROR_REJECT to TRUE;

1> set the IE "*Protocol Error Cause*" in the variable PROTOCOL_ERROR_INFORMATION to "CSN.1 violation or encoding error";

1> perform procedure specific error handling according to clause 7.

If a set of system information message received on SRB 1 does not result in any valid syntax value, the MES shall:

1> ignore the set of system information message;

1> treat the other sets of this system information message as if those sets were not present.

8.3 Unknown or unforeseen message type

If a MES receives an RRC message on a SRB 2, SRB 3 or SRB 4 with a message type not defined for that SRB it shall:

1> set the variable PROTOCOL_ERROR_REJECT to TRUE;

1> transmit an RRC STATUS message on SRB 2. The IE "*Protocol Error Information*" shall contain an IE "*Protocol Error Cause*" set to "Message type non-existent or not implemented";

1> when the RRC STATUS message has been submitted to lower layers for transmission:

2> continue with any ongoing processes and procedures as if the invalid message had not been received.

8.4 Unsolicited received message

If the MES receives any of the following messages, on SRB 2:

- an RRC CONNECTION SETUP message addressed to the MES; or
- an RRC CONNECTION REJECT message addressed to the MES; or
- a MES CAPABILITY INFORMATION CONFIRM message; or
- a CELL UPDATE CONFIRM message addressed to the MES; or
- a GRA UPDATE CONFIRM message addressed to the MES;

and no procedure is ongoing according to clause 7 which expects the message to be received:

the MES shall:

1> ignore the received message.

8.5 Unexpected critical message extension

If the MES receives an RRC message on SRB 2, SRB 3 or SRB 4, or sent via a radio access technology other than GERAN, containing an undefined critical message extension indicated with the error label: "Critical extension", the MES shall:

1> set the variable PROTOCOL_ERROR_REJECT to TRUE;

1> set the IE "*Protocol Error Cause*" in the variable PROTOCOL_ERROR_INFORMATION to "Message extension not comprehended";

1> if the IE "*Message Type*" of the received message is not present in the table "Rejected transactions" in the variable TRANSACTIONS:

2> store the IE "*Message Type*" of the received message in the table "Rejected transactions" in the variable TRANSACTIONS; and

2> set the IE "*RRC Transaction Identifier*" to zero in that table entry;

1> perform procedure specific error handling according to clause 7.

If the MES receives an RRC message on the SRB 1, containing an undefined critical message extension, the MES shall:

1> ignore the message.

8.6 Message with error label: "Content part error"

If the MES receives an RRC message containing the error label: "Content part error", the MES shall:

1> set the variable PROTOCOL_ERROR_REJECT to TRUE;

1> set the IE "*Protocol Error Cause*" in the variable PROTOCOL_ERROR_INFORMATION to "Message content part error";

1> if the IE "*Message Type*" of the received message is not present in the table "Rejected transactions" in the variable TRANSACTIONS:

2> store the IE "*Message Type*" of the received message in the table "Rejected transactions" in the variable TRANSACTIONS; and

2> set the IE "*RRC Transaction Identifier*" to zero in that table entry;

1> ignore the data corresponding to the description following the error label;

1> perform procedure specific error handling according to clause 7.

8.7 Unknown or unforeseen information element value, mandatory information element

If the MES receives an RRC message on SRB 2, SRB 3 or SRB 4, or sent via a radio access technology other than GERAN, with a mandatory IE having a value, including choice, reserved for future extension (spare) or a value not used in the present document (e.g. a dummy value), the MES shall:

1> if a default value of the IE is defined in the procedure:

2> treat the rest of the message using the default value of the IE;

1> if no default value of the IE is defined in the procedure:

2> set the variable PROTOCOL_ERROR_REJECT to TRUE;

2> set the IE "*Protocol Error Cause*" in the variable PROTOCOL_ERROR_INFORMATION to "Information element value not comprehended";

2> perform procedure specific error handling according to clause 7.

If the MES receives a system information message on SRB 1 with a mandatory IE having a value reserved for future extension (spare) or a value not used in the present document (e.g. a dummy value), the MES shall:

1> if a default value of the IE is defined in the procedure:

2> treat the rest of the system information message using the default value of the IE;

1> if no default value of the IE is defined in the procedure:

2> ignore the system information message.

If the MES receives an RRC message on SRB 1 with a mandatory IE having a value reserved for future extension (spare) or a value not used in the present document (e.g. a dummy value), the MES shall:

1> if a default value of the IE is defined in the procedure:

2> treat the rest of the message using the default value of the IE;

1> if no default value of the IE is defined in the procedure:

2> ignore the message.

8.8 Unexpected non-critical message extension

If the MES receives an RRC message on the SRB 2, SRB 3 or SRB 4, or sent via a radio access technology other than GERAN, containing an undefined non-critical message extension, the MES shall:

1> ignore the content of the extension and the message contents after the extension, but treat the parts of the message up to the extension normally.

If the MES receives an RRC message on the SRB 1, containing an undefined non-critical message extension, the MES shall:

1> ignore the content of the extension and the message contents after the extension, but treat the parts of the message up to the extension normally.

8.9 Message with error label: "Message escape"

If the MES receives an RRC message containing the error label: "Message escape" where the number of bits of the extension is not defined in clause 9, the MES shall:

1> ignore the message.

If the MES receives an RRC message containing the error label: "Message escape" where the number of bits of the extension is defined in clause 9, the MES shall:

1> ignore the extension by skipping the number of bits indicated in clause 9;

1> treat the rest of the message as if the extension was not present.

8.10 Handling of errors in nested information elements

This clause specifies the handling of errors in mandatory IEs as well as for conditional IEs for which the specified conditions for presence are met, that are nested in another IE.

In case the MES receives an IE (Information Element 1) that includes a mandatory IE (Information Field 1-1) having a value, including reserved for future extension (spare) or a value not used in the present document (e.g. a dummy value), the MES shall:

1> consider Information Element 1 to have an undefined value; and

1> apply the corresponding generic error handling to Information Element 1.

In case there are many IE nesting levels, in all of which the IE is mandatory while no default value is defined, this treatment may need to be repeated several times. The following example illustrates the general principle.

Table 8.10.1: EXAMPLE MESSAGE information elements

< EXAMPLE MESSAGE message content > ::= { { 0 | 1 < **Information Element 1** : < Information Element 1 IE > > } < **Information Element 2** : < Information Element 2 IE > > ! < content part error : bit (*) = < no string > > };

Table 8.10.2: Information Element 1 information element

< Information Element 1 IE > ::=
{
{ 0 | 1 < **Information Field 1-1** : bit (4) > }
< **Information Element 1-2** : < Information Element 1-2 IE > >
< **Information Element 1-3** : < Information Element 1-3 IE > >
};

Table 8.10.3: Information Element 1 information element details

Information Field 1-1 (4 bit field) 4 3 2 1 0 0 0 0 1 0 0 0 1 2 : : : : 1 1 0 0 13 1 1 0 1 reserved for future extension 1 1 1 0 reserved for future extension 1 1 1 1 reserved for future extension
Information Element 1-2 Definition of Information Element 1-2.
Information Element 1-3 Definition of Information Element 1-3.

If in the above example, GERAN would include Information Element 1 and set Information Field 1-1 to value 13, the MES experiences an error in a mandatory IE. The guideline outlined in the previous then means that the MES shall not discard the entire message but instead consider "Information Element 1" to have an unknown value. Since Information Element 1 is optional, the generic error handling would be to ignore "Information Element 1".

In case the MES receives an IE (Information Element 1) that includes a list of another IE (Information Field1-1) for which one or more entries in the list have a value, including reserved for future extension (spare) or a value not used in the present document (e.g. a dummy value), the MES shall:

1> consider the list as if these entries were not included.

The rules of handling the errors for nested IE coded in ASN1 are defined in ETSI TS 125 331 [21].

8.11 Void

9 Message functional definitions and contents

9.1 General

9.1.1 Introduction

Padding is not needed for RRC messages since RRC is not a transmission protocol.

For harmonisation sake, it is assumed that GERAN RRC has to provide the same extension capability as UTRAN RRC. The management of extension for future releases is done at the message level or at Information Element (IE) level when the IE uses the { < Length of content > < Content > } format. The error handling is not defined at the IE level.

An IE can be structured or simple. A structured IE consists of other IEs and/or fields. A simple IE consists of one field. A field defines itself.

It was also agreed as working assumption that IEs in ETSI TS 101 376-4-8 [7] to be used in both modes (e.g. physical channel parameters) will not be copied from ETSI TS 101 376-4-8 [7] into the present document. Instead, in the present document, two fields will be defined: the length in octets, as bit(8), and a content placeholder with such length and whose definition points to the value part of the IE in ETSI TS 101 376-4-8 [7] should be included in the the present document. When the IE in ETSI TS 101 376-4-8 [7] is coded in CSN.1 and it already includes the length, a content placeholder with such length and whose definition points to the value part of the IE in ETSI TS 101 376-4-8 [7] should be included in the present document.

Bit fields within RRC messages shall have the highest numbered bit of the bit field in the highest numbered bit of the lowest number octet. The mapping of an 11 bit field is illustrated in figure 9.1.1.1.

bit

8	7	6	5	4	3	2	1	
								Octet N
				bit 11	bit 10	bit 9	bit 8	Octet N+1
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1		Octet N+2
								Octet N+3

Figure 9.1.1.1: Field mapping within RRC messages

9.1.2 Repetitions of Structure, IE or field

The following coding shall be used for unbounded repetition:

{ { 1 < **label** : < IE > > } ** 0 } or,
{ { 1 < **field** : bit (integer) > } ** 0 } or,
{ { 1 < repeated struct > } ** 0 }

The following coding shall be used for bounded extension for optional structures, IEs or fields:

{ 0 | 1 < **number of repetition** : bit (integer) >
< **label** : < IE > >* (n+val(number of repetition)) }

or

{ 0 | 1 < **number of repetition** : bit (integer) >
< **field**: bit (integer) >* (n+val(number of repetition)) }

or

{ 0 | 1 < **number of repetition** : bit (integer) >
< repeated struct >* (n+val(number of repetition)) }

where n ≥ 1.

The following coding shall be used for bounded extension for mandatory structures, IEs or fields:

{ < **number of repetition** : bit (integer) >
< **label** : < IE > >* (n+val(number of repetition)) }

or

{ < **number of repetition** : bit (integer) >
< **field** : bit (integer) >* (n+val(number of repetition)) }

or

{ < **number of repetition** : bit (integer) >
< repeated struct >* (n+val(number of repetition)) }

where n ≥ 1.

9.1.3 Message format and error labels

9.1.3.1 General

The general format of messages, including these error labels, is:

```
< General message format > ::=
    < MESSAGE_TYPE : < bit (8) > >
        {   < contents >
        !   < Content part error : bit (*) = < no string > > }
    !   < Unknown message type : bit (8) = < no string > ;
```

Message type shall be coded using 8 bits with separate message type for uplink and downlink, as follow:

```
< Uplink RRC messages > ::=
    < MESSAGE_TYPE : 00000000 > < MESSAGE NAME1 message content > |
    < MESSAGE_TYPE : 00000001 > < MESSAGE NAME2 message content > ;
```

The message content should be presented as follows:

9.2.x MESSAGE NAME

Explanation of the message use.

Radio Bearer: SRBx

Direction: GERAN → MES and/or MES → GERAN

Table 9.2.x.1: MESSAGE NAME information elements

```
< MESSAGE NAME message content > ::=
        {
                < IE1 : < IE1 > >
                < IE2 : < IE2 > >
        !       < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.x.2: MESSAGE NAME information element details

IE1 Definition of the IE1
IE2 Definition of the IE2

9.1.3.2 Message extension for new protocol version in RRC

9.1.3.2.0 General

Non-Critical message extension and critical message extension mechanism from UTRAN RRC (ETSI TS 125 331 [21]) are duplicated in GERAN RRC.

9.1.3.2.1 Non-Critical extension

Non-critical extensions will be achieved by adding in the optional references at the end of the message definition. The new elements introduced to specify the extensions should be grouped together in a structure with a name showing the version of the release.

Table 9.1.3.2.1.1: Coding non-critical extension in CSN.1

```
    { null | 0    bit ** = < no string >        -- Receiver compatible with earlier release
    | 1                            -- Additions in Release xx
        < MessageLabel extension for R-XX: < Extension for R-XX struct > > }
```

Table 9.1.3.2.1.2: Example message coding using non-critical extension in CSN.1

```
< MESSAGE NAME message content > ::=
    {
        < IE1 : < IE1 > >
        < IE2 : < IE2 > >
        { null | 0 bit ** = < no string >
        | 1
        < R6 IE1 : < R6 IE1 > >
        < R6 IE2 : < R6 IE2 > >
        { null | 0 bit ** = < no string >
        | 1
        < R7 IE1 : < R7 IE1 > >
        < R7 IE2 : < R7 IE2 > >} }
    !   < Content part error : bit (*) = < no string > >} ;
```

9.1.3.2.2 Critical extension

At the beginning of the message, which may require critical extensions, one bit is added for defining a choice of two branches. All Downlink messages shall enable critical extension with an escape bit at the beginning. One branch would include the message structure, the other branch would be an empty sequence with the comment "Message escape critical extensions".

Table 9.1.3.2.2.1: Coding of critical extension in CSN.1

```
0   -- critical extension escape available
    < Content >
!   < Message escape : 1 bit (*) = < no string > >
```

Table 9.1.3.2.2.2: An example message coding containing critical extension bit in CSN.1

```
< MESSAGE NAME message content > ::=
    { 0   -- critical extension escape available
        {
            < IE1 : < IE1 > >
            < IE2 : < IE2 > >        !    < content part error : bit (*) = < no string > > }
  !   < Message escape critical extension: 1 bit (*) = < no string > > };
```

When a new release is introduced, the empty sequence with "Message escape critical extensions" will be replaced by a new structure that includes a new type containing the message extensions, and the same extension mechanism recursively for further extensions.

Table 9.1.3.2.2.3: An example message coding using critical extension bit in CSN.1

```
< MESSAGE NAME message content > ::=
      { 0     -- critical extension escape available
              {
                      < IE1 : < IE1 > >
                      < IE2 : < IE2 > >
              !       < Content part error : bit (*) = < no string > > }
      | 1     -- critical extension for R-7
              { 0
                      {
                              <IE3 : < IE3 > >
                              <IE4 : < IE4 > >
                      !       < Content part error : bit (*) = < no string > >}
              !       < Message escape critical extension: 1 bit (*) = < no string > > }
  };
```

The critical extension escape should be used as scarcely as possible in order to preserve backward compatibility.

9.1.3.2.3 Extension of IEs

If an IE is expected to be extended, the addition of a fixed length extension length at the start of the IE, and <spare bits >** at the end will allow for future extension of the information element.

Table 9.1.3.2.3.1: Coding of IE extension in CSN.1

```
< IE NAME message content > ::=
  < IE Name Length : bit (n) >
  < IE1 : < IE1 > >
  < IE2 : < IE2 > >
  < spare bit >** ;
```

Table 9.1.3.2.3.2: Example description of IE extension fields

IE Name Length (n bit field) This field is the binary representation of the length in bits of the IE (excluding the length field) struct. Range 0 to 2…

9.1.3.2.4 "Message escape" error label

The "Message escape" error label is used to provide an escape for, e.g. a future modification of the message syntax. The generic description is:

```
0 < Content >
! < Message escape : 1 bit (N) = < no string > >
```

A "Message escape" error label shall be applied by the receiver of a downlink RRC message when specified in the message description. The description on the left of the error branch needs to be correctly recognized. Otherwise, the error branch "Message escape" is called. N should be an integer to enable the receiver to skip the exact number of information bits in the message in case of error. N may also be "*" when the number of bits are not defined.

9.2 Messages for Radio Resources management

9.2.1 General

9.2.1.0 Message definitions overview

Each definition given in clause 9.2 includes:

- a brief description of the message direction and use;
- a CSN.1 description of the message, information elements and fields (see CSN.1 Specification, Version 2.0 [i.8]). Definition of information elements may immediately follow the definition of the message. If the definition of an information element immediately follows the message definition, the information element name ends with "struct". Otherwise the information element name ends with "IE" and the definition of the information element is defined in clause 9.3 or in ETSI TS 101 376-4-14 [14]. The definition of a "struct" is valid only within the table in which it is defined. No references shall be made to a "struct" definition from outside of the table in which it is defined or from outside the present document. The definition of an information element is valid throughout clause 9;
- a table follows which contains a definition for each field referenced in the message definition or in an information element struct immediately following the message definition. Presence requirement for information elements or fields may be indicated in this table to define when the information elements shall be included or not, what non-presence of such information elements or fields means, and, for IEs with conditional presence requirement, the static conditions for presence and/or non-presence of the information elements or fields. However, the normative text for the presence requirement for information elements or fields is specified in the appropriate procedure clause.

9.2.1.1 References

Table 9.2.1.1.1 summarizes the messages for Radio Resources management.

NOTE: New messages will be added in table 9.2.1.1.1.

Table 9.2.1.1.1: Messages for Radio Resources management

Messages	Reference
RRC connection mobility	
CELL UPDATE	Clause 9.2.2
CELL UPDATE CONFIRM	Clause 9.2.3
GERAN MOBILITY INFORMATION	Clause 9.2.8
GERAN MOBILITY INFORMATION CONFIRM	Clause 9.2.9
GERAN MOBILITY INFORMATION FAILURE	Clause 9.2.10
GRA UPDATE	Clause 9.2.11
GRA UPDATE CONFIRM	Clause 9.2.12
Handover	
HANDOVER COMPLETE	Clause 9.2.14
HANDOVER FAILURE	Clause 9.2.15
INTER SYSTEM TO CDMA2000 HANDOVER COMMAND	Clause 9.2.18
INTER SYSTEM TO UTRAN HANDOVER COMMAND	Clause 9.2.19
LCS information	
LCS DOWNLINK INFORMATION	Clause 9.2.20
LCS UPLINK INFORMATION	Clause 9.2.21
Position Reporting	
POSITION REPORT REQUEST	Clause 9.2.20a
POSITION REPORT RESPONSE	Clause 9.2.21
POSITION UPDATE INDICATION	Clause 9.2.21b
MES Capability information	
MES CAPABILITY ENQUIRY	Clause 9.2.24
MES CAPABILITY INFORMATION	Clause 9.2.25
MES CAPABILITY INFORMATION CONFIRM	Clause 9.2.26
Measurement	
MEASUREMENT ORDER	Clause 9.2.22a
Paging	
DEDICATED PAGING REQUEST	Clause 9.2.4
Radio bearer control	
RADIO BEARER RECONFIGURATION	Clause 9.2.28
RADIO BEARER RECONFIGURATION COMPLETE	Clause 9.2.29
RADIO BEARER RECONFIGURATION FAILURE	Clause 9.2.30
RADIO BEARER RELEASE	Clause 9.2.31
RADIO BEARER RELEASE COMPLETE	Clause 9.2.32
RADIO BEARER RELEASE FAILURE	Clause 9.2.33
RADIO BEARER SETUP	Clause 9.2.34
RADIO BEARER SETUP COMPLETE	Clause 9.2.35
RADIO BEARER SETUP FAILURE	Clause 9.2.36
GERAN Iu mode DTM REQUEST	Clause 9.2.57
GERAN Iu mode DTM REJECT	Clause 9.2.58
RAB Binding	
RAB BINDING REQUEST	Clause 9.2.26a
RAB BINDING RESPONSE	Clause 9.2.26b
RRC Connection Management	
RRC CONNECTION REJECT	Clause 9.2.37
RRC CONNECTION RELEASE	Clause 9.2.38
RRC CONNECTION RELEASE COMPLETE	Clause 9.2.39
RRC CONNECTION REQUEST	Clause 9.2.40
RRC CONNECTION SETUP	Clause 9.2.41
RRC CONNECTION SETUP COMPLETE	Clause 9.2.42
Security mode control	
SECURITY MODE COMMAND	Clause 9.2.45
SECURITY MODE COMPLETE	Clause 9.2.46
SECURITY MODE FAILURE	Clause 9.2.47
Signalling flow	
SIGNALLING CONNECTION RELEASE	Clause 9.2.48
SIGNALLING CONNECTION RELEASE INDICATION	Clause 9.2.49
System information	
SYSTEM INFORMATION	ETSI TS 101 376-4-8 [7]

Messages	Reference
Delivery of NAS	
DOWNLINK DIRECT TRANSFER	Clause 9.2.5
INITIAL DIRECT TRANSFER	Clause 9.2.17
UPLINK DIRECT TRANSFER	Clause 9.2.56
Miscellaneous	
RRC STATUS	Clause 9.2.43
RRC FAILURE INFO	Clause 9.2.44
INTER RAT or MODE HANDOVER INFO WITH MES CAPABILITIES	Clause 11.1.5
SBSS RELOCATION INFO	Clause 11.1.5

9.2.1.2 Downlink RRC messages

The different types of messages are distinguished by the MESSAGE_TYPE field.

```
< Downlink RRC messages > ::=
    {
    < MESSAGE_TYPE : 00000000 > < CELL UPDATE CONFIRM message content > |
    < MESSAGE_TYPE : 00000001 > < DEDICATED PAGING REQUEST message content > |
    < MESSAGE_TYPE : 00000010 > < DOWNLINK DIRECT TRANSFER message content > |
    < MESSAGE_TYPE : 00000011 > < RAB BINDING RESPONSE message content > |
    < MESSAGE_TYPE : 00000100 > < GERAN MOBILITY INFORMATION message content > |
    < MESSAGE_TYPE : 00000101 > < GRA UPDATE CONFIRM message content > |
    < MESSAGE_TYPE : 00000111 > < HANDOVER FROM GERAN Iu COMMAND message content > |
    < MESSAGE_TYPE : 00001000 > < INTERSYSTEM HANDOVER TO CDMA2000 message content > |
    < MESSAGE_TYPE : 00001001 > < INTERSYSTEM HANDOVER TO UTRAN message content > |
    < MESSAGE_TYPE : 00001010 > < LCS DOWNLINK INFORMATION message content > |
    < MESSAGE_TYPE : 00001011 > < MEASUREMENT INFORMATION message content > |
    < MESSAGE_TYPE : 00001100 > < MES CAPABILITY ENQUIRY message content > |
    < MESSAGE_TYPE : 00001101 > < MES CAPABILITY INFORMATION CONFIRM message content > |
    < MESSAGE_TYPE : 00001110 > < RADIO BEARER RECONFIGURATION message content > |
    < MESSAGE_TYPE : 00001111 > < RADIO BEARER SETUP message content > |
    < MESSAGE_TYPE : 00010000 > < RADIO BEARER RELEASE message content > |
    < MESSAGE_TYPE : 00010001 > < RRC CONNECTION REJECT message content > |
    < MESSAGE_TYPE : 00010010 > < RRC CONNECTION RELEASE message content > |
    < MESSAGE_TYPE : 00010011 > < RRC CONNECTION SETUP message content > |
    < MESSAGE_TYPE : 00010100 > < RRC STATUS message content > |
    < MESSAGE_TYPE : 00010101 > < SECURITY MODE COMMAND message content > |
    < MESSAGE_TYPE : 00010110 > < SIGNALLING CONNECTION RELEASE message content > |
    < MESSAGE_TYPE : 00010111 > < GERAN Iu mode DTM REJECT message content > |
    < MESSAGE_TYPE : 00011000 > < Downlink Key Exchange message content > |
    < MESSAGE_TYPE : 00011100 > < RAB UPPER LAYER RECONFIGURATION message content >
    < MESSAGE_TYPE : 00011101 > < POSITION REPORT REQUEST message content >
    < spare bit >** }
    ! < Unknown message type : { bit (8) = < no string > } < Default downlink message content > > ;
```

9.2.1.3 Uplink RRC messages

9.2.1.3.0 General

The different types of messages are distinguished by the MESSAGE_TYPE field.

```
< Uplink RRC messages > ::=
    {
    < MESSAGE_TYPE : 00000010 > < GERAN MOBILITY INFORMATION CONFIRM message content > |
    < MESSAGE_TYPE : 00000011 > < GERAN MOBILITY INFORMATION FAILURE message content > |
    < MESSAGE_TYPE : 00000100 > < GRA UPDATE message content > |
    < MESSAGE_TYPE : 00000101 > < Uplink Key Exchange message content > |
    < MESSAGE_TYPE : 00000110 > < HANDOVER COMPLETE message content > |
    < MESSAGE_TYPE : 00000111 > < HANDOVER FAILURE message content > |
    < MESSAGE_TYPE : 00001000 > < INITIAL DIRECT TRANSFER message content > |
    < MESSAGE_TYPE : 00001001 > < LCS UPLINK INFORMATION message content > |
    < MESSAGE_TYPE : 00001010 > < MEASUREMENT REPORT message content > |
    < MESSAGE_TYPE : 00001011 > < MES CAPABILITY INFORMATION message content > |
    < MESSAGE_TYPE : 00001100 > < RADIO BEARER RECONFIGURATION COMPLETE message content > |
    < MESSAGE_TYPE : 00001101 > < RADIO BEARER RECONFIGURATION FAILURE message content > |
    < MESSAGE_TYPE : 00001110 > < RADIO BEARER RELEASE COMPLETE message content > |
    < MESSAGE_TYPE : 00001111 > < RADIO BEARER RELEASE FAILURE message content > |
    < MESSAGE_TYPE : 00010000 > < RADIO BEARER SETUP COMPLETE message content > |
    < MESSAGE_TYPE : 00010001 > < RADIO BEARER SETUP FAILURE message content > |
    < MESSAGE_TYPE : 00010010 > < RRC CONNECTION RELEASE COMPLETE message content > |
    < MESSAGE_TYPE : 00010100 > < RRC CONNECTION SETUP COMPLETE message content > |
    < MESSAGE_TYPE : 00010101 > < RRC STATUS message content > |
    < MESSAGE_TYPE : 00010110 > < SECURITY MODE COMPLETE message content > |
    < MESSAGE_TYPE : 00010111 > < SECURITY MODE FAILURE message content > |
    < MESSAGE_TYPE : 00011000 > < SIGNALLING CONNECTION RELEASE INDICATION message content > |
    < MESSAGE_TYPE : 00011001 > < UPLINK DIRECT TRANSFER message content > |
    < MESSAGE_TYPE : 00011010 > < RAB BINDING REQUEST message content > |
    < MESSAGE_TYPE : 00011011 > < GERAN Iu mode DTM REQUEST message content > |
    < MESSAGE_TYPE : 00011100 > < RAB UPPER LAYER RECONFIGURATION COMPLETE message content> |
    < MESSAGE_TYPE : 00011101 > < POSITION REPORT RESPONSE message content > |
    < MESSAGE_TYPE : 00011110 > < CHANNEL CHANGE PREPARATION COMPLETE message content > |
    < MESSAGE_TYPE : 00011111 > < POSITION UPDATE INDICATION message content >
    < spare bits > ** } ;
```

The "Default downlink message contents" consists in an unspecified bit string that expands to the end of the message.

```
< Default downlink message content > ::=
    bit (*) = < no string > ;
```

9.2.1.3.1 Message definitions

Not used in of GMR-1 3G.

9.2.2 CELL UPDATE

In GMR-1 3G, Cell Update procedure shall be requested in CHANNEL REQUEST TYPE3 or PACKET CHANNEL REQUEST TYPE2 message. See ETSI TS 101 376-4-8 [7] and ETSI TS 101 376-4-12 [13] respectively.

9.2.3 CELL UPDATE CONFIRM

This message confirms the cell update procedure and can be used to reallocate new G-RNTI information for the MES valid in the new cell.

Radio Bearer: SRB2

Direction: GERAN → MES

NOTE: In GMR-1 3G, the CELL UPDATE CONFIRM message may also be sent in an IMMEDIATE ASSIGNMENT TYPE 5 message on the AGCH (see ETSI TS 101 376-4-8 [7]).

Table 9.2.3.1: CELL UPDATE CONFIRM information elements

```
< CELL UPDATE CONFIRM message content > ::=
    { 0 -- Critical extension escape available
        {
        -- MES Information Elements
            < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
            { 0 | 1 < Activation Time : < Activation Time IE > > } - When Activation Time field is not present, it means
activation time of NOW
            < RRC State Indicator : < RRC State Indicator IE > >
            < Request Reference: <Request Reference IE> >
            { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
            { 0 | 1  < Integrity Protection Mode Info : < Integrity Protection Mode Info IE > > }
            { 0 | 1  < Ciphering Mode Info : < Ciphering Mode Info IE > > }
            { 0 | 1  < New G-RNTI : < G-RNTI IE > > }
            < RLC re-establishment indicator SRB2-4 : bit(1) >
            < RLC re-establishment indicator RB5+ : bit(1) >
        -- CN Information Elements
            { 0 | 1  < CN Information Info : < CN Information Info IE > > }
        -- GERAN Information Elements
            { 0 | 1  < GRA Identity : < GRA Identity IE > > }
        -- RB Information Elements
            { 0 | 1  < RB Information to Release list : bit (5) >
                    {    < RB Information to Release : < RB Information to Release IE > >
                    }*(1 + val(RB Information to Release list) ) }
            { 0 | 1  < RB Information to Reconfigure list : bit (5) >
                    {    < RB Information to Reconfigure : < RB Information to Reconfigure IE > >
                            { 0 | 1 < RB Priority : bit (2) > }
                            { 0 | 1 < RRBid identity : RRB Identity IE >>}
                            { 0 | 1 < Physical Information : < Physical Channel Configuration IE > >}
                            0 | 1 < NETWORK_RESPONSE_TIMES : < Network Response Times struct >> }
                    }*(1 + val(RB Information to Reconfigure list) )
        -- RB information elements including SRBs
            { 0 | 1  < RB Information for Setup List : bit (5) >
                      {        < RB identity : <RB Identity IE >>
                               {  0 | 1 < RRBid identity : RRB Identity IE >>}
                               { 0 | 1 < RB Priority : bit (2) > }
                               < Physical Information : < Physical Channel Configuration IE > >
                      }*(1+val(RB Information for Setup List))
             }

            { 0 | 1  < Downlink Counter Synchronization Info : < Downlink Counter Synchronization info struct > > }
            {0 | 1  < STARTn : < Start IE > >}
            {0 | 1 < RB Ciphering Synchronization: < RB Ciphering Synchronization IE>>}**0 –  used with UE
Software Version Indicator 0x1 or higher
            <Security Procedure Pending: bit (1) >
            { 0 | 1 { < Release  Cause: bit (3) >}*(1+val(RB Information to Release List))}
        !    < Content part error : bit (*) = < no string > > }
    !    < Message escape critical extensions : 1 bit (*) = < no string > >} ;
```

```
< Downlink Counter Synchronization Info struct> ::=
    < RB with PDCP Information List : bit (5) >
    {    { 0 | 1  < RB with PDCP Information : < RB with PDCP Information IE > > }
        { 0 | 1  < PDCP context relocation info : < PDCP context relocation info IE > > } } * (1 + val(RB with PDCP
Information List) );
```

```
< Network Response Times struct > ::=
    -- GMR-1 3G: Reserved for Future use.
} ;
```

Table 9.2.3.2: CELL UPDATE CONFIRM information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Activation Time This IE is defined in clause 9.3.1.
RRC State Indicator This IE is defined in clause 9.3.97.
Request Reference This IE is defined in clause 9.3.98a. The contents of IE shall be set to 0 in the present document. The MES shall ignore this IE.
Integrity Check Info This IE is defined in clause 9.3.36. The integrity Check Info IE is included when integrity protection is applied.
Integrity Protection Mode Info This IE is defined in clause 9.3.39. The GERAN does not include this IE unless it is performing an SBSS relocation.
Ciphering Mode Info This IE is defined in clause 9.3.14. The GERAN does not include this IE unless it is performing an SBSS relocation and a change in ciphering algorithm.
New G-RNTI This IE assigns a new G-RNTI to the MES. This IE is coded as the G-RNTI IE defined in clause 9.3.32.
CN Information Info This IE is defined in clause 9.3.17.
RLC Re-establishment indicator SRB2-4 (1 bit field) This field indicates to the MES to re-establish the RLC instances for SRB2-4 (see ETSI TS 101 376-4-14 [14]). bit 1 0 Do not re-establish the RLC instances for SRB2-4 1 Re-establish the RLC instances for SRB2-4 It shall not be set to 1 if struct "Downlink counter synchronization info" is included.
RLC Re-establishment indicator RB5+ (1 bit field) This field indicates to the MES to re-establish the RLC instances for RB5+ (see ETSI TS 101 376-4-14 [14]). bit 1 0 Do not re-establish the RLC instances for RB5+ 1 Re-establish the RLC instances for RB5+ It shall not be set to 1 if struct "Downlink counter synchronization info" is included.
GRA Identity This field is defined in clause 9.3.30.
RB Priority (2 bit field) This field identifies the Radio Bearer priority as determined by the network. bit 2 1 0 0 Priority 0 (Highest) 0 1 Priority 1 1 0 Priority 2 1 1 Priority 3 (Lowest) This field may also be present when the uplink channel is PDCH. The value of this field shall be used if the RB is moved to DCH by a procedure which did not explicitly provide a value for RB priority.
Physical Information The *Physical Channel Configuration* IE is defined in clause 9.3.62.
RB Information to Release list (5 bit field) This field is used to repeat information on each RB to be released, where 0 enables one RB to be described. Range: 0 to maxRB-1.
RB Information to Release This IE is defined in clause 9.3.83.
RB Information to Reconfigure list (5 bit field) This field is used to repeat information on each RB to be reconfigured, where 0 enables one RB to be described. Range: 0 to maxRB-1.
RB Information to Reconfigure This IE is defined in clause 9.3.82.
RB Information for Setup List (5 bit field) This field is the binary representation of the number of RB to setup. Range: 0 to maxRB-1.
RB Identity This field identifies the Radio Bearer Identity. This IE is defined in clause 9.3.80.

RRB Identity This field is used to identify the Reduced Radio Bearer identity. This IE is defined in clause 9.3.80a. The RRB identity/RB identity association holds only on the MAC slots assigned in the message. This field may also be present when the uplink channel is PDCH. The value of this field shall be used if the RB is moved to DCH by a procedure which did not explicitly provide a value for RRB Identity.
RB with PDCP Information list (5 bit field) This field is used to repeat information on each RB with PDCP Information, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1.
RB with PDCP Information This IE is defined in clause 9.3.86.
PDCP context relocation info This IE is defined in clause 9.3.116.
Downlink Counter Synchronization Info struct This structure contains information about PDCP synchronization.
Network Response Times struct This structure contains information about network response times. This structure is reserved for future use.
STARTn This IE is defined in clause 9.3.102. If this IE is included, then the message shall be integrity protected using STARTn (for initializing HFN component of the COUNT-I).
RB Ciphering Synchronization This IE is defined in clause 9.3.84b.
Security Procedure Pending 0 Operate normally 1 Suspend all uplink data transmissions until a subsequent security mode procedure completes. The only uplink data allowed from MES is SRB2 traffic to send Uplink Key Exchange message or to send security mode command complete message. All MAC control messages are also allowed to be transmitted. When security mode command procedure ends, MES resumes normal operation and uplink data transmission.
Release Cause (3 bit field) This field indicates the reason for the RB Release Bit 3 2 1 0 0 0 Not specified 0 0 1 Lack of Resources 0 1 0 Core Network Initiated Release 0 1 1 Radio Bearer Inactivity All other values are reserved

9.2.4 DEDICATED PAGING REQUEST

Not supported in GMR-1 3G.

9.2.5 DOWNLINK DIRECT TRANSFER

This message is sent by GERAN to transfer higher layer messages.

Radio Bearer: SRB2

Direction: GERAN → MS

Table 9.2.5.1: DOWNLINK DIRECT TRANSFER information elements

< DOWNLINK DIRECT TRANSFER message content > ::= { 0 -- *critical extension escape available* { -- *MES Information Elements* < **RRC Transaction Identifier :** < RRC Transaction Identifier IE > > { 0 | 1 < **Integrity Check Info** : < Integrity Check Info IE > > } -- *CN Information Elements* < **CN Domain Identity** : < CN Domain Identity IE > > < **NAS Message** : < NAS Message IE > > ! < Content part error : bit (*) = < no string > > } ! < Message escape critical extensions : 1 bit (*) = < no string > >} ;

Table 9.2.5.2: DOWNLINK DIRECT TRANSFER information element details

RRC Transaction Identifier The RRC Transaction Identifier IE is defined in clause 9.3.98.
Integrity Check Info The *Integrity Check Info* IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
CN Domain Identity The *CN Domain Identity* IE is defined in clause 9.3.15.
NAS Message The *NAS Message* IE is defined in clause 9.3.54.

9.2.6 EXTENDED MEASUREMENT ORDER

Not supported in GMR-1 3G.

9.2.7 EXTENDED MEASUREMENT REPORT

Not supported in GMR-1 3G.

9.2.7a ENHANCED MEASUREMENT REPORT

Not supported in GMR-1 3G.

9.2.8 GERAN MOBILITY INFORMATION

This message is used by GERAN to allocate a new G-RNTI and to convey other GERAN mobility related information to a MES.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.8.1: GERAN MOBILITY INFORMATION information elements

```
< GERAN MOBILITY INFORMATION message content > ::=
   { 0      -- Critical extension escape available
      {
      -- MES Information Elements
         < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
         < MES Timers and Constants in Connected Mode : < MES Timers and Constants in Connected Mode IE
> >
         { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
         { 0 | 1  < Integrity protection mode info : < Integrity Protection Mode Info IE > > }
         { 0 | 1  < Ciphering Mode Info : < Ciphering Mode Info IE > > }
         { 0 | 1  < New G-RNTI : < G-RNTI IE > > }
      -- CN Information Elements
         { 0 | 1  < CN Information Info : < CN Information Info IE > > }
      -- GERAN Information Elements
         { 0 | 1  < GRA Identity : < GRA Identity IE > > }
         { 0 | 1  < Downlink Counter Synchronization Info : < Downlink Counter Synchronization Info struct > > }
         { 0 | 1 <BCCH ARFCN : bit(11) > } –  used with UE Software Version Indicator 0x1 or higher
         { 0 | 1 < MES Additional Timers and Constants in Connected Mode : < MES Additional Timers and
Constants in Connected Mode IE > } –  used with UE Software Version Indicator 0x1 or higher

      !    < Content part error : bit (*) = < no string > > }
   !    < Message escape critical extensions : 1 bit (*) = < no string > >} ;
< Downlink Counter Synchronization Info struct> ::=
   < RB with PDCP Information List : bit (5) >
   {    { 0 | 1  < RB with PDCP Information : < RB with PDCP Information IE > > }
      { 0 | 1   < PDCP context relocation info : < PDCP context relocation info IE > > } } * (1 + val(RB with PDCP
Information List) );
```

Table 9.2.8.2: GERAN MOBILITY INFORMATION information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
MES Timers and Constants in connected mode This IE is defined in clause 9.3.51.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info IE* is included when integrity protection is applied.
Integrity Protection Mode Info This IE is defined in clause 9.3.39. The GERAN does not include this IE unless it is performing an SBSS relocation.
Ciphering mode info This IE is defined in clause 9.3.14. The GERAN does not include this IE unless it is performing an SBSS relocation and a change in ciphering algorithm.
New G-RNTI This IE assigns a new G-RNTI to the MES. The *G-RNTI* IE is defined in clause 9.3.32.
CN Information Info This IE is defined in clause 9.3.17.
GRA Identity This IE is defined in clause 9.3.30.
Downlink Counter Synchronization info This structure contains information about PDCP synchronization.
RB with PDCP Information List (5 bit field) This field is used to repeat information on each RB with PDCP Information, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1. Other values are reserved.
RB with PDCP Information This IE is defined in clause 9.3.86.
PDCP context relocation info This IE is defined in clause 9.3.116.
BCCH ARFCN This IE contains the ARFCN of the BCCH. ARFCN is defined in ETSI TS 101 376-5-5 [11].
MES Additional Timers and Constants in connected mode This IE is defined in clause 9.3.51a.

9.2.9 GERAN MOBILITY INFORMATION CONFIRM

This message is used to confirm the new GERAN mobility information for the MES.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.9.1: GERAN MOBILITY INFORMATION CONFIRM information elements

```
< GERAN MOBILITY INFORMATION CONFIRM message content > ::=
    {
    -- MES Information Elements
        < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
        { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
        { 0 | 1  < Uplink Integrity Protection Activation Info : < Integrity Protection Activation Info IE > > }
    -- RB Information Elements
        { 0 | 1  < COUNT-C Activation Time : < Activation Time IE > > }
        { 0 | 1  < Radio Bearer Uplink Ciphering Activation Time Info : < RB Activation Time Info IE> >}
        { 0 | 1  < Uplink Counter Synchronization Info : < Uplink Counter Synchronization Info struct > > }
        !    < Content part error : bit (*) = < no string > > };

< Uplink Counter Synchronization Info struct > ::=
        {
        < START List: bit (2) >
        {    < START : < START IE > >
             < CN Domain Identity : < CN Domain Identity IE > > } *(1+val(START list))
        { 0 | 1  < RB with PDCP Information list : bit (5) >
                 < RB with PDCP Information : < RB with PDCP Information IE > > *(1 + val(RB with PDCP Information
list) )}
}
```

Table 9.2.9.2: GERAN MOBILITY INFORMATION CONFIRM information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included when integrity protection is applied.
Uplink Integrity Protection Activation Info The *Integrity Protection Activation Info* IE is defined in clause 9.3.37.
COUNT-C Activation Time The IE is used for radio bearers mapped on RLC-TM when the MES is moving to RRC-Cell_Dedicated state. The Activation Time IE is defined in clause 9.3.1.
Radio Bearer Activation Time Info The RB Activation Time Info IE is defined in clause 9.3.77.
Uplink Counter Synchronization info This structure contains information about PDCP synchronization.
START List (2 bit field) This field is the binary representation of the number of CN domain START struct. Range: 0 to maxCNdomains-1.
START This field is defined in clause 9.3.102.
CN Domain Identity The *CN Domain Identity* IE identifies the type of core network domain. This IE is defined in clause 9.3.15.
RB with PDCP Information List (5 bit field) This field is used to repeat information on each RB with PDCP Information, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1.
RB with PDCP Information This IE is defined in clause 9.3.86.

9.2.10 GERAN MOBILITY INFORMATION FAILURE

This message is sent to indicate a failure to act on a received GERAN MOBILITY INFORMATION message.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.10.1: GERAN MOBILITY INFORMATION FAILURE information elements

< GERAN MOBILITY INFORMATION FAILURE message content > ::= { < **RRC Transaction Identifier** : < RRC Transaction Identifier IE > > < **Failure Cause** : < Failure Cause and Error Information IE > > { 0 | 1 < **Integrity Check Info** : < Integrity Check Info IE > > } ! < Content part error : bit (*) = < no string > > };

Table 9.2.10.2: GERAN MOBILITY INFORMATION FAILURE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Failure Cause and Error Information The *Failure Cause And Error Information* IE is defined in clause 9.3.25.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included when integrity protection is applied.

9.2.11 GRA UPDATE

In GMR-1 3G, GRA Update procedure shall be requested in CHANNEL REQUEST TYPE 3 or PACKET CHANNEL REQUEST TYPE 2 message. See ETSI TS 101 376-4-8 [7] and ETSI TS 101 376-4-12 [13] respectively.

9.2.12 GRA UPDATE CONFIRM

This message confirms the GRA update procedure and can be used to reallocate new G-RNTI information for the MES valid after the GRA update.

Radio Bearer: SRB2

Direction: GERAN → MES

NOTE: In GMR-1 3G, the GRA UPDATE CONFIRM message may also be sent in an IMMEDIATE ASSIGNMENT TYPE 5 message on the AGCH (see ETSI TS 101 376-4-8 [7]).

Table 9.2.12.1: GRA UPDATE CONFIRM information elements

```
< GRA UPDATE CONFIRM message content > ::=
    { 0      -- Critical extension escape available
        {
        -- MES Information Elements
            < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
            { 0 | 1  < Integrity protection mode info : < Integrity Protection Mode Info IE > > }
            { 0 | 1  < Ciphering Mode Info : < Ciphering Mode Info IE > > }
            { 0 | 1  < New G-RNTI : < G-RNTI IE > > }
            { 0 | 1   < RRC State Indicator : < RRC State Indicator IE > > }
        -- CN Information Elements
            { 0 | 1  < CN Information Info : < CN Information Info IE > > }
        -- GERAN Information Elements
            { 0 | 1  < GRA Identity : < GRA Identity IE > > }
            { 0 | 1  < Downlink Counter Synchronization Info : < Downlink Counter Synchronization Info struct > > }
            { 0 | 1  < STARTn : < Start IE > >  < Integrity Check Info : < Integrity Check Info IE > >}
           <Security Procedure Pending: bit (1) >

        !    < Content part error : bit (*) = < no string > > }
    !    < Message escape critical extensions : 1 bit (*) = < no string > >} ;
< Downlink Counter Synchronization Info struct> ::=
    < RB with PDCP Information List : bit (5) >
    {    { 0 | 1  < RB with PDCP Information : < RB with PDCP Information IE > > }
        { 0 | 1   < PDCP context relocation info : < PDCP context relocation info IE > > } } * (1 + val(RB with PDCP
Information List) );
         }
```

Table 9.2.12.2: GRA UPDATE CONFIRM information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Protection Mode Info This IE is defined in clause 9.3.39. The GERAN does not include this IE unless it is performing an SBSS relocation.
Ciphering mode info This IE is defined in clause 9.3.14. The GERAN does not include this IE unless it is performing an SBSS relocation and a change in ciphering algorithm.
New G-RNTI This IE assigns a new G-RNTI to the MES. The *G-RNTI* IE is defined in clause 9.3.32.
RRC State Indicator This IE is defined in clause 9.3.97.
CN Information Info This IE is defined in clause 9.3.17.
GRA Identity This IE is defined in clause 9.3.30.
Downlink Counter Synchronization info This structure contains information about PDCP synchronization.
RB with PDCP Information List (5 bit field) This field is used to repeat information on each RB with PDCP Information, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1. Other values are reserved.
RB with PDCP Information This IE is defined in clause 9.3.86.
PDCP context relocation info This IE is defined in clause 9.3.116
STARTn This IE is defined in clause 9.3.102. If this IE is included, then the message shall be integrity protected using STARTn (for initializing HFN component of the COUNT-I).
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included when integrity protection is applied. When this IE is included, the message shall be integrity protected using STARTn.
Security Procedure Pending 0 Operate normally 1 Suspend all uplink data transmissions until a subsequent security mode procedure completes. The only uplink data allowed from MES is SRB2 traffic to send Uplink Key Exchange message or to send security mode complete message. All MAC control messages are also allowed to be transmitted. When security mode command procedure ends, MES resumes normal operation and uplink data transmission.

9.2.13 Void

9.2.14 HANDOVER COMPLETE

This message is sent from the MES when a physical channel reconfiguration has been done.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.14.1: HANDOVER COMPLETE information elements

```
< HANDOVER COMPLETE message content > ::=
    {
    -- MES information elements
        < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
        < RRC Cause : < RRC Cause IE > >
        { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
        { 0 | 1  < Uplink Integrity Protection Activation Info : < Integrity Protection Activation Info IE > > }
        { 0 | 1  < Mobile Observed Time Difference : < Mobile Time Difference IE> > }
    -- RB information elements
        { 0 | 1  < COUNT-C Activation Time : < Activation Time IE > > }
        { 0 | 1  < Radio Bearer Uplink Ciphering Activation Time Info : < RB Activation Time Info IE> > }
        { 0 | 1  < Uplink Counter Synchronization Info : < Uplink Counter Synchronization Info struct > > }
    !   < Content part error : bit (*) = < no string > > } ;

< Uplink Counter Synchronization Info struct > ::=
    {   < START List : bit (2) >
        {   < CN Domain Identity : < CN Domain Identity IE > >
            < START : < START IE > > } * (1+val(START List))
        { 0 | 1  < RB with PDCP Information List : bit (5) >
                < RB with PDCP Information : < RB with PDCP Information IE > > *(1+val(RB with PDCP Information
List)) }
    };
```

Table 9.2.14.2: HANDOVER COMPLETE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE shall be set to the used signalling radio bearer identity when the encoded RRC message is used as the MESSAGE parameter in the integrity protection algorithm. This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included when integrity protection is applied.
Uplink Integrity Protection Activation Info This IE contains the time, in terms of RRC sequence numbers, when a new integrity protection configuration shall be activated for the signalling radio bearers. The Integrity protection activation info IE is defined in clause 9.3.36.
COUNT-C Activation Time The *Activation Time* IE is defined in clause 9.3.1
Radio Bearer Uplink Ciphering Activation Time info The *RB activation time info* IE is defined in clause 9.3.77
Uplink Counter Synchronization Info struct This structure enable to synchronize the Uplink security counters.
START List (2 bit field) This field is used to repeat information on each RB to be affected, where 0 enables one RB to be described. Range: 0 to maxCNdomains-1.
CN Domain Identity This IE is defined in clause 9.3.15.
START This IE is defined in clause 9.3.102. START value to be used in this CN domain.
RB with PDCP Information List (5 bit field) This field is used to repeat information on each RB with PDCP Information, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1.
RRC Cause This IE is defined in clause 9.3.94.
RB with PDCP Information This IE is defined in clause 9.3.86.

9.2.15 HANDOVER FAILURE

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.15.1: HANDOVER FAILURE information elements

```
< HANDOVER FAILURE message content > ::=
  {
    < Failure Cause : < Failure Cause and Error Information IE > >
    < RRC Cause : < RRC Cause IE > >
    { 0 | 1  < RRC Transaction Identifier : < RRC Transaction Identifier IE > > }
    { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
  !  < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.15.2: HANDOVER FAILURE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE shall be set to the used signalling radio bearer identity when the encoded RRC message is used as the MESSAGE parameter in the integrity protection algorithm. This IE is defined in clause 9.3.36.
RRC Cause The *RRC Cause* IE is defined in clause 9.3.94.
Failure Cause The *Failure Cause and Error Information* IE is defined in clause 9.3.25.

9.2.16 HANDOVER FROM GERAN Iu COMMAND

Not used in GMR-1 3G.

9.2.17 INITIAL DIRECT TRANSFER

This message is used to initiate a signalling connection based on indication from the upper layers, and to transfer a NAS message.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.17.1: INITIAL DIRECT TRANSFER information elements

```
< INITIAL DIRECT TRANSFER message content > ::=
  {
    < CN Domain Identity : < CN Domain Identity IE > >
    < Intra Domain NAS Node Selector : < Intra Domain NAS Node Selector IE > >
    < NAS Message : < NAS Message IE > >
    { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
    < Start : < Start IE > >
  !  < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.17.2: INITIAL DIRECT TRANSFER information element details

CN Domain Identity The CN Domain Identity IE is defined in clause 9.3.15.
Intra Domain NAS Node Selector The Intra Domain NAS Node Selector IE is defined in clause 9.3.41.
NAS Message The NAS Message IE is defined in clause 9.3.54.
Integrity Check Info The Integrity Check Info IE is defined in clause 9.3.36. The Integrity Check Info IE is included if integrity protection is applied.
Start This IE is defined in clause 9.3.102.

9.2.18 INTER SYSTEM TO CDMA2000 HANDOVER COMMAND

Not used in GMR-1 3G.

9.2.19 INTER SYSTEM TO UTRAN HANDOVER COMMAND

Not used in GMR-1 3G.

9.2.20 LCS DOWNLINK INFORMATION

This message is used by the GERAN to convey embedded LCS RRLP PDUs between the SMLC and the MES.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.20.1: LCS DOWNLINK INFORMATION information elements

```
< LCS DOWNLINK INFORMATION message content > ::=
  { 0 -- critical extension escape available
      {
          < RRC Transaction Identifier :< RRC Transaction Identifier IE > >
          { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
          < RRLP PDU Length : bit (8) >
          < RRLP PDU : octet(val(RRLP PDU Length)) >
      !   < Content part error : bit (*) = < no string > > }
  !   < Message escape critical extension : 1 bit (*) = < no string > >} ;
```

Table 9.2.20.2: LCS DOWNLINK INFORMATION information element details

RRC Transaction Identifier This field is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
RRLP PDU Length (8 bit field) This field is the binary representation of the length in octets of the following RRLP PDU field. Range: 0 to 241. All other values are reserved.
RRLP PDU (variable length octet string) This field contains an RRLP PDU as defined in ETSI TS 144 031 [29].

9.2.20a POSITION REPORT REQUEST

This message is used by the GERAN to convey request position from MES.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.20a.1: POSITION REPORT REQUEST information elements

< POSITION REPORT REQUEST message content > ::= { 0 -- *critical extension escape available* { < **RRC Transaction Identifier** :< RRC Transaction Identifier IE > > { 0 | 1 < **Integrity Check Info** : < Integrity Check Info IE > > } ! < Content part error : bit (*) = < no string > > } ! < Message escape critical extension : 1 bit (*) = < no string > >} ;

Table 9.2.20a.2: POSITION REPORT REQUEST information element details

RRC Transaction Identifier This field is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.

9.2.21 LCS UPLINK INFORMATION

This message is used by the MES to convey embedded LCS RRLP PDUs between the MES and the GERAN (SMLC).

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.21.1: LCS UPLINK INFORMATION information elements

< LCS UPLINK INFORMATION message content > ::= { < **RRC Transaction Identifier** : < RRC Transaction Identifier IE > > { 0 | 1 < **Integrity Check Info** : < Integrity Check Info IE > > } < **RRLP PDU Length** : bit (8) > < **RRLP PDU** : octet(val(RRLP PDU Length)) > ! < Content part error : bit (*) = < no string > > } ;

Table 9.2.21.2: LCS UPLINK INFORMATION information element details

RRC Transaction Identifier This field is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
RRLP PDU Length (8 bit field) This field is the binary representation of the length in octets of the following RRLP PDU field. Range: 0 to 241. All other values are reserved.
RRLP PDU (variable length octet string) This field contains an RRLP PDU as defined in ETSI TS 144 031 [29].

9.2.21a POSITION REPORT RESPONSE

This message is used by the MES to convey its position to the GERAN.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.21a.1: POSITION REPORT RESPONSE information elements

```
< POSITION REPORT RESPONSE message content > ::=
   { 0 -- critical extension escape available
      {
         < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
         { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
         < MES GPS Position >
      !  < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.21a.2: POSITION REPORT RESPONSE information element details

RRC Transaction Identifier This field is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
MES GPS Position This IE contains the value part of GPS Position IE defined in ETSI TS 101 376-4-8 [7].

9.2.21b POSITION UPDATE INDICATION

This message is used by the MES to convey its position to the GERAN when autonomous position reporting has been enabled at the MES.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.21b.1: POSITION UPDATE INDICATION information elements

```
< POSITION UPDATE INDICATION message content > ::=
   { 0 -- critical extension escape available
      {
         { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
         < MES GPS Position >
      !  < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.21b.2: POSITION UPDATE INDICATION information element details

Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
MES GPS Position This IE contains the value part of GPS Position IE defined in ETSI TS 101 376-4-8 [7].

9.2.22 MEASUREMENT INFORMATION

Not used in GMR-1 3G.

9.2.22a MEASUREMENT ORDER

This message is the used by GERAN to command the MES to perform measurements on the indicated the neighbour cells.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.22a.1: MEASUREMENT ORDER information elements

```
< Measurement Order message content > ::=
< Measurement Order message content > ::=
{ 0  -- critical extension escape available
        {
              < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
              { 0 | 1 < Integrity Check Info : < Integrity Check Info IE > > }
              < Reference: bit(8)>
              { 0    < Position Measurement: <Position Measurement struct > > |
                10  < 3G Neighbour Cell Measurement: <3G Neighbour Cell Description struct > >}
           ! < Content part error : bit (*) = < no string > > }
    !    < Message escape critical extension : 1 bit (*) = < no string > >} ;
```

Table 9.2.22a.2: MEASUREMENT ORDER information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. Integrity check info is included if integrity protection is applied.
Reference Number (8 bit field) This field is used to match measurement order with the response from the MES. The MES shall include this field in the response to the network.
Position Measurement This IE is defined in ETSI TS 101 376-4-12 [13].
3G Neighbour Cell Measurement This IE is defined in ETSI TS 101 376-4-12 [13].

9.2.23 MEASUREMENT REPORT

This message is used by the MES to convey the neighbour cell measurement results.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.23.1: MEASUREMENT REPORT information elements

```
Measurement Report message content > ::=
    < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
    { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
    < Reference: bit(8) >
    { 0   < Position Measurement Report: <Position Measurement Report Struct> > |
      10 < 3G Measurement Report : < 3G Measurement Report struct > > }
    !    < Content part error : bit (*) = < no string > > };
```

Table 9.2.23.2: MEASUREMENT REPORT information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. Integrity check info is included if integrity protection is applied.
Reference Number (8 bit field) The MES shall set this to the same value present in MEASUREMENT ORDER for which this report is being sent to the network.
Position Measurement Report This IE is defined in ETSI TS 101 376-4-12 [13].
3G Measurement Report This IE is defined in ETSI TS 101 376-4-12 [13].

9.2.24 MES CAPABILITY ENQUIRY

The MES CAPABILITY ENQUIRY is used by the GERAN to enquire GERAN A/Gb mode, UTRAN or CDMA2000 classmarks and UTRAN predefined configurations from the MES.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.24.1: MES CAPABILITY ENQUIRY information elements

```
< MES CAPABILITY ENQUIRY message content > ::=
   { 0 -- critical extension escape available
      {
      -- MES Information Elements
         < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
         { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
         < Capability Update Requirement : < Capability Update Requirement IE > >
         { 0 | 1 < UTRAN predefined Configuration Requirement: bit (1) > }
      !  < Content part error: bit(*) = < no string > > }
   !  < Message escape critical extensions: 1 bit (*) = < no string > > } ;
```

Table 9.2.24.2: MES CAPABILITY ENQUIRY information element details

RRC Transaction Identifier This field is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. Integrity check info is included if integrity protection is applied.
UTRAN predefined Configuration Requirement (1 bit field) This field corresponds to the information whether the predefined configurations are requested by the network. bit 1 0 UTRAN predefined configuration not requested by the network 1 UTRAN predefined configuration requested by the network
Capability Update Requirement This IE is defined in clause 9.3.4.

9.2.25 MES CAPABILITY INFORMATION

This message is sent by the MES to the GERAN to convey MES specific capability information to the GERAN.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.25.1: MES CAPABILITY INFORMATION information elements

```
< MES CAPABILITY INFORMATION message content > ::=
        {
        -- MES Information Elements
            { 0 | 1  < RRC Transaction Identifier : < RRC Transaction Identifier IE > > }
            { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
            { 0 | 1  < MES GERAN Iu mode Radio Access Capability : < MES GERAN Iu mode Radio Access Capability IE > > }
            { 0 | 1  < MES GERAN A/Gb mode Radio Access Capability : < MES GERAN A/Gb mode Radio Access Capability IE > > }
            { 0 | 1  < UE UTRAN Radio Access Capability : < UE UTRAN Radio Access Capability IE > > }
            { 0 | 1  < UE UTRAN Radio Access Capability Extension : < UE UTRAN Radio Access Capability Extension IE >> }
            { 0 | 1  < UE UTRAN Predefined Configuration Status Information : < UE UTRAN Predefined Configuration Status Information IE >> }
            { 0 | 1  < UE CDMA2000 Radio Access Capability : < UE CDMA2000 Radio Access Capability IE > > }
        !    < Content part error: bit (*) = < no string > > } ;
```

Table 9.2.25.2: MES CAPABILITY INFORMATION information element details

RRC Transaction Identifier This field is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. Integrity check info is included if integrity protection is applied.
MES GERAN Iu mode Radio Access Capability This IE is defined in clause 9.3.45.
MES GERAN A/Gb mode Radio Access Capability This IE is defined in clause 9.3.46.
UE UTRAN Radio Access Capability This IE is defined in clause 9.3.108.
UE UTRAN Radio Access Capability Extension This IE is defined in clause 9.3.109.
UE UTRAN Predefined Configuration Status Information This IE is defined in clause 9.3.108a.
UE CDMA2000 Radio Access Capability This IE is defined in clause 9.3.110.

9.2.26 MES CAPABILITY INFORMATION CONFIRM

This message is sent by the GERAN to the MES to confirm that the MES capability information has been received.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.26.1: MES CAPABILITY INFORMATION CONFIRM information elements

```
< MES CAPABILITY INFORMATION CONFIRM message content > ::=
    { 0 -- critical extension escape available
        {
        -- MES Information Elements
            < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
            { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
        !    < Content part error : bit (*) = < no string > > }
    !    < Message escape critical extensions: 1 bit (*) = < no string > >} ;
```

Table 9.2.26.2: MES CAPABILITY INFORMATION CONFIRM information element details

RRC Transaction Identifier This field is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. *Integrity Check Info* IE is included if integrity protection is applied.

9.2.26a RAB BINDING REQUEST

This message is sent by the MES to the GERAN to create, update or delete a binding between a RAB and upper layer information.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.26a.1: RAB BINDING REQUEST information elements

< RAB BINDING REQUEST message content > ::=
{ 0 -- *critical extension escape available*
{
{ 0 | 1 < **Integrity Check Info** : < Integrity Check Info IE > > }
< **RAB Id** : <RAB Identity> >
{
00000 < **Multicast binding info** : <Multicast Binding Info struct> > -- Add multicast binding ("Join")
| 00001 -- Remove multicast binding ("Leave")
| 00010 < **PTT binding info** : <PTT Binding Info struct> > -- Add PTT binding ("Join")
| 00011 < **PTT binding info** : <PTT Binding Info struct> > -- Update PTT binding
| 00100 -- Remove PTT binding ("Leave")
}
! < Content part error : bit (*) = < no string > > }
! < Message escape critical extensions: 1 bit (*) = < no string > >} ;

< Multicast Binding Info struct> ::= { < **Multicast Group Id** : bit (32) > < **Tunnel Port** : bit (16) > < **IPv4 PDP Address** : bit (32) > 0 }; – Available for extension
< PTT Binding Info struct> ::= { { 0 | 1 < **PTT Session Key** : bit (32) > } { 0 | 1 < **PTT Session Mode** : bit (2) > } 0 }; – Available for extension

Table 9.2.26a.2: RAB BINDING REQUEST information element details

Integrity Check Info This IE is defined in clause 9.3.36. *Integrity Check Info* IE is included if integrity protection is applied.
RAB Id This field identifies the RAB for which the binding is to be added, updated or deleted. RAB Identity IE is defined in clause 9.3.72.
Multicast Group Id (32 bit field) This field identifies the IPv4 multicast group to which the MES wishes to bind the RAB. It contains the Class D IPv4 address of the multicast group in network byte order.
IPv4 PDP Address (32 bit field) This field identifies the IPv4 PDP address of the MES or TE. It contains the IPv4 address in network byte order.
Tunnel Port (16 bit field) This field identifies a unique UDP port to use for the tunnel port. It contains a UDP port number in network byte order.
PTT Session Key (32 bit field) This field identifies the PTT session to which the MES wishes to bind the RAB. It contains the 32-bit checksum of the PTT group identifier, if applicable.

PTT Session Mode (2 bit field) This field identifies the mode in which PTT session will be used. Bit 2 1 0 0 Pre-established, unicast 0 1 Pre-established, multicast-capable 1 0 On-demand, unicast 1 1 On-demand, multicast-capable

9.2.26b RAB BINDING RESPONSE

This message is sent by the GERAN to the MES to report the result of a requested RAB binding operation.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.26b.1: RAB BINDING RESPONSE information elements

```
< RAB BINDING RESPONSE message content > ::=
  { 0 -- critical extension escape available
    {
      { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
      < RAB Id : <RAB Identity> >
      { 0 <RAB Binding Success : bit(2) >  -- Operation succeeded
      | 1 < RAB Binding Failure Cause : bit(4) > } – Operation failed
    !   < Content part error : bit (*) = < no string > > }
  !   < Message escape critical extensions: 1 bit (*) = < no string > >} ;
```

Table 9.2.26b.2: RAB BINDING RESPONSE information element details

Integrity Check Info This IE is defined in clause 9.3.36. *Integrity Check Info* IE is included if integrity protection is applied.
RAB Id This field identifies the RAB for which the binding is to be added, updated or deleted. RAB Identity IE is defined in clause 9.3.72.
RAB Binding Success (2 bit field) This field indicates the reason for the failure of the binding request. Bit 2 1 0 0 Binding created 0 1 Binding updated 1 0 Binding deleted 1 1 Reserved
RAB Binding Failure Cause (4 bit field) This field indicates the reason for the failure of the binding request. Bit 4 3 2 1 0 0 0 0 RAB Id invalid for update or delete 0 0 0 1 Duplicate operation 0 0 1 0 Invalid binding information 0 0 1 1 Other failure 0 1 0 0 Incompatible ciphering algorithm 0 1 0 1 Resources not available 0 1 1 0 Multicast not supported All other values are reserved.

9.2.27a RAB UPPER LAYER RECONFIGURATION

This message is sent by the GERAN to the MES to request vocoder rate or other RAB upper layer change.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.27a.1: RAB UPPER LAYER RECONFIGURATION information elements

```
< RAB UPPER LAYER RECONFIGURATION message content > ::=
   { 0 -- critical extension escape available
      {
      -- MES Information Elements
         < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
         { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
         < RAB to Reconfigure : <RAB Identity> >
         < Reconfigured Link Direction: bit(2)>
         { 0 | 1 < Upper layer bearer info : <Upper Layer Bearer Info IE> > }
      !  < Content part error : bit (*) = < no string > > }
   !  < Message escape critical extensions: 1 bit (*) = < no string > >} ;
```

Table 9.2.27a.2: RAB UPPER LAYER RECONFIGURATION information element details

RRC Transaction Identifier This field is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. *Integrity Check Info* IE is included if integrity protection is applied.
RAB to Reconfigure This field identifies the RAB for which the upper layer change is requested. RAB Identity IE is defined in clause 9.3.72.
Reconfigured Link Direction (2 bit field) This field is used to indicate the link direction to which the reconfiguration applies. 00 - uplink (to GERAN) 01 - downlink (to MES) 10 - uplink and downlink 11 - Reserved for future use.
Upper Layer Bearer Info This IE is defined in clause 9.3.135.

9.2.27b RAB UPPER LAYER RECONFIGURATION COMPLETE

This message is sent by the MES to the GERAN to confirm that the vocoder rate or other RAB upper layer change has been completed. The message can also specify where the upper layer reconfiguration differs from that specified by the GERAN within the RAB UPPER LAYER RECONFIGURATION message.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.27b.1: RAB UPPER LAYER RECONFIGURATION COMPLETE information elements

```
< RAB UPPER LAYER RECONFIGURATION COMPLETE message content > ::=
  { 0 -- critical extension escape available
      {
      -- MES Information Elements
          < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
          { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
          < RAB to Reconfigure : <RAB Identity> >
          < Reconfigured Link Direction: bit(2)>
          { 0 | 1 < Upper layer bearer info : <Upper Layer Bearer Info IE> >  }
      !   < Content part error : bit (*) = < no string > > }
  !   < Message escape critical extensions: 1 bit (*) = < no string > >} ;
```

Table 9.2.27b.2: RAB UPPER LAYER RECONFIGURATION COMPLETE information element details

RRC Transaction Identifier This field is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. *Integrity Check Info* IE is included if integrity protection is applied.
RAB to Reconfigure This field identifies the RAB for which the upper layer change was completed. RAB Identity IE is defined in clause 9.3.72.
Reconfigured Link Direction (2 bit field) This field is used to indicate the link direction to which the reconfiguration applies. 00 - uplink (to GERAN) 01 - downlink (to MES) 10 - uplink and downlink 11 - Reserved for future use.
Upper Layer Bearer Info This IE is defined in clause 9.3.135.

9.2.28 RADIO BEARER RECONFIGURATION

This message is sent from GERAN to reconfigure parameters related to a change of QoS or change of physical channel.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.28.1: RADIO BEARER RECONFIGURATION information elements

```
< RADIO BEARER RECONFIGURATION message content > ::=
  { 0 -- critical extension escape available
      {
      -- MES information elements
          < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
          { 0 | 1 < Downlink Activation Time : < Activation Time IE > > } - When Downlink Activation Time field is not
present switching occurs after RLC acknowledgement of CHANNEL CHANGE PREPARATION COMPLETE message
          < RRC State Indicator : < RRC State Indicator IE > >
          { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
          { 0 | 1  < Integrity Protection Mode Info : < Integrity Protection Mode Info IE > > }
```

{ 0 | 1 < **Ciphering Mode Info** : < Ciphering Mode Info IE > > }
{ 0 | 1 < **New G-RNTI** : < G-RNTI IE > > }
-- *CN information elements*
{ 0 | 1 < **CN Information Info** : < CN Information Info IE > > }
-- *GERAN information elements*
{ 0 | 1 < **GRA Identity** : < GRA Identity IE > > }
-- *RB information elements*
{ 0 | 1 < **RAB Information to Reconfigure List** : bit (4) >
< **RAB Information to Reconfigure** : < RAB Information to Reconfigure IE > > * (1+val(RAB Information to Reconfigure List)) }
{ 0 | 1 < **PDCP** - **RB Information to Reconfigure List** : bit (5) >
{ < **PDCP** - **RB Information to Reconfigure** : < PDCP- RB Information to Reconfigure IE > >
{ 0 | 1 < **RB priority** : bit (2) }
{ 0 | 1 < **Physical Information** : < Physical Channel Configuration IE > > } - - used with UE Software Version Indicator 0x0
{ 0 | 1 < **Uplink Physical Channel Information List Index** : bit(5) > } – used with UE Software Version Indicator 0x1 or higher
{ 0 | 1 < **Downlink Physical Channel Information List Index** : bit(5) > } – used with UE Software Version Indicator 0x1 or higher
{ 0 | 1 < **NETWORK_RESPONSE_TIMES** : < Network Response Times struct >> }
{ 0 | 1 < **RRB identity** : <RRB Identity IE >>}
{ 0 | 1 < **Last Received RLC Block** : < RLC Sequence Number IE>>}

}* (1+val(RB Information to Reconfigure List))
}
{ 0 | 1 <**Uplink Physical Information List** : bit (5) >
{ < **Uplink Physical Channel** : < Physical Channel Description IE > >
}* (1+val(Uplink Physical Information List))
}-
{ 0 | 1 <**Downlink Physical Information List** : bit (5) >
{ < **Downlink Physical Channel** : < Physical Channel Description IE > >
}* (1+val(Downlink Physical Information List))
}-
{ 0 | 1 < **Downlink Counter Synchronization Info :** < Downlink Counter Synchronization info struct > > }
{ 0 | 1 <**BCCH ARFCN** : bit(11) > } – used with UE Software Version Indicator 0x1 or higher
{ 0 | 1 < **MES Timers and Constants in Connected Mode** : < MES Timers and Constants in Connected Mode IE > } – used with UE Software Version Indicator 0x1 or higher
{ 0 | 1 < **MES Additional Timers and Constants in Connected Mode** : < MES Additional Timers and Constants in Connected Mode IE > } – used with UE Software Version Indicator 0x1 or higher
{ 0 | 1 < **Handover Traffic Carrier Info** : < Handover Traffic Carrier Info IE > } – used with UE Software Version Indicator 0x1 or higher
{ 0 | 1 < **Carrier Reconfiguration Type** : < Carrier Reconfiguration Type IE > } – used with UE Software Version Indicator 0x1 or higher
-- used with UE Software Version Indicator 0x1 or higher
--use this ciphering information when provided otherwise use the MES ciphering key generated during authentication
{1 {00<Ciphering Key: bit(128)> | 01<AES-256 Ciphering Key: bit(256)> } --key applies to all RBs listed in Ciphering Synchronization
< RB Ciphering Synchronization: < RB Ciphering Synchronization IE>>}**0
{ 0 | 1 < **RB Information to Release List** : bit (5) >
{ < **RB Information to Release** : < RB Information to Release IE > >
}*(1+val(RB Information to Release List))
{ 0 | 1 { < **Release Cause**: bit (3) >}*(1+val(RB Information to Release List))}
! < Content part error : bit (*) = < no string > > }
! < Message escape critical extension : 1 bit (*) = < no string > >} ;

< Downlink Counter Synchronization Info struct> ::=
< **RB with PDCP Information List** : bit (5) >
{ { 0 | 1 < **RB with PDCP Information** : < RB with PDCP Information IE > > }
{ 0 | 1 < **PDCP context relocation info** : < PDCP context relocation info IE > > } } * (1 + val(RB with PDCP Information List));

< Network Response Times struct > ::=
-- GMR-1 3G: Reserved for Future use

Table 9.2.28.2: RADIO BEARER RECONFIGURATION information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Downlink Activation Time The *Activation Time* IE is defined in clause 9.3.1. Downlink frame reconfiguration occurs at the downlink frame indicated by this IE. Uplink frame reconfiguration occurs at Downlink Activation Time + USF Delay. USF Delay takes the value of USF Delay field in MES Additional Timers and Constants in Connected Mode when present. Otherwise, the USF Delay of current beam applies. Uplink frame reconfiguration occurs at Downlink Activation Time + USF Delay regardless of whether the downlink channel changes.
RRC State Indicator This IE is defined in clause 9.3.86.
Integrity Check Info This IE is defined in clause 9.3.36. The integrity Check Info IE is included when integrity protection is applied.
Integrity Protection Mode Info This IE is defined in clause 9.3.39. The GERAN does not include this IE unless it is performing an SBSS relocation.
Ciphering Mode Info This IE is defined in clause 9.3.14. The GERAN does not include this IE unless it is performing an SBSS relocation and a change in ciphering algorithm.
New G-RNTI This IE assigns a new G-RNTI to the MES. This IE is coded as the *G-RNTI* IE defined in clause 9.3.32.
CN Information Info This IE is defined in clause 9.3.17.
GRA Identity This IE is defined in clause 9.3.30.
RAB Information to Reconfigure List (4 bit field) This field is used to repeat information on each RAB to reconfigure. Range: 0 to maxRABsetup-1, where 0 enables one RAB to be described.
RAB Information to Reconfigure This IE is defined in clause 9.3.76.
PDCP - RB Information to Reconfigure List (5 bit field) This field is used to repeat information on each RB to reconfigure, where 0 enables one RB to be described. Range: 0 to maxRB-1.
PDCP - RB Information to Reconfigure This IE is defined in clause 9.3.82a.
RB Priority (2 bit field) This field identifies the Radio Bearer priority as determined by the network. This field may also be present when the uplink channel is PDCH. The value of this field shall be used if the RB is moved to DCH by a procedure which did not explicitly provide a value for RB priority
RB with PDCP Information list (5 bit field) This field is used to repeat information on each RB with PDCP Information, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1.
Downlink Counter Synchronization Info struct This structure contains information about PDCP synchronization.
RB with PDCP Information This IE is defined in clause 9.3.86.
PDCP context relocation info This IE is defined in clause 9.3.116.
Physical Information The *Physical Channel Configuration* IE is defined in clause 9.3.62.
Downlink Physical Information List (5 bit field) This field is used to repeat downlink physical information associated with one or more RBs, where 0 enables one downlink physical information be described. Range: 0 to maxRB-1.

Uplink Physical Information List (5 bit field) This field is used to repeat uplink physical information associated with one or more RBs, where 0 enables one uplink physical information be described. Range: 0 to maxRB-1.
Physical Channel Description This IE is defined in clause 9.3.62a.
Downlink Physical Channel Information List Index(5 bit field) This field contains an index to the physical channel information, which is present in the Downlink Physical Information List .The physical information thus obtained applies to the reconfigured RB. Range: 0 to maxRB-1.
Uplink Physical Channel Information List Index(5 bit field) This field contains an index to the physical channel information, which is present in the Uplink Physical Information List . The physical information thus obtained applies to the reconfigured RB. Range: 0 to maxRB-1.
Network Response Times struct This structure contains information about network response times. This structure is reserved for future use.
RRB Identity This field is used to identify the Reduced Radio Bearer identity. This IE is defined in clause 9.3.80a. The RRB identity/RB identity association holds only on the MAC slots assigned in the message. This field may also be present when the uplink channel is PDCH. The value of this field shall be used if the RB is moved to DCH by a procedure which did not explicitly provide a value for RRB Identity.
RLC Sequence Number This IE is defined in clause 9.3.136.
BCCH ARFCN This IE contains the ARFCN of the BCCH. ARFCN is defined in ETSI TS 101 376-5-5 [11].
MES Timers and Constants in connected mode This IE is defined in clause 9.3.51.
MES Additional Timers and Constants in connected mode This IE is defined in clause 9.3.51a.
Handover Traffic Carrier Info This IE is defined in clause 9.3.34a.
Ciphering Key (128 bit field) Contains the CK value to be used for the specified RBs in the downlink direction.
AES-256 Ciphering Key: bit(256) Contains the AES-256 CK value to be used for the specified RBs in the downlink direction.
RB Ciphering Synchronization This IE is defined in clause 9.3.84b.
Carrier Reconfiguration Type This IE is defined in clause 9.3.137.
RB Information to Release List (5 bit field) This field is used to repeat information on each RB to reconfigure, where 0 enables one RB to be described. Range: 0 to maxRB-1.
RB Information to Release This IE is defined in clause 9.3.83.
Release Cause (3 bit field) This field indicates the reason for the RB Release Bit 3 2 1 0 0 0 Not specified 0 0 1 Lack of Resources 0 1 0 Core Network Initiated Release 0 1 1 Radio Bearer Inactivity All other values are reserved

9.2.29 RADIO BEARER RECONFIGURATION COMPLETE

This message is sent from the MES when a RB and/or a physical channel reconfiguration has been done.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.29.1: RADIO BEARER RECONFIGURATION COMPLETE information elements

```
< RADIO BEARER RECONFIGURATION COMPLETE message content > ::=
    {
    -- MES information elements
        < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
        { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
        { 0 | 1  < Uplink Integrity Protection Activation Info : < Integrity Protection Activation Info IE > > }
        { 0 | 1  < Mobile Observed Time Difference : < Mobile Time Difference IE > > }
    -- RB information elements
        { 0 | 1  < COUNT-C Activation Time : < Activation Time IE > > }
        { 0 | 1  < Radio Bearer Uplink Ciphering Activation Time Info : < RB Activation Time Info IE> > }
        { 0 | 1  < Uplink Counter Synchronization Info : < Uplink Counter Synchronization Info struct > > }
    !   < Content part error : bit (*) = < no string > > } ;

< Uplink Counter Synchronization Info struct > ::=
    {   < START List : bit (2) >
        {   < CN Domain Identity : < CN Domain Identity IE > >
            < START : < START IE > > } * (1+val(START List))
        { 0 | 1  < RB with PDCP Information List : bit (5) >
                < RB with PDCP Information : < RB with PDCP Information IE > > * (1+val(RB with PDCP Information
List)) }
    };
```

Table 9.2.29.2: RADIO BEARER RECONFIGURATION COMPLETE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
Uplink Integrity Protection Activation Info This IE contains the time, in terms of RRC sequence numbers, when a new integrity protection configuration shall be activated for the signalling radio bearers. The *Integrity protection activation info* IE is defined in clause 9.3.37.
COUNT-C Activation Time The *Activation Time* IE is defined in clause 9.3.1.
Radio Bearer Uplink Ciphering Activation Time Info This IE is coded as the *RB activation time info* IE defined in clause 9.3.77.
Mobile Observed Time Difference The *Mobile Time Difference* IE is defined in clause 9.3.43.
Uplink Counter Synchronization Info struct This structure enable to synchronize the Uplink security counters.
START List (2 bit field) START value to be used in this CN domain. This field is the binary representation of the number of RB to be affected. Range: 0 to maxCNdomains-1.
CN Domain Identity This IE is defined in clause 9.3.15.
START This IE is defined in clause 9.3.102.
RB with PDCP Information List (5 bit field) This field is used to repeat information on each RB to reconfigure, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1.
RB with PDCP Information This IE is defined in clause 9.3.86.

9.2.30 RADIO BEARER RECONFIGURATION FAILURE

This message is sent by MES if the configuration given by GERAN is unacceptable or if the MES failed to establish the physical channel(s).

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.30.1: RADIO BEARER RECONFIGURATION FAILURE information elements

```
< RADIO BEARER RECONFIGURATION FAILURE message content > ::=
  {
  -- MES information elements
      < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
      < RRC Cause : < RRC Cause IE > >
      < Failure Cause : < Failure Cause and Error Information IE > >
      { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
  -- RB information elements
      { 0 | 1  < Potentially Successful RB List : bit (5) >
               < RB Identity : < RB Identity IE >> *(1 + val(Potentially Successful RB List) ) }
  !   < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.30.2: RADIO BEARER RECONFIGURATION FAILURE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. Integrity Check Info is included if integrity protection is applied.
Failure Cause This *Failure Cause and Error Information* IE is defined in clause 9.3.25.
RRC Cause This *RRC Cause* IE is defined in clause 9.3.94.
Potentially Successful RB List (5 bit field) This field is the binary representation of the number of RB for which reconfiguration would have succeeded. Range: 0 to maxRB-1.
RB Identity This IE is defined in clause 9.3.80.

9.2.31 RADIO BEARER RELEASE

This message is used by GERAN to release a radio bearer. It can also include modifications to the configurations of physical channels.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.31.1: RADIO BEARER RELEASE information elements

< RADIO BEARER RELEASE message content > ::=
{ 0 -- *critical extension escape available*
{
-- *MES information elements*
< **RRC Transaction Identifier** : < RRC Transaction IdentifierIE > >
{ 0 | 1 < **Activation Time** : < Activation Time IE > > } - When Activation Time field is not present, it means activation time of NOW
< **RRC State Indicator** : < RRC State Indicator IE > >
{ 0 | 1 < **Integrity Check Info** : < Integrity Check Info IE > > }
{ 0 | 1 < **Integrity Protection Mode Info** : < Integrity Protection Mode Info IE > > }
{ 0 | 1 < **Ciphering Mode Info** : < Ciphering Mode Info IE > > }
{ 0 | 1 < **New G-RNTI** : < G-RNTI IE > > }
-- *CN information elements*
{ 0 | 1 < **Signalling Connection Release Indication** : < CN Domain Identity IE> > }
{ 0 | 1 < **CN Information Info** : < CN Information Info IE > > }
-- *GERAN information elements*
{ 0 | 1 < **GRA Identity** : < GRA Identity IE > > }
-- *RB information elements*
{ 0 | 1 < **RAB Information to Reconfigure List** : bit (4) >
< **RAB Information to Reconfigure** : < RAB Information to Reconfigure IE > > *(1+val(RAB Information to Reconfigure List)) }
{ 0 | 1 < **RB Information to Release List** : bit (5) >
{ < **RB Information to Release** : < RB Information to Release IE > >
}*(1+val(RB Information to Release List))
}
{ 0 | 1 < **Downlink Counter Synchronization Info :** < Downlink Counter Synchronization info struct > > }
{ 0 | 1 { < **Release Cause**: bit (3) >}*(1+val(RB Information to Release List)) }
! < Content part error : bit (*) = < no string > > }
! < Message escape critical extension : 1 bit (*) = < no string > >} ;

< Downlink Counter Synchronization Info struct> ::= < **RB with PDCP Information List** : bit (5) > { { 0 | 1 < **RB with PDCP Information** : < RB with PDCP Information IE > > } { 0 | 1 < **PDCP context relocation info** : < PDCP context relocation info IE > > } } * (1 + val(RB with PDCP Information List));
< Network Response Times struct > ::= -- GMR-1 3G: Reserved for Future use

Table 9.2.31.2: RADIO BEARER RELEASE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Activation Time The *Activation Time* IE is defined in clause 9.3.1.
RRC State Indicator This IE is defined in clause 9.3.97.
Integrity Check Info This IE is defined in clause 9.3.36. Integrity Check Info is included if integrity protection is applied.
Integrity Protection Mode Info This IE is defined in clause 9.3.39. The GERAN does not include this IE unless it is performing an SBSS relocation.
Ciphering Mode Info This IE is defined in clause 9.3.14. The GERAN does not include this IE unless it is performing an SBSS relocation and a change in ciphering algorithm.
New G-RNTI This IE assigns a new G-RNTI to the MES. This IE is coded as the G-RNTI IE defined in clause 9.3.33.
Signalling Connection Release Indication The *CN Domain Identity* IE is defined in clause 9.3.15.
CN Information Info This IE is defined in clause 9.3.17.
GRA Identity This IE is defined in clause 9.3.30.
RAB Information to Reconfigure List (4 bit field) This field is used to repeat information on each RAB to reconfigure, where 0 enables one RAB to be described. Range: 0 to maxRABsetup-1.

RAB Information to Reconfigure This IE is defined in clause 9.3.76.
RB Information to Release List (5 bit field) This field is used to repeat information on each RB to reconfigure, where 0 enables one RB to be described. Range: 0 to maxRB-1.
RB Information to Release This IE is defined in clause 9.3.83.
Downlink Counter Synchronization Info struct This structure contains information about PDCP synchronization.
RB with PDCP Information List (5 bit field) This field is used to repeat information on each RB with PDCP Information, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1.
RB with PDCP Information This IE is defined in clause 9.3.86.
PDCP context relocation info This IE is defined in clause 9.3.116.
Physical Information The *Physical Channel Configuration* IE is defined in clause 9.3.62.
Network Response Times struct This structure contains information about network response times. This structure is reserved for future use.
Release Cause (3 bit field) This field indicates the reason for the RB Release Bit 3 2 1 0 0 0 Not specified 0 0 1 Lack of Resources 0 1 0 Core Network Initiated Release 0 1 1 Radio Bearer Inactivity All other values are reserved

9.2.32 RADIO BEARER RELEASE COMPLETE

This message is sent from the MES when radio bearer release has been completed.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.32.1: RADIO BEARER RELEASE COMPLETE information elements

```
< RADIO BEARER RELEASE COMPLETE message content > ::=
    {
    -- MES information elements
        < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
        { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
        { 0 | 1  < Uplink Integrity Protection Activation Info : < Integrity Protection Activation Info IE > > }
    -- RB information elements
        { 0 | 1  < COUNT-C Activation Time : < Activation Time IE > > }
        { 0 | 1  < Radio Bearer Uplink Ciphering Activation Time Info : < RB Activation Time Info IE> > }
        { 0 | 1  < Uplink Counter Synchronization Info : < Uplink Counter Synchronization Info struct > > }
    !   < Content part error : bit (*) = < no string > > } ;

< Uplink counter synchronization Info struct > ::=
    {   < START List : bit (2) >
        {   < CN Domain Identity : < CN Domain Identity IE > >
            < START : < START IE >) > } * (1+val(START List))
        { 0 | 1  < RB with PDCP Information List : bit (5) >
                < RB with PDCP Information : < RB with PDCP Information IE > > * (1+val(RB with PDCP Information
List)) }
    };
```

Table 9.2.32.2: RADIO BEARER RELEASE COMPLETE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
Uplink Integrity Protection Activation Info This IE contains the time, in terms of RRC sequence numbers, when a new integrity protection configuration shall be activated for the signalling radio bearers. The *Integrity Protection Activation Info* IE is defined in clause 9.3.3.37.
COUNT-C Activation Time The *Activation Time* IE is defined in clause 9.3.1.
Radio Bearer Uplink Ciphering Activation Time Info The *RB Activation Time Info* IE is defined in clause 9.3.77.
Uplink Counter Synchronization Info Struct This structure enable to synchronize the Uplink security counters.
START List (2 bit field) START value to be used in this CN domain. This field is the binary representation of the number of RB to be affected. Range: 0 to maxCNdomains-1.
CN Domain Identity This IE is defined in clause 9.3.15.
START This IE is defined in clause 9.3.102.
RB with PDCP Information List (5 bit field) This field is used to repeat information on each RB with PDCP Information, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1.
RB with PDCP Information This IE is defined in clause 9.3.86.

9.2.33 RADIO BEARER RELEASE FAILURE

This message is sent by MES if the configuration given by GERAN is unacceptable or if radio bearer cannot be released.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.33.1: RADIO BEARER RELEASE FAILURE information elements

< RADIO BEARER RELEASE FAILURE message content > ::= { < **RRC Transaction Identifier** : < RRC Transaction Identifier IE > > < **RRC Cause** : < RRC Cause IE > > < **Failure Cause** : < Failure Cause and Error Information IE > > { 0 | 1 < **Integrity Check Info** : < Integrity Check Info IE > > } { 0 | 1 < **Potentially Successful RB List** : bit (5) > < **RB Identity** :< RB Identity IE > > *(1 + val(Potentially Successful RB List)) } ! < Content part error : bit (*) = < no string > > } ;

Table 9.2.33.2: RADIO BEARER RELEASE FAILURE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36.The *Integrity Check Info* IE is included if integrity protection is applied.
Failure Cause The *Failure Cause and Error Information* IE is defined in clause 9.3.25.
RRC Cause This *RRC Cause* IE is defined in clause 9.3.94.
Potentially Successful RB List (5 bit field) This field is the binary representation of the number of RB for which reconfiguration would have succeeded. Range: 0 to maxRB-1.
RB Identity This IE is defined in clause 9.3.80.

9.2.34 RADIO BEARER SETUP

This message is sent by GERAN to the MES to establish new radio bearer(s) and optionally to modify existing radio bearer.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.34.1: RADIO BEARER SETUP information elements

```
< RADIO BEARER SETUP message content > ::=
   { 0  -- critical extension escape available
      {
      -- MES information elements
         < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
         { 0 | 1 < Downlink Activation Time : < Activation Time IE > > } - When Downlink Activation Time field is not present, it means activation time of NOW if there are no radio bearers being reconfigured. Otherwise switching occurs after RLC acknowledgement of CHANNEL CHANGE PREPARATION COMPLETE message.
         < RRC State Indicator : < RRC State Indicator IE > >
         { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
         { 0 | 1  < Integrity Protection Mode Info : < Integrity Protection Mode Info IE > > }
         { 0 | 1  < Ciphering Mode Info : < Ciphering Mode Info IE > > }
         { 0 | 1  < New G-RNTI : < G-RNTI IE > > }
      -- CN information elements
         { 0 | 1  < CN Information Info : < CN Information Info IE > > }
      -- GERAN information elements
         { 0 | 1  < GRA identity : < GRA identity IE > > }
         { 0 | 1  < RAB Information for Setup List : bit (4) >
               < RAB Information for Setup : < RAB Information for Setup IE > > *(1+val(RAB Information for Setup List)) }
      -- RB information elements including SRBs
        --  used with UE Software Version Indicator 0x0
         { 0 | 1  < RB Information for Setup List : bit (5) >
                 {       < RB identity : <RB Identity IE >>
                         { 0 | 1 < RB priority : bit (2) }
                         {  0 | 1 < RRBid identity : RRB Identity IE >>}
                         < Physical Information : < Physical Channel Configuration IE > >
                 }*(1+val(RB Information for Setup List))
          }
        -- used with UE Software Version Indicator 0x1 or higher
         { 0 | 1< RB Information for Setup List : bit (5) >
                 {       < RB identity : <RB Identity IE >>
                         { 0 | 1 < RB priority : bit (2) }
                         { 0 | 1 < RRBid identity : RRB Identity IE >>}
                         { 0 | 1 < Uplink Physical Channel Information List Index : bit(5) > }
                         { 0 | 1 < Downlink Physical Channel Information List Index : bit(5) > }
                 }*(1+val(RB Information for Setup List))
          }
```

```
            { 0 | 1  < PDCP-RB Information to Reconfigure List : bit (5) >
                    {    < PDCP-RB Information to Reconfigure : < PDCP-RB Information to Reconfigure IE > >
                        { 0 | 1 < RB priority : bit (2) }
                        { 0 | 1 < Physical Information : < Physical Channel Configuration IE > > } --  used with UE
Software Version Indicator 0x0
                        { 0 | 1 < Uplink Physical Channel Information List Index : bit(5) > } – used with UE Software
Version Indicator 0x1 or higher
                        { 0 | 1 < Downlink Physical Channel Information List Index : bit(5) > } – used with UE Software
Version Indicator 0x1 or higher
                        { 0 | 1 < NETWORK_RESPONSE_TIMES : < Network Response Times struct >> }
                        { 0 | 1 < RRB identity : RRB Identity IE >>}
                        { 0 | 1 < Last Received RLC Block : < RLC Sequence Number IE>>}
                    }* (1+val(RB Information to Reconfigure List))
            }
            { 0 | 1 <Uplink Physical Information List : bit (5) >
                    {    < Uplink Physical Channel : < Physical Channel Description IE > >
                    }* (1+val(Uplink Physical Information List))
            } –  used with UE Software Version Indicator 0x1 or higher
            { 0 | 1 <Downlink Physical Information List : bit (5) >
                    {     < Downlink Physical Channel : < Physical Channel Description IE > >
                    }* (1+val(Downlink Physical Information List))
            } – used with UE Software Version Indicator 0x1 or higher
            { 0 | 1  < Downlink Counter Synchronization Info : < Downlink Counter Synchronization info struct > > }
            { 0 | 1 <BCCH ARFCN : bit(11) > } –  used with UE Software Version Indicator 0x1 or higher
            { 0 | 1 < MES Timers and Constants in Connected Mode : < MES Timers and Constants in Connected
Mode IE > } –  used with UE Software Version Indicator 0x1 or higher
            { 0 | 1 < MES Additional Timers and Constants in Connected Mode : < MES Additional Timers and
Constants in Connected Mode IE > } –  used with UE Software Version Indicator 0x1 or higher
            { 0 | 1 < Handover Traffic Carrier Info : < Handover Traffic Carrier Info IE > } –  used with UE Software
Version Indicator 0x1 or higher
            { 0 | 1 < Carrier Reconfiguration Type : < Carrier Reconfiguration Type IE > } > --  used with UE Software
Version Indicator 0x1 or higher
             – used with UE Software Version Indicator 0x1 or higher
             --use this ciphering information when provided otherwise use the MES ciphering key generated during
authentication
            {1  {00<Ciphering Key: bit(128)>| 01<AES-256 Ciphering Key: bit(256)>} --key applies to all RBs listed in
Ciphering Synchronization
                    < RB Ciphering Synchronization: < RB Ciphering Synchronization IE>>}**0
        !    < Content part error : bit (*) = < no string > > }
    !    < Message escape critical extension : 1 bit (*) = < no string > >} ;
```

```
< Downlink Counter Synchronization Info struct> ::=
    < RB with PDCP Information List : bit (5) >
    {    { 0 | 1  < RB with PDCP Information : < RB with PDCP Information IE > > }
         { 0 | 1   < PDCP context relocation info : < PDCP context relocation info IE > > } } * (1 + val(RB with PDCP
Information List));
```

```
< Network Response Times struct > ::=
    -- GMR-1 3G: Reserved for Future use
```

Table 9.2.34.2: RADIO BEARER SETUP information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Downlink Activation Time The *Activation Time* IE is defined in clause 9.3.1. Downlink frame reconfiguration occurs at the downlink frame indicated by this IE. Uplink frame reconfiguration occurs at Downlink Activation Time + USF Delay. USF Delay takes the value of USF Delay field in MES Additional Timers and Constants in Connected Mode when present. Otherwise, the USF Delay of current beam applies. Uplink frame reconfiguration occurs at Downlink Activation Time + USF Delay regardless of whether the downlink channel changes.
RRC State Indicator (2 bit field) This IE is defined in clause 9.3.97.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
Integrity Protection Mode Info This IE is defined in clause 9.3.39. The GERAN does not include this IE unless it is performing an SBSS relocation.
Ciphering Mode Info This IE is defined in clause 9.3.14. The GERAN does not include this IE unless it is performing an SBSS relocation and a change in ciphering algorithm.

New G-RNTI This IE assigns a new G-RNTI to the MES. This IE is coded as the G-RNTI IE defined in clause 9.3.32.
CN Information Info This IE is defined in clause 9.3.17.
GRA Identity This IE is defined in clause 9.3.30.
RAB Information for Setup List (4 bit field) This field is used to repeat information on each RAB to reconfigure, where 0 enables one RAB to be described. Range: 0 to maxRABsetup-1.
RAB Information for Setup This IE is defined in clause 9.3.75.
RB Information for Setup List (5 bit field) This field is the binary representation of the number of RB to setup. Range: 0 to maxRB-1.
RB Identity This field identifies the Radio Bearer Identity. This IE is defined in clause 9.3.80.
RB Priority (2 bit field) This field identifies the Radio Bearer priority as determined by the network. This field may also be present when the uplink channel is PDCH. The value of this field shall be used if the RB is moved to DCH by a procedure which did not explicitly provide a value for RB Priority.
RRB Identity This field is used to identify the Reduced Radio Bearer identity. This IE is defined in clause 9.3.80a. The RRB identity/RB identity association holds only on the MAC slots assigned in the message. This field may also be present when the uplink channel is PDCH. The value of this field shall be used if the RB is moved to DCH by a procedure which did not explicitly provide a value for RRB Identity.
Physical Information The *Physical Channel Configuration* IE is defined in clause 9.3.62.
Downlink Physical Information List (5 bit field) This field is used to repeat downlink physical information associated with one or more RBs, where 0 enables one downlink physical information be described. Range: 0 to maxRB-1.
Uplink Physical Information List (5 bit field) This field is used to repeat uplink physical information associated with one or more RBs, where 0 enables one uplink physical information be described. Range: 0 to maxRB-1.
Physical Channel Description This IE is defined in clause 9.3.62a.
Downlink Physical Channel Information List Index(5 bit field) This field contains an index to the physical channel information, which is present in the Downlink Physical Information List .The physical information thus obtained applies to the reconfigured RB. Range: 0 to maxRB-1.
Uplink Physical Channel Information List Index(5 bit field) This field contains an index to the physical channel information, which is present in the Uplink Physical Information List . The physical information thus obtained applies to the reconfigured RB. Range: 0 to maxRB-1.
PDCP - RB Information to Reconfigure List (5 bit field) This field is used to repeat information on each RB to reconfigure, where 0 enables one RB to be described. Range: 0 to maxRB-1.
PDCP - RB Information to Reconfigure This IE is defined in clause 9.3.82a.
Downlink Counter Synchronization Info struct This structure contains information about PDCP synchronization.
RB with PDCP Information List (5 bit field) This field is used to repeat information on each RB with PDCP Information, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1.
RB with PDCP Information This IE is defined in clause 9.3.86.
PDCP context relocation info This IE is defined in clause 9.3.116.
Network Response Times struct This structure contains information about network response times. This structure is reserved for future use.
RLC Sequence Number This IE is defined in clause 9.3.136.
BCCH ARFCN This IE contains the ARFCN of the BCCH. ARFCN is defined in ETSI TS 101 376-5-5 [11].
MES Timers and Constants in connected mode This IE is defined in clause 9.3.51.

MES Additional Timers and Constants in connected mode This IE is defined in clause 9.3.51a.
Handover Traffic Carrier Info This IE is defined in clause 9.3.34a.
Ciphering Key (128 bit field) Contains the CK value to be used for the specified RBs in the downlink direction.
AES-256 Ciphering Key: bit(256) Contains the AES-256 CK value to be used for the specified RBs in the downlink direction.
RB Ciphering Synchronization This IE is defined in clause 9.3.84b.
Carrier Reconfiguration Type This IE is defined in clause 9.3.137.

9.2.35 RADIO BEARER SETUP COMPLETE

This message is sent by MES to confirm the establishment of the radio bearer.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.35.1: RADIO BEARER SETUP COMPLETE information elements

```
< RADIO BEARER SETUP COMPLETE message content > ::=
    {
        < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
        { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
        { 0 | 1  < Uplink Integrity Protection Activation Info : < Integrity Protection Activation Info IE > > }
        { 0 | 1  < COUNT-C Activation Time : < Activation Time IE> > }
        { 0 | 1  < Radio Bearer Uplink Ciphering Activation Time info : < RB Activation Time info IE > > }
        { 0 | 1  < Uplink Counter Synchronization Info : < Uplink Counter Synchronization Info struct > > }
    !   < Content part error : bit (*) = < no string > > } ;

< Uplink Counter Synchronization Info struct > ::=
    {   < START List : bit (2) >
        {   < CN Domain Identity : < CN Domain Identity IE > >
            < START : < START IE > > } * (1 + val(START List) )
        { 0 | 1  < RB with PDCP Information List : bit (5) >
                < RB with PDCP Information : < RB with PDCP Information IE > > * (1 + val(RB with PDCP Information
List) ) }
    };
```

Table 9.2.35.2: RADIO BEARER SETUP COMPLETE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
Uplink Integrity Protection Activation Info This IE contains the time, in terms of RRC sequence numbers, when a new integrity protection configuration shall be activated for the signalling radio bearers. The Integrity protection activation info IE is defined in clause 9.3.36.
COUNT-C Activation Time The *Activation Time* IE is defined in clause 9.3.1.
Radio bearer uplink ciphering activation time info The *RB Activation Time Info* IE is defined in clause 9.3.77.
Uplink Counter Synchronization Info struct This structure enables the synchronization of the Uplink security counters.
START List (2 bit field) START value to be used in this CN domain. This field is the binary representation of the number of RB to be affected. Range: 0 to maxCNdomains-1.
CN Domain Identity This IE is defined in clause 9.3.15.
START This IE is defined in clause 9.3.102.
RB with PDCP Information List (5 bit field) This field is used to repeat information on each RB with PDCP Information, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1.
RB with PDCP Information This IE is defined in clause 9.3.86.

9.2.35a CHANNEL CHANGE PREPARATION COMPLETE

This message is sent by MES to confirm that preparations required for changing the uplink physical channel type for all radio bearers is complete. The new uplink physical channel is not yet setup on the MES.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.35a.1: CHANNEL CHANGE PREPARATION COMPLETE information elements

```
< CHANNEL CHANGE PREPARATION COMPLETE message content > ::=
    {
    < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
    { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
    { 0 | 1  < Uplink Integrity Protection Activation Info : < Integrity Protection Activation Info IE > > }
    { 0 | 1  < COUNT-C Activation Time : < Activation Time  IE> > }
    { 0 | 1  < Radio Bearer Uplink Ciphering Activation Time info : < RB Activation Time info IE > > }
    { 0 | 1  < Uplink Counter Synchronisation Info : < Uplink Counter Synchronisation Info struct > > }
    { 0 | 1  < Change Preparation Complete RB List : bit (5) >
            < RB identity : <RB Identity IE >>
             < Last Received RLC Block : <RLC Sequence Number IE>>
                }*(1+val(Change Preparation Complete RB List)) }

    !    < Content part error : bit (*) = < no string > > } ;

< Uplink Counter Synchronisation Info struct > ::=
    {    < START List : bit (2) >
         {    < CN Domain Identity : < CN Domain Identity IE > >
              < START : < START IE > > } * (1 + val(START List) )
         { 0 | 1  < RB with PDCP Information List : bit (5) >
                  < RB with PDCP Information : < RB with PDCP Information IE > > * (1 + val(RB with PDCP
Information List) ) }
    };
```

Table 9.2.35a.2: CHANNEL CHANGE PREPARATION COMPLETE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
Uplink Integrity Protection Activation Info This IE contains the time, in terms of RRC sequence numbers, when a new integrity protection configuration shall be activated for the signalling radio bearers. The Integrity protection activation info IE is defined in clause 9.3.36.
COUNT-C Activation Time The *Activation Time* IE is defined in clause 9.3.1.
Radio bearer uplink ciphering activation time info The *RB Activation Time Info* IE is defined in clause 9.3.77.
Uplink Counter Synchronisation Info struct This structure enables the synchronisation of the Uplink security counters.
START List (2 bit field) START value to be used in this CN domain. This field is the binary representation of the number of RB to be affected. Range : 0 to maxCNdomains-1.
CN Domain Identity This IE is defined in clause 9.3.15.
START This IE is defined in clause 9.3.102.
RB with PDCP Information List (5 bit field) This field is used to repeat information on each RB with PDCP Information, where 0 enables one RB to be described. Range: 0 to maxRBallRABs-1.
RB with PDCP Information This IE is defined in clause 9.3.86.
RLC Sequence Number This IE is defined in clause 9.3.136.

9.2.36 RADIO BEARER SETUP FAILURE

This message is sent by MES, if it does not support the configuration given by GERAN.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.36.1: RADIO BEARER SETUP FAILURE information elements

< RADIO BEARER SETUP FAILURE message content > ::= { < **RRC Transaction Identifier** : < RRC Transaction Identifier IE > > < **RRC Cause** : < RRC Cause IE > > < **Failure Cause** : < Failure Cause and Error Information IE > > { 0 | 1 < **Integrity Check Info** : < Integrity Check Info IE > > } { 0 | 1 < **Potentially Successful RB List** : bit (5) > < **RB Identity** : < RB Identity IE > > *(1+val(Potentially Successful RB List)) } ! < Content part error : bit (*) = < no string > > } ;

Table 9.2.36.2: RADIO BEARER SETUP FAILURE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
Failure Cause The *Failure Cause and Error Information* IE is defined in clause 9.3.25.
RRC Cause This *RRC Cause* IE is defined in clause 9.3.94.
Potentially Successful RB List (5 bit field) This field is the binary representation of the number of RB for which setup would have succeeded. Range: 0 to maxRB-1.
RB Identity This IE is defined in clause 9.3.80.

9.2.37 RRC CONNECTION REJECT

The network transmits this message when the requested RRC connection cannot be accepted. In GMR-1 3G, RRC CONNECTION REJECT shall be indicated in Immediate Assignment Reject Type 3 message. See ETSI TS 101 376-4-8 [7] for details.

9.2.38 RRC CONNECTION RELEASE

This message is sent by GERAN to release the RRC connection. The message also releases all radio bearers between the MES and GERAN.

Radio Bearer: SRB 2

Direction: GERAN → MES

Table 9.2.38.1: RRC CONNECTION RELEASE information elements

< RRC CONNECTION RELEASE message content > ::= { 0 -- *critical extension escape available* { < **RRC Transaction Identifier** : < RRC Transaction Identifier IE > > < **RRC Release Cause** : < Release Cause IE > > { 0 | 1 < **Integrity Check Info** : < Integrity Check Info IE > > } { 0 | 1 < **N308** : bit (3) > } { 0 | 1 < **RPLMN Information** : < RPLMN Information IE > >} { 0 | 1 < **CN Information Info** : < CN Information Info IE > > { 0 | 1 < **STARTn** : <Start IE > } ! < Content part error : bit (*) = < no string > > } ! < Message escape critical extensions : 1 bit (*) = < no string > >} ;

Table 9.2.38.2: RRC CONNECTION RELEASE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
N308 (3 bit field) This IE is present when MES is in RRC-CELL_DEDICATED state. N308 indicates the Maximum number of retransmissions of the RRC CONNECTION RELEASE COMPLETE message. bit 3 2 1 0 0 0 1 0 0 1 2 0 1 0 3 0 1 1 4 1 0 0 5 1 0 1 6 1 1 0 7 1 1 1 8.
CN Information Info This IE is defined in clause 9.3.17. This IE shall be present when a RRC connection release is triggered to redirect the MES to a Routing Area (RA) other than the one to which it is currently registered. The CN information that is provided, together with the "directed signalling connection re-establishment" Release Cause will allow the MES to immediate re-establish an RRC connection and register in the RA specified by the new network-provided RAC.
Release cause This IE is defined in clause 9.3.90.
RPLMN Information This IE is defined in clause 9.3.93.
STARTn This IE is defined in clause 9.3.102.

9.2.39 RRC CONNECTION RELEASE COMPLETE

This message is sent by MES to confirm that the RRC connection has been released.

Radio Bearer: SRB2

Direction: MES $\rightarrow$ GERAN

Table 9.2.39.1: RRC CONNECTION RELEASE COMPLETE information elements

< RRC CONNECTION RELEASE COMPLETE message content > ::= { < **RRC Transaction Identifier** : < RRC Transaction Identifier IE > > { 0 | 1 < **Integrity Check Info** : < Integrity Check Info IE > > } { 0 | 1 < **Error Indication** : < Failure Cause and Error Information IE > > } ! < Content part error : bit (*) = < no string > > }

Table 9.2.39.2: RRC CONNECTION RELEASE COMPLETE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
Error Indication The *Failure Cause and Error Information* IE is defined in clause 9.3.25.

9.2.40 RRC CONNECTION REQUEST

RRC Connection Request is the first message transmitted by the MES when setting up an RRC Connection to the network. In GMR-1 3G, RRC CONNECTION REQUEST shall be requested using CHANNEL REQUEST TYPE 3 message. See ETSI TS 101 376-4-8 [7] for details.

9.2.41 RRC CONNECTION SETUP

This message is used by the network to accept the establishment of an RRC connection for an MES, including assignment of signalling link information and optionally physical channel information.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.41.1: RRC CONNECTION SETUP information elements

```
< RRC CONNECTION SETUP message content > ::=
    { 0 -- critical extension escape available
        {
        -- MES information elements
            < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
            { 0 | 1 < Activation Time : < Activation Time IE > > }  -- When Activation Time field is not present, it means
activation time of NOW
            < New G-RNTI : < G-RNTI IE > >
            < RRC State Indicator : < RRC State Indicator IE > >
            < Capability Update Requirement : < Capability Update Requirement IE > >
        -- RB information elements
            { 0 | 1  < Signalling RB Information to Setup list : bit (3) >
                    < Signalling RB Information to Setup : < Signalling RB Information to Setup IE > >
*(1+val(Signalling RB Information to Setup list)) }
         -- Information for MES to form CGI
            {0 | 1 <GMR-1 Cell Identity: <GMR-1 Cell Identity IE> >}
         -- GPS Position Determination Timer for RRC-Idle mode and RRC-GRA_PCH state
            {0 | 1 < Position Update Info1: <Position Update Information IE> >}
         -- GPS Position Determination Timer for RRC-Cell_Shared and RRC-Cell-Dedicated Mode
            {0 | 1 < Position Update Info2: < Position Update Information IE > >}      -- Timers and constants applicable
for connected mode operation
           { 0 | 1 < MES Timers and Constants in Connected Mode : < MES Timers and Constants in Connected
Mode IE > } –  used with UE Software Version Indicator 0x1 or higher
            { 0 | 1 < MES Additional Timers and Constants in Connected Mode : < MES Additional Timers and
Constants in Connected Mode IE > } –  used with UE Software Version Indicator 0x1 or higher
        !    < Content part error : bit (*) = < no string > > }
    !    < Message escape critical extensions : 1 bit (*) = < no string > >} ;
```

Table 9.2.41.2: RRC CONNECTION SETUP information element details

RRC Transaction Identifier (2 bit field) This IE is defined in clause 9.3.98.
Activation Time (8 bit field) This IE is defined in clause 9.3.1.
New G-RNTI This IE assigns a new G-RNTI to the MES. This IE is coded as the *G-RNTI* IE defined in clause 9.3.32.
RRC State Indicator This IE is defined in clause 9.3.97.
Capability Update Requirement This IE is defined in clause 9.3.4.
Signalling RB Information to Setup list (3 bit field) This field is the binary representation of the number of SRB to setup. Range: 0 to maxSRBsetup-1.
Signalling RB Information to Setup This IE is present for each SRB to establish. This IE is defined in clause 9.3.101.
GMR-1 Cell Identity This IE contains GMR-1 Cell Identity that is determined by the GERAN based on the GPS position supplied by the MES. The MES shall use this field in constructing CGI. This IE is defined in clause 9.3.30a.
Position Update Information 1 This IE contains value part of Position Update Information IE defined in ETSI TS 101 376-4-8 [7]. Contents of this IE define the GPS position reporting parameters applicable to RRC-Idle mode and RRC-GRA_PCH state.
Position Update Information 2 This IE contains value part of Position Update Information IE defined in ETSI TS 101 376-4-8 [7]. Contents of this IE define the GPS position reporting parameters applicable to RRC-Cell_Shared state and RRC-Cell_Dedicated state.
MES Timers and Constants in connected mode This IE is defined in clause 9.3.51.
MES Additional Timers and Constants in connected mode This IE is defined in clause 9.3.51a.

9.2.42 RRC CONNECTION SETUP COMPLETE

This message confirms the establishment of the RRC Connection by the MES.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.42.1: RRC CONNECTION SETUP COMPLETE information elements

< RRC CONNECTION SETUP COMPLETE message content > ::=
{
< **RRC Transaction Identifier** : < RRC Transaction Identifier IE > >
< **Initial MES Identity** : < Initial MES Identity IE > >
{0 | 1< **MES GPS Position**: < GPS Position IE >
{0 | 1 < **Time Stamp**: <GPS Timestamp IE >>} }
{0 < **Directed RAC**: < Directed RAC IE >> | 1 < **CN Information Info**: < CN Information Info IE >>}

< **START list** : bit (2) >
{ < **CN Domain Identity** : < CN Domain Identity IE > >
< **START** : < START IE > > } *(1+val(START List))
{ 0 | 1 < **MES GERAN Iu mode Radio Access Capability** : < MES GERAN Iu mode Radio Access Capability IE > > }
< **Inter-RAT MES Radio Access Capability** : < Inter-RAT MES Radio Access Capability struct > > }
! < Content part error : bit (*) = < no string > > } ;

< Inter-RAT MES Radio Access Capability struct > ::=

< Inter-RAT MES Radio Access Capability Length : bit (15) >
{ 0 | 1 < **MES GERAN A/Gb mode Radio Access Capability** : < MES GERAN A/Gb mode Radio Access Capability IE > > }
{ 0 | 1 < **UE UTRAN Radio Access Capability** : < UE UTRAN Radio Access Capability IE > > }
{ 0 | 1 < **UE UTRAN Radio Access Capability Extension** : < UE UTRAN Radio Access Capability Extension IE > > }
{ 0 | 1 < **UE CDMA2000 Radio Access Capability** : < UE CDMA2000 Radio Access Capability IE > > }
{ 0 | 1 < **UE Software Version Indicator** : < UE Software Version Indicator IE > > } – used with UE Software Version Indicator 0x1 or higher < spare bits >**;

NOTE: Inter-RAT MES radio access capability is currently included in the MES radio access capability from ETSI TS 124 008 [31]. MES radio access capability extension is currently not defined.

Table 9.2.42.2: RRC CONNECTION SETUP COMPLETE information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Initial MES Identity This IE is defined in clause 9.3.35.
MES GPS Position This IE contains the value part of GPS Position IE defined in ETSI TS 101 376-4-8 [7].
Time Stamp This IE contains the value part of GPS Position IE defined in ETSI TS 101 376-4-8 [7].
Directed RAC The *Directed RAC* IE is defined in ETSI TS 101 376-4-8 [7]. The IE shall be included when an RRC connection establishment is initiated and the MES indicated the use of the BCCH-broadcast RAC in the Channel Request Type 3 message (see ETSI TS 101 376-4-8 [7]). The IE shall be also included when an RRC connection establishment immediately follows an Immediate Assignment Reject with Cause equal to "RA Redirect" (see clause 9.2.38 and ETSI TS 101 376-4-8 [7]) in which the IE was provided by the GERAN. Either the *RAC* IE or the *CN Information* IE will be included within the RRC Connection Setup message.
CN Information Info The *CN Information Info* IE is defined in clause 9.3.17. The IE shall be included when the RRC connection establishment follows an Immediate Assignment Reject with Cause equal to "Directed signalling connection re-establishment" (see clause 9.2.38 and ETSI TS 101 376-4-8 [7]) or follows an RRC Connection Release with the same Cause where in either case the IE was provided by the GERAN. Either the *RAC* IE or the *CN Information Info* IE will be included within the RRC Connection Setup message.
START List (2 bit field) This field is the binary representation of the number of CN domains for which a START value is included. Range: 0 to maxCNdomains-1.
CN Domain Identity This field is defined in clause 9.3.15.
START This field is defined in clause 9.3.102.
Inter-RAT MES Radio Access Capability Length This field indicates the length of the structure excluding the 15 bits to indicate the length. Range 0 - 32768.
MES GERAN Iu mode Radio Access Capability This IE is defined in clause 9.3.45.
MES GERAN A/Gb mode Radio Access Capability This IE is defined in clause 9.3.44.
UE UTRAN Radio Access Capability This IE is defined in clause 9.3.108.
UE UTRAN Radio Access Capability Extension This IE is defined in clause 9.3.109.
UE CDMA2000 Radio Access Capability This IE is defined in clause 9.3.110.
UE Software Version Indicator This IE is defined in clause 9.3.110a. This IE is always included for terminals with UE Software Version Indicator 0x1 or higher.

9.2.43 RRC STATUS

This message is sent to indicate a protocol error.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.43.1: RRC STATUS information elements

```
< RRC STATUS message content > ::=
    {
        < Protocol Error Information : < Protocol Error Information IE > >
        { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
        { 0 | 1  < Identification of Received Message : < Identification of Received Message struct > > }
    !   < Content part error : bit (*) = < no string > > } ;

< Identification of Received Message struct > ::=
    < Received Message Type : < Message Type IE > >
    < RRC Transaction Identifier : < RRC Transaction Identifier IE > > ;
```

Table 9.2.43.2: RRC STATUS information element details

Protocol Error Information The *Protocol Error Information* IE is defined in clause 9.3.71.
Integrity Check Info The Integrity Check Info IE is defined in clause 9.3.36. The Integrity Check Info IE is included if integrity protection is applied.
Identification of Received Message struct This structure is present if the *Protocol Error Cause* IE in the *Protocol Error Information* IE has any other value than "CSN.1 violation or encoding error" or "Message type non-existent or not implemented".
Received Message Type The Message Type IE is defined in clause 9.2.1.
RRC Transaction Identifier The RRC Transaction Identifier IE is defined in clause 9.3.98.

9.2.44 RRC FAILURE INFO

This message is sent between network nodes in order to provide information about the cause for failure to perform the requested operation.

Radio Bearer: N/A

Direction: GERAN/UTRAN → GERAN

Table 9.2.44.1: RRC FAILURE INFO information elements

```
< RRC FAILURE Info message content > ::=
    {   < Failure cause : 0011 >
                < Protocol Error Information : < Protocol Error Information IE > >
    |   < Failure cause : 0000 | 0001 | 0010 | 01 bit (2) | 1 bit(3) > }
    !   < Content part error : bit (*) = < no string > > ;
```

Table 9.2.44.2: RRC FAILURE INFO information element details

Failure Cause The *Failure Cause* IE indicates the cause of the failure in order to perform the required RRC procedure. This IE is defined in clause 9.3.24.
Protocol Error Information This IE is defined in clause 9.3.71.

9.2.45 SECURITY MODE COMMAND

This message is sent by GERAN to start or reconfigure ciphering and/or integrity protection parameters.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.45.1: SECURITY MODE COMMAND information elements

< SECURITY MODE COMMAND message content > ::=
{ 0 -- *critical extension escape available*
{
-- *MES information elements*
< **RRC Transaction Identifier :** < RRC Transaction Identifier IE > >
< **Integrity Check Info** : < Integrity Check Info IE > >
< **Security Capability** : < Security Capability IE > >
{ 0 | 1 < **Ciphering Mode Info** : < Ciphering Mode Info IE > > }
{ 0 | 1 < **Integrity Protection Mode Info** : < Integrity Protection Mode Info IE > > }
-- *CN information elements*
< **CN Domain Identity** : < CN Domain Identity IE > >
-- *other information elements*
{ 0 | 1 < **GSM MES Security Capability** : < GSM MES Security Capability IE > > }
<**Check Last Used Ciphering Algorithm**: bit (1) >
! < Content part error : bit (*) = < no string > > }
! < Message escape critical extensions : 1 bit (*) = < no string > > } ;

Table 9.2.45.2: SECURITY MODE COMMAND information element details

RRC Transaction Identifier The *RRC Transaction Identifier* IE is defined in clause 9.3.98.
Integrity Check Info The *Integrity Check Info* IE is defined in clause 9.3.36.
Security Capability The *Security Capability* IE is defined in clause 9.3.100.
Ciphering Mode Info Only present if ciphering shall be controlled. The *Ciphering Mode Info* IE is defined in clause 9.3.14.
Integrity Protection Mode Info Only present if integrity protection shall be controlled. The *Integrity Protection Mode Info* IE is defined in clause 9.3.39.
CN Domain Identity Indicates which cipher and integrity protection keys are applicable. The *CN Domain Identity* IE is defined in clause 9.3.15.
GSM MES Security Capability This IE is defined in clause 9.3.33.
Check Last Used Ciphering Algorithm 0 No need to check last used ciphering algorithm. 1 Report last used ciphering algorithm in Security Mode Complete message. If last used ciphering algorithm is AES-256, suspend all uplink data transmissions until a subsequent security mode procedure completes. The only uplink data allowed from MES is SRB2 traffic to send Uplink Key Exchange message or to send Security Mode Complete message. All MAC control messages are also allowed to be transmitted. When security mode command procedure ends, MES resumes normal operation and uplink data transmission.

9.2.46 SECURITY MODE COMPLETE

This message is sent by MES to confirm the reconfiguration of ciphering and/or integrity protection.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.46.1: SECURITY MODE COMPLETE information elements

< SECURITY MODE COMPLETE message content > ::=
{
< RRC Transaction Identifier : < RRC Transaction Identifier IE >>
< **Integrity Check Info** : < Integrity Check Info IE > >
{ 0 | 1 < **Uplink Integrity Protection Activation Info** : < Integrity Protection Activation Info IE > > }
{ 0 | 1 < **Radio Bearer Uplink Ciphering Activation Time Info** : < RB Activation Time Info IE > > }
{0 | 1 < **Last Used Ciphering Algorithm :** < Ciphering Algorithm IE > >} – This field should not be included if UT has no knowledge of what algorithm was used in the last session, if ciphering was disabled, or if GERAN didnot request the information.
! < Content part error : bit (*) = < no string > > } ;

Table 9.2.46.2: SECURITY MODE COMPLETE information element details

RRC Transaction Identifier The *RRC Transaction Identifier* IE is defined in clause 9.3.98.
Integrity Check Info The *Integrity Check Info* IE is defined in clause 9.3.36.
Uplink Integrity Protection Activation Info The *Integrity Protection Activation Info* IE contains the time, in terms of RRC sequence numbers, when a new integrity protection configuration shall be activated for the signalling radio bearers. The *Integrity Protection Activation Info* IE is defined in clause 9.3.37.
Radio Bearer Uplink Ciphering Activation Time Info The *RB Activation Time Info* IE is defined in clause 9.3.77.
Last Used Ciphering Algorithm The Ciphering Algorithm IE is defined in clause 9.3.13.

9.2.47 SECURITY MODE FAILURE

This message is sent to indicate a failure to act on a received SECURITY MODE CONTROL message.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.47.1: SECURITY MODE FAILURE information elements

```
< SECURITY MODE FAILURE message content > ::=
  {
     < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
     { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > > }
     < Failure Cause : < Failure Cause and Error Information IE > >
  !  < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.47.2: SECURITY MODE COMPLETE information element details

RRC Transaction Identifier The *RRC Transaction Identifier* IE is defined in clause 9.3.98.
Integrity Check Info The *Integrity Check Info* IE is defined in clause 9.3.36. Integrity Check Info is included if integrity protection is applied.
Failure Cause The *Failure Cause and Error Information* IE is defined in clause 9.3.25.

9.2.48 SIGNALLING CONNECTION RELEASE

This message is used to notify the MES that its ongoing signalling connection to a CN domain has been released.

Radio Bearer: SRB 2

Direction: GERAN → MES

Table 9.2.48.1: SIGNALLING CONNECTION RELEASE information elements

```
< SIGNALLING CONNECTION RELEASE message content > ::=
  { 0 -- critical extension escape available
     {
        < CN Domain Identity : < CN Domain Identity IE > >
        < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
        { 0 | 1 < Integrity Check Info : < Integrity Check Info IE > > }
     !  < Content part error : bit (*) = < no string > > }
  !  < Message escape critical extensions : 1 bit (*) = < no string > > } ;
```

Table 9.2.48.2: SIGNALLING CONNECTION RELEASE information element details

CN Domain Identity The *CN Domain Identity* IE is defined in clause 9.3.15.
RRC Transaction Identifier The *RRC Transaction Identifier* IE is defined in clause 9.3.98.
Integrity Check Info The *Integrity Check Info* IE is defined in clause 9.3.36. Integrity Check Info is included if integrity protection is applied.

9.2.49 SIGNALLING CONNECTION RELEASE INDICATION

This message is used by the MES to indicate to GERAN the release of an existing signalling connection.

Radio Bearer: SRB 2

Direction: MES → GERAN

Table 9.2.49.1: SIGNALLING CONNECTION RELEASE INDICATION information elements

```
< SIGNALLING CONNECTION RELEASE INDICATION message content > ::=
  {
    < CN Domain Identity : < CN Domain Identity IE > >
    { 0 | 1 < Integrity Check Info : < Integrity Check Info IE > > }
  ! < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.49.2: SIGNALLING CONNECTION RELEASE INDICATION information element details

CN Domain Identity The *CN Domain Identity* IE is defined in clause 9.3.15.
Integrity Check Info The Integrity Check Info IE is defined in clause 9.3.36. *Integrity Check Info* IE is included if integrity protection is applied.

9.2.50 Void

9.2.51 Void

9.2.52 Void

9.2.53 Void

9.2.54 Void

9.2.55 Void

9.2.56 UPLINK DIRECT TRANSFER

This message is used to transfer NAS messages for an existing signalling connection.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.56.1: UPLINK DIRECT TRANSFER information elements

```
< UPLINK DIRECT TRANSFER message content > ::=
  {
     < CN Domain Identity : < CN Domain Identity IE > >
     < NAS Message : < NAS Message IE > >
     { 0 | 1 < Integrity Check Info : < Integrity Check Info IE > > }
  !  < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.56.2: UPLINK DIRECT TRANSFER information element details

CN Domain Identity The *CN Domain Identity* IE is defined in clause 9.3.15.
NAS Message The *NAS Message* IE is defined in clause 9.3.54.
Integrity Check Info The Integrity Check Info IE is defined in clause 9.3.36. *Integrity Check Info* IE is included if integrity protection is applied.

9.2.57 GERAN Iu mode DTM REQUEST

This message is used by the MES to initiate an allocation of PDCH(s) when the MES is in RRC-Cell_Dedicated state-MAC-Dedicated state.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.57.1: GERAN Iu mode DTM REQUEST information elements

```
< GERAN Iu mode DTM REQUEST message content > ::=
  {
     { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > >}
     < START List : bit (2) >
     {    < CN Domain Identity : < CN Domain Identity IE > >
          < START : < START IE > > } * (1+val(START List))
     < Iu mode RRC Channel Request Description : < Iu mode Channel Request Description IE > >
  !  < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.57.2: GERAN Iu mode DTM REQUEST information element details

G-RNTI This IE is defined in clause 9.3.32.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
START List (2 bit field) START value to be used in this CN domain. This field is the binary representation of the number of RB to be affected. Range: 0 to maxCNdomains-1.
CN Domain Identity This IE is defined in clause 9.3.15.
START This IE is defined in clause 9.3.102.
Iu mode RRC Channel Request Description This IE is defined in clause 9.3.113.

9.2.58 GERAN Iu mode DTM REJECT

This message is used by the GERAN to reject the DTM request when the MES is in RRC-Cell_Dedicated state-MAC-Dedicated state.

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.58.1: GERAN Iu mode DTM REJECT information elements

```
< GERAN Iu mode DTM REJECT message content > ::=
   {   < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
       { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > >}
       < Failure Cause : < Failure Cause and Error Information IE > >
       < Wait Indication : <Wait Indication IE>>
   !   < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.58.2: GERAN Iu mode DTM REJECT information element details

Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
RRC Transaction Identifier This IE is defined in clause 9.3.98.
Failure Cause This *Failure Cause and Error Information* IE is defined in clause 9.3.25.
Wait Indication This *Wait Indication* IE is defined in clause 9.3.114.

9.2.59 Downlink Key Exchange

This message is sent by GERAN to transfer GERAN key as part of the key exchange protocol

Radio Bearer: SRB2

Direction: GERAN → MES

Table 9.2.59.1: Downlink Key Exchange information elements

```
< Dowlink Key Exchange message content > ::=
   { 0 -- critical extension escape available
       {
           < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
           { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > >}
           { 000 {<gix:bit (528)>} -- 521-Bit Random ECP Group Key with compression
           | 001 {<gix: bit (528)> <giy: bit(528)>} -- 521-Bit Random ECP Group Key without compression
           }
           {0|1 {<NONCE: bit(64)>}
       !   < Content part error : bit (*) = < no string > > } ;
   !   < Message escape critical extension : 1 bit (*) = < no string > >} ;
```

Table 9.2.59.2: Downlink Key Exchange information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
gix *This field is the x component of the public key g^i=(gix,giy), details defined in [*33*]*.
giy *This field is the y component of the public key g^i=(gix,giy), details defined in [*33*]*.
NONCE This field is used to set the 64 left most bits of the input to the ciphering function to generate the keystream blocks

9.2.60 Uplink Key Exchange

This message is sent by MES to transfer MES key as part of the key exchange protocol.

Radio Bearer: SRB2

Direction: MES → GERAN

Table 9.2.60.1: Uplink Key Exchange information elements

```
< Uplink Key Exchange message content > ::=
   {   < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
       { 0 | 1  < Integrity Check Info : < Integrity Check Info IE > >}
       { 000 {<grx:bit (528)>} -- 521-Bit Random ECP Group Key with compression
        | 001 {<grx: bit (528)> <gry: bit(528)>} -- 521-Bit Random ECP Group Key without compression
       }
   !   < Content part error : bit (*) = < no string > > } ;
```

Table 9.2.60.2: Uplink Key Exchange information element details

RRC Transaction Identifier This IE is defined in clause 9.3.98.
Integrity Check Info This IE is defined in clause 9.3.36. The *Integrity Check Info* IE is included if integrity protection is applied.
grx *This field is the x component of the public key g^r=(grx,gry), details defined in [*33*]*.
gry *This field is the y component of the public key g^r=(grx,gry), details defined in [*33*]*.

9.3 Information Elements

9.3.1 Activation Time

The *Activation Time* IE defines the frame number/time at which the operation/changes caused by the related message shall take effect.

Table 9.3.1.1: *Activation Time* information elements

```
< Activation Time IE > ::=
   < Activation Time : bit (19) > ;
```

Table 9.3.1.2: *Activation Time* information element details

Activation Time (19 bit field) The Activation Time field defines the frame number/time at which the operation/changes caused by the related message shall take effect. This field is encoded as a binary number. TDMA Frame Number is defined in ETSI TS 101 376-5-2 [8].

9.3.2 BA List Pref

Not used in GMR-1 3G.

9.3.3 BA Range

Not used in GMR-1 3G.

9.3.4 Capability Update Requirement

The *Capability Update Requirement* IE indicates to the MES which specific capabilities to transfer to the network.

Table 9.3.4.1: *Capability Update Requirement* information elements

< Capability Update Requirement IE > ::= < **Capability Update Requirement length** : bit (4) > < **MES GERAN Iu mode radio access capability update requirement** : bit (1) > < **MES GERAN A/Gb mode radio access capability update requirement** : bit (1) > < **UE radio capability FDD capability update requirement** : bit (1) > < **UE radio capability 3,84 Mcps TDD capability update requirement** : bit(1) > < **UE radio capability 1,28 Mcps TDD capability update requirement** : bit (1) > < **UE CDMA2000 radio access capability update requirement** : bit (1) > < spare bits >**;

Table 9.3.4.2: *Capability Update Requirement* information element details

Capability Update Requirement length (4 bit field) This field indicates the number of capability updates requirements included in this IE in bits. It is encoded as the binary representation of the amount of capability updates included. Its value is 6 ("0110") in the present document.
MES GERAN Iu mode radio access capability update requirement (1 bit field) **MES GERAN A/Gb mode radio access capability update requirement** (1 bit field) **UE radio capability FDD capability update requirement** (1 bit field) **UE radio capability 3,84 Mcps TDD capability update requirement** (1 bit field) **UE radio capability 1,28 Mcps TDD capability update requirement** (1 bit field) **UE CDMA2000 radio access capability update requirement** (1 bit field) Each of these fields indicates the update requirement of the associated radio access capability. bit 1 0 not required 1 required

9.3.5 CDMA2000 MES security capability

Not used in GMR-1 3G.

9.3.6 Cell Channel Description

Not used in GMR-1 3G.

9.3.7 Cell Description

See ETSI TS 101 376-4-8 [7].

9.3.7a GMR-1 Spotbeam Description

The *GMR-1 Spotbeam Description* IE contains spotbeam information.

Table 9.3.7a.1: *GMR-1 Spotbeam Description* information elements

< GMR-1 Spotbeam Description IE > ::= < **BCCH ARFCN:** bit(11) > < **SB_BCCH_STN**: bit(5)> < **MAC_FORWARD_TS_OFFSET**: bit(2)> < **MAC_RETURN_TS_OFFSET**: bit(5)> < **SB_FRAME_TS_OFFSET**: bit(5)> < **SB_SYMBOL_OFFSET**: bit(6)> < **SB_Mask**: bit(8)> < **Spotbeam Id**: bit(10)> {0 | 1 <**Satellite Id**: bit(2) >}

Table 9.3.7a.2: *GMR-1 Spotbeam Description* information element details

BCCH ARFCN This IE contains the ARFCH as the BCCH. ARFCN is defined in ETSI TS 101 376-5-5 [11].
SA_BCCH_STN This IE is defined in ETSI TS 101 376-4-8 [7].
MAC_FORWARD_TS_OFFSET This IE is defined in ETSI TS 101 376-4-8 [7].
MAC_RETURN_TS_OFFSET This IE is defined in ETSI TS 101 376-4-8 [7].
SB_FRAME_TS_OFFSET This IE is defined in ETSI TS 101 376-4-8 [7].
SB_SYMBOL_OFFSET This IE is defined in ETSI TS 101 376-4-8 [7].
Satellite Id This IE is defined in ETSI TS 101 376-4-8 [7].
Spotbeam Id This IE is defined in ETSI TS 101 376-4-8 [7].
SB_Mask This IE is defined in ETSI TS 101 376-4-8 [7].

9.3.8 Cell Update Cause

The *Cell Update Cause* IE indicates the cause for performing a Cell Update.

Table 9.3.8.1: *Cell Update Cause* information elements

< Cell Update Cause IE > ::= < **Cell Update Cause** : bit (3) > > ;

Table 9.3.8.2: *Cell Update Cause* information element details

Cell Update Cause (3 bit field) bit 3 2 1 0 0 0 Reserved 0 0 1 Initiating conversational call 0 1 0 uplink data transmission 0 1 1 paging response 1 0 0 radio link failure 1 0 1 RLC unrecoverable error 1 1 0 Invalid RLC/MAC control message 1 1 1 Emergency Call

9.3.9 Channel Description

See ETSI TS 101 376-4-8 [7].

9.3.10 Channel Description 2

Not used in GMR-1 3G.

9.3.11 Channel Mode

See ETSI TS 101 376-4-8 [7].

9.3.12 Channel Mode 2

Not used in GMR-1 3G.

9.3.13 Ciphering Algorithm

The *Ciphering Algorithm* IE indicates which type of ciphering algorithm is used. This field is defined in ETSI TS 133 102 [23].

Table 9.3.13.1: *Ciphering Algorithm* information elements

```
< Ciphering Algorithm IE > ::=
    < Ciphering Algorithm : bit (4) > > ;
```

Table 9.3.13.2: *Ciphering Algorithm* information element details

```
Ciphering Algorithm (4 bit field)
bit
4 3 2 1
0 0 0 0     UEA0  -- see ETSI TS 133 102 [23]
0 0 0 1     UEA1  -- see ETSI TS 133 102 [23]
1 0 0 0     AES-256 -- defined in FIPS PUB 197 [32]

All other values are reserved.
```

9.3.14 Ciphering Mode Info

The *Ciphering Mode Info* IE contains the ciphering specific security mode control information.

Table 9.3.14.1: *Ciphering Mode Info* information elements

```
< Ciphering Mode Info IE > ::=
    {
        < Ciphering Mode Command : 0 >
    |   < Ciphering Mode Command : 1 >
        {    < Ciphering Algorithm : < Ciphering Algorithm IE > >
             { 0 | 1  < Ciphering Activation Time for DCH : < Activation Time IE > > }
             { 0 | 1  < RB Downlink Ciphering Activation Time Info : < RB Activation Time Info IE > > } }
    } ;
```

Table 9.3.14.2: *Ciphering Mode Info* information element details

Ciphering Mode Command (1 bit field) bit 1 0 stop ciphering mode 1 start/restart ciphering mode.
Ciphering Algorithm (4 bit field) The *Ciphering Algorithm* IE is defined in clause 9.3.13.
Ciphering Activation Time for DCH The *Activation Time* IE is used for radio bearers mapped on RLC-TM. This IE is defined in clause 9.3.1.
RB Downlink Ciphering Activation Time info The *RB Activation Time Info* IE is used for radio bearers mapped on RLC-AM or RLC-UM. This IE is defined in clause 9.3.77.

9.3.15 CN Domain Identity

The *CN Domain Identity* IE identifies the type of core network domain.

Table 9.3.15.1: *CN Domain Identity* information elements

```
< CN Domain Identity IE > ::=
    < CN Domain Identity : bit (2) > ;
```

Table 9.3.15.2: *CN Domain Identity* information element details

CN Domain Identity (2 bit field) bit 2 1 0 0 CS domain 0 1 PS domain 1 0 Reserved 1 1 Reserved.

9.3.16 Void

9.3.17 CN Information Info

The *CN Information Info* IE indicates information about the CN.

Table 9.3.17.1: *CN Information Info* information elements

```
< CN Information info IE > ::=
    { 0 | 1  < PLMN Identity : < PLMN Identity IE > > }
    { 0 | 1  < CN Common GSM-MAP NAS System Info : < NAS System Information GSM-MAP IE > > }
    { 0 | 1  < Length of CN Domain Related Information : bit (2) >
            {    < CN Domain Identity : < CN Domain Identity IE > >
                 < CN Domain Specific GSM-MAP NAS System Info : < NAS System Information GSM-MAP IE > >
            } *( 1 + val ( Length of CN Domain Related Information ) )
    } ;
```

Table 9.3.17.2: *CN Information Info* information element details

PLMN Identity This IE is defined in clause 9.3.63.
CN Common GSM-MAP NAS System Info The *NAS System Information GSM-MAP* IE is defined in clause 9.3.56.
CN Domain Specific GSM-MAP NAS System Info The *NAS system information GSM-MAP* IE is defined in clause 9.3.56. **Length of CN Domain Related Information** (2 bit field) This field is used to calculate the number of CN domains included in this IE. Range: 0 to MaxCNdomains-1. **CN Domain Identity** The *CN Domain Identity* IE is defined in clause 9.3.15.

9.3.18 Void

9.3.19 DCH Description

Not used in GMR-1 3G.

9.3.20 Dynamic ARFCN Mapping

Not used in GMR-1 3G.

9.3.21 Establishment Cause

The *Establishment Cause* IE defines the cause for an RRC connection establishment request.

Table 9.3.21.1: *Establishment Cause* information elements

< Establishment Cause IE > ::= < **Establishment Cause** : bit (5) > > ;

Table 9.3.21.2: *Establishment Cause* information element details

Establishment Cause (5 bit field) bit 5 4 3 2 1 0 0 0 0 0 Originating Conversational Call 0 0 0 0 1 Originating Streaming Call 0 0 0 1 0 Originating Interactive Call 0 0 0 1 1 Originating Background Call 0 0 1 0 0 Originating Subscriber traffic Call 0 0 1 0 1 Terminating Conversational Call 0 0 1 1 0 Terminating Streaming Call 0 0 1 1 1 Terminating Interactive Call 0 1 0 0 0 Terminating Background Call 0 1 0 0 1 Emergency Call 0 1 0 1 0 Inter-RAT cell re-selection 0 1 0 1 1 Inter-RAT cell change order 0 1 1 0 0 Registration 0 1 1 0 1 Detach 0 1 1 1 0 Originating High Priority Signalling 0 1 1 1 1 Originating Low Priority Signalling 1 0 0 0 0 Call re-establishment 1 0 0 0 1 Terminating High Priority Signalling 1 0 0 1 0 Terminating Low Priority Signalling 1 0 0 1 1 Terminating - cause unknown 1 0 1 0 0 Inter-mode cell re-selection

9.3.22 Expiration Time Factor

Not used in GMR-1 3G.

9.3.23 Extension

The *Extension* IE indicates possible extension for empty choice branches.

Table 9.3.23.1: *Extension* information elements

< Extension IE > ::= null;

9.3.24 Failure Cause

The *Failure Cause* IE indicates the cause of the failure in order to perform the required RRC procedure.

Table 9.3.24.1: *Failure Cause* information elements

< Failure Cause IE > ::= < **Failure Cause** : bit (4) > > ;

Table 9.3.24.2: *Failure Cause* information element details

Failure Cause (4 bit field) bit 4 3 2 1 0 0 0 0 configuration unsupported 0 0 0 1 physical channel failure 0 0 1 0 incompatible simultaneous reconfiguration 0 0 1 1 protocol error 0 1 0 0 compressed mode runtime error 0 1 0 1 cell reselection 0 1 1 0 invalid configuration 0 1 1 1 configuration incomplete 1 0 0 0 unsupported measurement 1 0 0 1 Inter-mode Protocol Error All others values are reserved.

9.3.25 Failure Cause and Error Information

The *Failure Cause and Error Information* IE indicates the cause for failure to perform the requested procedure.

Table 9.3.25.1: *Failure Cause and Error Information* information elements

< Failure Cause and Error Information IE > ::= { < **Failure Cause** : 0011> < **Protocol Error Information :** < Protocol Error Information IE > > | < **Failure cause** : 0000 | 0001 | 0010 | 01 bit (2) | 1 bit (3) > } ;

Table 9.3.25.2: *Failure Cause and Error Information* information element details

Failure Cause The *Failure Cause* IE is defined in clause 9.3.24.
Protocol Error Information The IE indicates information about the protocol error when the IE "*Failure Cause*" has the value "Protocol error". This IE is defined in clause 9.3.71.

9.3.26 Frequency Channel Sequence

Not used in GMR-1 3G.

9.3.27 Frequency List

Not used in GMR-1 3G.

9.3.28 Frequency Short List

Not used in GMR-1 3G.

9.3.29 GERAN DRX Cycle Length Coefficient

Not used in GMR-1 3G.

9.3.30 GRA Identity

The *GRA Identity* IE identifies a GERAN Registration Area (GRA). In case of overlapping GRAs in the cell, it can be used to indicate to the MES which GRA it shall use. The GRA Identity shall be set to the 16 bit LAC identity defined in ETSI TS 101 376-4-8 [7].

Table 9.3.30.1: *GRA Identity* information elements

< GRA Identity IE > ::= < **GRA Identity** : bit(16) >;

Table 9.3.30.2: *GRA Identity* information element details

GRA Identity (16 bit field) The GRA identity field is encoded as a binary number. Range 0 to 65 535.

9.3.30a GMR-1 Cell Identity

The *GMR-1 Cell Identity* IE identifies a unique geographical area within the GMR-1 service area.

Table 9.3.30a.1: *GMR-1 Cell Identity* information elements

< GMR-1 Cell Identity IE > ::= < **GMR-1 Cell Identity** : bit(16) >;

Table 9.3.30a.2: *GMR-1 Cell Identity* information element details

GMR-1 Cell Identity (16 bit field) The GMR-1 Cell identity field is encoded as a binary number. Range 0 to 65 535.

9.3.31 GRA Update Cause

The *GRA Update Cause* IE indicates the cause for performing GRA Update.

Table 9.3.31.1: *GRA Update Cause* information elements

< GRA Update Cause IE > ::= < **GRA Update Cause** : bit(2) >;

Table 9.3.31.2: *GRA Update Cause* information element details

GRA Update Cause (2 bit field) bit 2 1 0 0 change of GRA 0 1 periodic GRA update All others values are reserved.

9.3.32 G-RNTI

The *G-RNTI (GERAN Radio Network Temporary Identity)* IE is allocated to an MES having a RRC connection and identifies the MES within GERAN.

Table 9.3.32.1: *G-RNTI* information elements

< G-RNTI IE > ::= < **Serving BSC identity** : bit (12) > -- RNC-Id for GERAN Iu mode < **S-RNTI** : bit (20) >;

Table 9.3.32.2: *G-RNTI* information element details

Serving BSC identity (12 bit field) This field identifies the MES's serving BSC in GERAN. For GERAN in Iu mode, this field contains the RNC-Id portion of the RNC Identifier as defined in ETSI TS 101 376-3-3 [2].
S-RNTI (20 bit field) This field identifies the mobile earth station in the area of its serving BSC (serving RNC for Iu mode).

9.3.33 GSM MES Security Capability

The *GSM MES Security Capability* IE indicates the MES security capability for *A/Gb mode*.

Table 9.3.33.1: *GSM MES Security Capability* information elements

< GSM MES Security Capability IE > ::= < **A5/1 support :** bit (1) > < **A5/2 support :** bit (1) > < **A5/3 support :** bit (1) > < **A5/4 support :** bit (1) > < **A5/5 support :** bit (1) > < **A5/6 support :** bit (1) > < **A5/7 support :** bit (1) > < spare bit >}; -- *Reserved*

Table 9.3.33.2: *GSM MES Security Capability* information element details

A5/1 support (1 bit field) **A5/2 support** (1 bit field) **A5/3 support** (1 bit field) **A5/4 support** (1 bit field) **A5/5 support** (1 bit field) **A5/6 support** (1 bit field) **A5/7 support** (1 bit field) This field indicates the support of the GSM encryption algorithm A5/X, where X has a range from 1 to 7. bit 1 0 not supported 1 supported.

9.3.34 Handover Reference

The *Handover Reference* IE is to provide a handover reference value used for access identification.

Table 9.3.34.1: *Handover Reference* information elements

< Handover Reference IE > ::= < **Handover Reference Value** : octet(1) >;

Table 9.3.34.2: *Handover Refer*ence information element details

Handover Reference Value (1 octet field) The Handover Reference content is coded as the value part of the *Handover Reference* IE defined in ETSI TS 101 376-4-8 [7].

9.3.34a Handover Traffic Carrier Info

The *Handover Traffic Carrier Info* IE provides common information about the traffic carrier to which the MES has been assigned during inter-beam or intra-beam handover.

Table 9.3.34a.1: *Handover Traffic Carrier Info* information elements

< Handover Traffic Carrier Info IE > ::= { 0 | 1 **SB_Mask**: bit(8)> } { 0 | 1 <**MAC_FORWARD_TS_OFFSET**: bit(2)> } { 0 | 1 <**MAC_RETURN_TS_OFFSET**: bit(5)> } { 0 | 1 < **USF_DELAY** : bit (3) > } ;

Table 9.3.34a.2: *Handover Traffic Carrier Info* information element details

SB_Mask (8 bit field) This IE is defined in ETSI TS 101 376-4-8 [7].
MAC_FORWARD_TS_OFFSET (2 bit field) This field is defined in ETSI TS 101 376-4-8 [7].
MAC_RETURN_TS_OFFSET (5 bit field) This field is defined in ETSI TS 101 376-4-8 [7].
USF_DELAY (3 bit field) This IE defined in clause 11.5.2.111a of ETSI TS 101 376-4-8 [7] System Information Segment 3G/3G bis message.

9.3.35 Initial MES Identity

The *Initial MES Identity IE* identifies the MES at a request of an RRC connection.

Table 9.3.35.1: *Initial MES Identity* information elements

```
< Initial MES Identity IE > ::=
  {   < MES Identity Type : 0000 >                  -- GSM-MAP TMSI and LAI
        < TMSI : bit (32) >
        < LAI : octet (5) >
   |  < MES Identity Type : 0001 >                  -- GSM-MAP P-TMSI and RAI
        < PTMSI : bit (32) >
        < RAI : octet (6) >
   |  < MES Identity Type : 0010 >                  -- GSM-MAP IMSI or IMEI
        < Length of Mobile Identity contents : bit (4) >
        < Mobile Identity : octet (val (Length of Mobile Identity contents)) >
   |  < MES Identity Type : 0011 >                  -- ESN (DS-41)
        < ESN : bit (32) >
   |  < MES Identity Type : 0100 >                  -- IMSI (DS-41)
        < IMSI length : bit (2) >                   -- only allowed 0 - 2
        < IMSI : octet (5+val(IMSI Length)) >
   |  < MES Identity Type : 0101 >                  -- reserved for IMSI and ESN (DS-41)
        < IMSI length : bit (2) > -- only allowed 0 - 2
        < IMSI : octet (5+val(IMSI Length)) >
        < ESN : bit (32) >
   |  < MES Identity Type : 0110 >                  -- reserved for TMSI (DS-41)
        < TMSI length : bit (4) >
        < TMSI-DS-41 : octet (2+val(length)) >

   |  < Message escape : { 1 bit(3) } bit** = < no string > >      -- reserved
  };
```

Table 9.3.35.2: *Initial MES Identity* information element details

GSM-MAP TMSI and LAI structure **TMSI** (32 bit field) The Temporary Mobile Subscriber Identity (TMSI) is associated with the mobile subscriber and defined in ETSI TS 101 376-3-3 [2]. This field is coded as a binary number. Range 0 to 4 294 967 295. **LAI** (5 octet field) This field is coded using the V format of the type 3 information element Location Area Identification defined in ETSI TS 101 376-4-8 [7].
GSM-MAP P-TMSI and RAI structure **PTMSI** (32 bit field) The Packet Temporary Mobile Station Identity (PTMSI) is associated with the mobile subscriber and defined in ETSI TS 101 376-3-3 [2]. This field is encoded as a binary number. Range 0 to 4 294 967 295. **RAI** (48 bit field) This field contains the Routing Area identification. This field is described in ETSI TS 101 376-4-8 [7].
GSM-MAP IMSI or IMEI **Mobile Identity** (variable length octet string) This octet string is the representation of the Mobile Identity. The encoding of this octet string is the value part (starting with octet 3) of the type 4 information element Mobile Identity defined in ETSI TS 101 376-4-8 [7]. Any value other than IMSI and IMEI for the type of identity in this octet string is spare.

9.3.36 Integrity Check Info

The *Integrity Check Info* IE contains the RRC message sequence number needed in the calculation of XMAC-I (see ETSI TS 133 102 [23]) and the calculated MAC-I.

Table 9.3.36.1: *Integrity Check Info* information elements

```
< Integrity Check Info IE > ::=
  < Message Authentication Code : bit (32) >  -- see ETSI TS 133 102 [23]
  < RRC Message sequence number : bit (4) >;
```

Table 9.3.36.2: *Integrity Check Info* information element details

Message Authentication Code (32 bit field) This field indicates authentication code of the message. The 27 MSB of the IE shall be set to zero and the 5 LSB of the IE shall be set to the used signalling radio bearer identity when the encoded RRC message is used as the MESSAGE parameter in the integrity protection algorithm. **RRC Message Sequence Number** (4 bit field) This field is the binary representation of the sequence number of the RRC message. Range 0 to 15. This field shall be set to zero when the encoded RRC message is used as the MESSAGE parameter in the integrity protection algorithm.

9.3.37 Integrity Protection Activation Info

The *Integrity Protection Activation Info* IE contains the time, in terms of RRC sequence numbers, when a new integrity protection configuration shall be activated for the signalling radio bearers.

Table 9.3.37.1: *Integrity Protection Activation Info* information elements

< Integrity Protection Activation Info IE > ::= < **RRC message sequence number** : bit (4) > * 4;

Table 9.3.37.2: *Integrity Protection Activation Info* information element details

RRC Message Sequence Number (4 bit field) These fields are binary representation of the RRC sequence number. Range 0 to 15. The RRC sequence number shall be applied for the signalling radio bearers in the order SRB4, SRB3, SRB2 and SRB1.

9.3.38 Integrity Protection Algorithm

The *Integrity Protection Algorithm* IE indicates which type of UMTS Integrity Algorithm is used. This field is defined in ETSI TS 133 102 [23].

Table 9.3.38.1: *Integrity Protection Algorithm* information elements

< Integrity Protection Algorithm IE > ::= < **Integrity Protection Algorithm** : bit (4) >;

Table 9.3.38.2: *Integrity Protection Algorithm* information element details

Integrity Protection Algorithm (4 bit field) bit 4 3 2 1 0 0 0 1 UIA1 -- *see ETSI TS 133 102 [23]* All other values are reserved.

9.3.39 Integrity Protection Mode Info

The *Integrity Protection Mode Info* IE contains information about the integrity protection.

Table 9.3.39.1: *Integrity Protection Mode Info* information elements

< Integrity Protection Mode Info IE > ::= { {< **Integrity protection mode command** : 0 > < **Integrity protection initialization number** : bit (32) > | < **Integrity protection mode command** : 1 > < **Downlink integrity protection activation info** : < Integrity protection activation info IE > > } { 0 | 1 < **Integrity protection algorithm** : < Integrity protection algorithm IE > > } };

Table 9.3.39.2: *Integrity Protection Mode Info* information element details

Integrity protection mode command (1 bit field) bit 1 0 start 1 modify
Downlink integrity protection activation info The Integrity protection activation info IE is defined in clause 9.3.37.
Integrity protection initialization number (32 bit field) This field is the FRESH random value generated by the network side as it is defined in ETSI TS 133 102 [23].
Integrity protection algorithm This IE is defined in clause 9.3.38.

9.3.40 Void

9.3.41 Intra Domain NAS Node Selector

This IE specifies information for routing a signalling connection to a CN node within a CN domain.

Table 9.3.41.1: *Intra Domain NAS Node Selector* information elements

```
< Intra Domain NAS Node Selector IE > ::=
  { 0                    -- release 5
    { 0                  -- GSM-MAP-type PLMN
      -- Routing basis
      { 000  < Routing Parameter TMSI-PTMSI : bit (10) >
                         -- TMSI allocated in current LA or PTMSI allocated in current RA
      | 001  < Routing Parameter TMSI-PTMSI : bit (10) >
                         -- TMSI allocated in another LA of this PLMN or PTMSI allocated in another RA of this PLMN
      | 010  < Routing Parameter TMSI-PTMSI : bit (10) >
                         -- TMSI or PTMSI allocated in another PLMN
      | 011  < Routing Parameter IMSI : bit (10) >
                         -- NAS identity is IMSI (response to IMSI paging)
      | 100  < Routing Parameter IMSI : bit (10) >
                         -- NAS identity is IMSI (MES-initiated event)
      | 101  < Routing Parameter IMEI : bit (10) >
                         -- NAS parameter is IMEI
      !   < Message escape : { 11 bit(1) } bit(10) = < no string > > }        -- Reserved
    | 1 (0)*14 }         -- ANSI-41
  !   < Message escape : 1 bit(15) = < no string > > };       -- Reserved
```

Table 9.3.41.2: *Intra Domain NAS Node Selector* information element details

Routing parameter TMSI-PTMSI (10 bit field) This field is the bitstring of bit(14) through bit(23) of the TMSI or PTMSI where bit(14) is the least significant.
Routing parameter IMSI (10 bit field) This field is the binary representation of [(IMSI div 10) mod 1000]. Range 0 to 999.
Routing parameter IMEI (10 bit field) This field is the binary representation of [(IMEI div 10) mod 1000]. Range 0 to 999.

9.3.42 Mobile Allocation

Not used in GMR-1 3G.

9.3.43 Mobile Time Difference

Not used in GMR-1 3G.

9.3.44 MES GERAN A/Gb mode Radio Access Capability

This Information Element contains the MES GERAN A/Gb mode radio access capability that is structured and coded according to the specification used for the corresponding system type.

This IE contains the Mobile station classmark 2 and 3 of the MES.

Table 9.3.44.1: *MES GERAN A/Gb mode Radio Access Ca*pability information elements

< MES GERAN A/Gb mode Radio Access Capability IE > ::= { < **Mobile Station Classmark 2 length** : bit(3) > < **Mobile Station Classmark 2**: octet(val (Mobile Station Classmark 2 length)) > } { < **Mobile Station Classmark 3 length** : bit(5) > < **Mobile Station Classmark 3**: octet (val (Mobile Station Classmark 3 length)) > } ;

Table 9.3.44.2: *MES GERAN A/Gb mode Radio Access Capability* information element details

Mobile Station Classmark 2 length (3 bit field) This field is the binary representation of the length of the *Mobile Station Classmark 2* IE in octets excluding the bits used for this length field. Range 0 to 7 octets.
Mobile Station Classmark 2 This IE is defined in ETSI TS 101 376-4-8 [7].
Mobile Station Classmark 3 length (5 bit field) This field is the binary representation of the length of the *Mobile Station Classmark 3* IE in octets excluding the bits used for this length field. Range 0 to 31 octets.
Mobile Station Classmark 3 This IE is defined in ETSI TS 101 376-4-8 [7].

9.3.45 MES GERAN Iu mode Radio Access Capability

This Information Element contains the MES GERAN Iu mode radio access capability that is structured and coded according to the specification used for the corresponding system type.

Table 9.3.45.1: *MES GERAN Iu mode Radio Access Capability* information elements

<MES GERAN Iu mode Radio Access Capability IE > ::= { < **MES GERAN Iu mode Radio Access Capability length** : bit (10)> < **MES RF Capability GSM** : < MES RF Capability GSM IE > > < **MES GERAN Iu mode RLC Capability** : < MES GERAN Iu Mode RLC Capability IE > > < **MES PDCP Capability** : < PDCP Capability IE > > < **MES Multi-Mode and Multi-RAT Capability** : < MES Multi-Mode and Multi-RAT Capability IE > > < **Security Capability** : < Security Capability IE > > < **MES Positioning Capability** : < MES Positioning Capability IE > > < **MES Measurement Capability** : < MES Measurement Capability IE > > < **MES Terminal Type** : < GMPRS Terminal Type Identifier IE > > < **FLO Iu Capability** : bit > *-- Release 6* < spare bit >**; *-- Extension information may be truncated between released versions of the protocol* *-- The receiver shall assume the value zero for any truncated bit* } ;

Table 9.3.45.2: *MES GERAN Iu mode Radio Access Capability* information element details

MES GERAN Iu mode Radio Access Capability length (10 bit field) This field is the binary representation of the length of the *MES GERAN Iu Mode Radio Access Capability* IE in bits excluding the bits used for this length field. Range: 0 to 1023.
MES RF Capability GSM This IE is defined in clause 9.3.47.
MES GERAN Iu mode RLC Capability This IE is defined in clause 9.3.46.
PDCP Capability This IE is defined in clause 9.3.59.
MES Multi-Mode and Multi-RAT Capability This IE is defined in clause 9.3.48.
Security Capability This IE is defined in clause 9.3.100.
MES Positioning Capability This IE is defined in clause 9.3.50.
MES Measurement Capability This IE is defined in clause 9.3.49.
MES Terminal Type This IE is defined in clause 9.3.45a.
FLO Iu Capability (1 bit field) Bit 0 FLO in GERAN Iu mode not supported. 1 FLO in GERAN Iu mode supported.

9.3.45a GMPRS Terminal Type Identifier

The *GMPRS Terminal Type Identifier* IE encodes the GMR-1 3G radio capabilities of the MES.

Table 9.3.45a.1: *GMPRS Terminal Type Identifier* information elements

< GMPRS Terminal Type Identifier IE > ::= < **GMPRS Terminal Type Identifier** : bit(7) >;

Table 9.3.45a.2: *GMPRS Terminal Type Identifier* information element details

GMPRS Terminal Type Identifier (7 bit field) The 7 bit GMPRS Terminal Type Identifier is encoded as a binary number. Range 0 to 127. See ETSI TS 101 376-5-2 [8].

9.3.46 MES GERAN Iu mode RLC Capability

The *MES GERAN Iu mode RLC capability* IE describes the capabilities of the RLC layer of the MES in GERAN Iu mode.

Table 9.3.46.1: *MES GERAN Iu mode RLC Capability* information elements

< MES GERAN Iu mode RLC Capability IE > ::=
{
< **MES GERAN Iu mode RLC Capability Length** : bit (4)>
< **Maximum number of RLC-AM entities** : bit (3) >
< **Maximum number of RLC-UM entities** : bit (3) >
< **Maximum number of RLC-T entities** : bit (3) >
< spare bit >**; *-- Extension information may be truncated between released versions of the protocol*
-- The receiver shall assume the value zero for any truncated bit
};

Table 9.3.46.2: *MES GERAN Iu mode RLC Capability* information element details

MES GERAN Iu mode RLC Capability Length (4 bit field) This field is the binary representation of the length of the MES GERAN Iu Mode RLC Capability IE in bits excluding the bits used for this length field. Range: 0 to 15.
Maximum number of RLC-AM entities (3 bits field) This field defines the number of RLC entities operating in acknowledge mode in the MES. bit 3 2 1 0 0 0   3 RLC-AM entities 0 0 1   4 RLC-AM entities 0 1 0   5 RLC-AM entities 0 1 1   6 RLC-AM entities 1 0 0   8 RLC-AM entities All other values are reserved.
Maximum number of RLC-UM entities (3 bits field) This field defines the number of RLC entities operating in unacknowledge mode in the MES. bit 3 2 1 0 0 0   3 RLC-UM entities 0 0 1   4 RLC-UM entities 0 1 0   5 RLC-UM entities 0 1 1   6 RLC-UM entities 1 0 0   8 RLC-UM entities All other values are reserved.
Maximum number of RLC-T entities (2 bits field) This field defines the number of RLC entities operating in transparent mode in the MES. bit 3 2 1 0 0 0   3 RLC-T entity 0 0 1   4 RLC-T entities 0 1 0   5 RLC-T entities 0 1 1   6 RLC-T entities 1 0 0   8 RLC-T entities All other values are reserved.

9.3.47 MES RF Capability GSM

The purpose of the *MES RF Capability GSM* information element is to provide the radio part of the network with information concerning radio aspects of the MES. The contents might affect the manner in which the network handles the operation of the MES.

The *MES RF Capability GSM* information element is coded as shown in table 9.3.47.1.

For the indication of the Access Technology Types the following conditions shall apply:

- Among the three Access Type Technologies GSM 900-P, GSM 900-E and GSM 900-R only one shall be present.
- Due to shared radio frequency channel numbers between GSM 1800 and GSM 1900, the MES should provide the relevant radio access capability for either GSM 1800 band OR GSM 1900 band, not both.
- The MES shall indicate its supported Access Technology Types.
- The MES satellite Access Technology Type capabilities shall be identified by GMR-1 3G S-Band and/or GMR-1 3G L-band, as applicable. Within the "MES RF Capability GSM" IE, GMR-1 3G shall be specified as an "Access technology using individual capabilities" (see table 9.3.47.1).

For error handling the following shall apply:

- If a received Access Technology Type is unknown to the receiver, it shall ignore all the corresponding fields.
- If within a known Access Technology Type a receiver recognizes an unknown field it shall ignore it.

Table 9.3.47.1: *MES RF Capability GSM* information elements

< MES RF Capability GSM IE > ::=
{
< **MES RF Capability GSM Length** : bit (8) >
< **RF Capability Group** : < RF Capability Group struct > >
{ 1 < **Additional RF Capability Group** : < RF Capability Group struct > > } ** 0
} ;

< RF Capability Group struct > ::=
-- *Access Technology using common capabilities*
< **Access Technology Type** : bit (4) >
{ 1 < **Additional Access Technology Type** : bit (4) > } ** 0
< **Common Access Capabilities** : < Access Capabilities struct > >
-- *Access Technology using individual capabilities*
{ 1 < **Additional Access Technology** : < Additional Access Technology struct > > } ** 0 ;

< Access Capabilities struct > ::=
< **Access Capabilities length** : bit (6)>
< **GMSK Power Capability** : bit (3) >
{ 0 | 1 < **8PSK Power Capability** : bit (2) > }
< **Pseudo Synchronization** : bit (1) >
< **Multislot capability** : < Multislot capability struct > >
< spare bit >**; -- *Extension information may be truncated between released versions of the protocol*
-- *The receiver shall assume the value zero for any truncated bit*

< Additional Access Technology struct > ::=
< **Additional Access Technology length** : bit (6)>
< **Access Technology Type** : bit (4) >
< **GMSK Power Class** : bit (3) >
< **8PSK Power Class** : bit (2) >
< spare bit >**; -- *Extension information may be truncated between released versions of the protocol*
-- *The receiver shall assume the value zero for any truncated bit*

NOTE: For GMR-1 3G access technologies only the Access technology Type is specified. The GMSK Power Class and 8PSK Power Class IEs are not applicable (see instead the "MES Terminal Type" IE) and so all of the associated IE bits shall be set to "0".

< Multislot Capability struct > ::=

{ 0 < **Combined GMSK and 8-PSK Multislot Class** : bit (6) >
| 1
< **GMSK Multislot Class** : bit (6) >
{ 0 | 1 < **8-PSK Multislot Class** : bit (6) >}};

Table 9.3.47.2: *MES RF Capability GSM* information element details

MES RF Capability GSM Length (8 bit field)
This field is the binary representation of the length of the MES RF Capability GSM IE in bits excluding the bits used for this length field.

Access Technology Type (4 bit field)
This field indicates the access technology type to be associated with the following access capabilities.

bit 4 3 2 1	
0 0 0 0	GSM P
0 0 0 1	GSM E--*note that GSM E covers GSM P*
0 0 1 0	GSM R--*note that GSM R covers GSM E and GSM P*
0 0 1 1	GSM 1800
0 1 0 0	GSM 1900
0 1 0 1	GSM 450
0 1 1 0	GSM 480
0 1 1 1	GSM 850
1 0 0 0	GSM 750
…	
1 1 0 1	GMR-1 3G 1500 (L-band)
1 1 1 0	GMR-1 3G 2000 (S-band)

All other values are treated as unknown by the receiver.

Common Access Capabilities This structure contains the access capabilities for the indicated access technology type and - if present - for the access technologies indicated by the optional List of additional access technologies.
Access Capabilities length (6 bit field) This field is the binary representation of the length of the Access Capabilities struct in bits excluding the bits used for this length field. Range: 0 to 63.
GMSK Power Capability, GMSK Power Class (3 bit field) This field contains the binary coding of the power class used for GMSK associated with the indicated Access Technology Type. NOTE: Not applicable for GMR-1 3G access technology.
8PSK Power Capability (2 bit field) If 8-PSK modulation is supported for uplink, this field indicates the radio capability for 8-PSK modulation. The following coding is used: bit 2 1 0 0 Reserved 0 1 Power class E1 1 0 Power class E2 1 1 Power class E3 NOTE: Not applicable for GMR-1 3G access technology.
8PSK Power Class (2 bit field) This field indicates the radio capability for 8-PSK modulation. The following coding is used: bit 2 1 0 0 8-PSK modulation not supported for uplink 0 1 Power class E1 1 0 Power class E2 1 1 Power class E3 NOTE: Not applicable for GMR-1 3G access technology.
Pseudo Synchronization (1 bit field) This field indicates the Pseudo Synchronization (Handover) capability. 0 Pseudo Synchronization capability not present 1 Pseudo Synchronization capability present NOTE: Not applicable for GMR-1 3G access technology.
RF Capability Group This structure contains the Common access capabilities for the indicated access technology type. These access capabilities may be extended by an optional List of additional access technologies.
Additional Access Technologies This structure contains the GMSK Power Class and 8PSK Power Class for additional access technologies. All other capabilities for this indicated access technologies are the same as the capabilities as indicated by the last previously included Common access capabilities.
Additional Access Technology length (6 bit field) This field is the binary representation of the length of the Additional Access Technology struct in bits excluding the bits used for this length field. Range: 0 to 63.
Multislot Capability This structure contains the multislot capability for GMSK and 8-PSK modulations. The multislot class capability for GMSK and 8-PSK modulations can be combined or it can be defined separately for the modulations.
Combined GMSK and 8-PSK Multislot Class (6 bit field) This field indicates common multislot class for both GMSK and 8-PSK modulations. The field is coded as the binary representation of the multislot class defined in ETSI TS 101 376-5-2 [8]. NOTE: Not applicable for GMR-1 3G access technology.
GMSK Multislot Class (6 bit field) This field indicates multislot class for GMSK modulation. The field is coded as the binary representation of the multislot class defined in ETSI TS 101 376-5-2 [8]. NOTE: Not applicable for GMR-1 3G access technology.
8-PSK Multislot Class (6 bit field) This field indicates multislot class for 8-PSK modulation. The field is coded as the binary representation of the multislot class defined in ETSI TS 101 376-5-2 [8]. NOTE: Not applicable for GMR-1 3G access technology.

9.3.48 MES Multi-Mode and Multi-RAT Capability

The *MES Multi-Mode and Multi-RAT Capability* IE describes the RLC multi-mode and multi-RAT capabilities of the MES.

Table 9.3.48.1: *MES Multi-Mode and Multi-RAT Capability* information elements

```
< MES Multi-Mode and Multi-RAT Capability IE > ::=
    < Support of GERAN A/Gb : bit (1) >
    < Support of Multi-Carrier : bit (1) >
    < Support of UMTS FDD : bit (1) >
    < Support of UMTS 1,28 Mcps TDD : bit (1) >
    < Support of UMTS 3,84 Mcps TDD : bit (1) >
    < Support of CDMA2000 : bit (1) >
    < spare bit >*10;
```

Table 9.3.48.2: *MES Multi-Mode and Multi-RAT Capability* information element details

Support of GERAN A/Gb (1 bit field)
Support of Multi-Carrier (1 bit field)
Support of UMTS FDD (1 bit field)
Support of UMTS FDD (1 bit field)
Support of UMTS 1,28 Mcps TDD (1 bit field)
Support of UMTS 3,84 Mcps TDD (1 bit field)
Support of CDMA2000 (1 bit field)
These fields indicates the support of the associated multi-mode/multi-RAT capability.

bit	
1	
0	not supported
1	supported.

9.3.49 MES Measurement Capability

The *MES Measurement Capability* IE describes the measurement capability and SMS value of the MES. This IE is not applicable to the GMR-1 3G access technology and shall be specified according to the MES GSM terrestrial access technology capabilities.

Table 9.3.49.1: *MES Measurement Capability* information elements

```
< MES Measurement Capability IE > ::=
    {
    < MES Measurement Capability Length : bit (4)>
    < Extended Measurement Capability : bit (1) >
    < SMS Value : bit (4) >
    < SM Value : bit (4) >
    < spare bit >**;    -- Extension information may be truncated between released versions of the protocol
                           -- The receiver shall assume the value zero for any truncated bit
    } ;
```

Table 9.3.49.2: *MES Measurement Capability* information element details

MES Measurement Capability Length (4 bit field) This field is the binary representation of the length of the MES Measurement Capability IE in bits excluding the bits used for this length field. Range: 0 to 15.
Extended Measurement Capability (1 bit field) This field indicates the support of Extended Measurement. bit 0 Extended Measurement is not supported 1 Extended Measurement is supported.
SMS Value (4 bit field) The SMS Value field indicates the time needed for the MES to switch from one radio channel to another, perform a neighbour cell power measurement, and the switch from that radio channel to another radio channel. bits 4 3 2 1 0 0 0 0 1/4 timeslot (~144 microseconds) 0 0 0 1 2/4 timeslot (~288 microseconds) 0 0 1 0 3/4 timeslot (~433 microseconds) . . . 1 1 1 1 16/4 timeslot (~2 307 microseconds).
SM Value (4 bit field) The SM Value field indicates the time needed for the MES to switch from one radio channel to another and perform a neighbour cell power measurement. bits 4 3 2 1 0 0 0 0 1/4 timeslot (~144 microseconds) 0 0 0 1 2/4 timeslot (~288 microseconds) 0 0 1 0 3/4 timeslot (~433 microseconds) . . . 1 1 1 1 16/4 timeslot (~2 307 microseconds).

9.3.50 MES Positioning Capability

The *MES Positioning Capability* IE describes the supported positioning methods in GERAN *Iu mode*.

Table 9.3.50.1: *MES Positioning Capability* information elements

< MES Positioning Capability IE > ::=
{
< **MES Positioning Capability Length** : bit (4)>
< **OTD-A support** : bit (1) >
< **OTD-B support** : bit (1) >
< **GPS-A support** : bit (1) >
< **GPS-B support** : bit (1) >
< **GPS-C support** : bit (1) >
< spare bit >**; *-- Extension information may be truncated between released versions of the protocol*
-- The receiver shall assume the value zero for any truncated bit
} ;

Table 9.3.50.2: *MES Positioning Capability* information element details

MES Positioning Capability Length (4 bit field) This field is the binary representation of the length of the MES Positioning Capability IE in bits excluding the bits used for this length field. Range: 0 to 15.
OTD-A support (1 bit field) MES assisted E-OTD. **OTD-B support** (1 bit field) MES based E-OTD. **GPS-A support** (1 bit field) MES assisted GPS. **GPS-B support** (1 bit field) MES based GPS. **GPS-C support** (1 bit field) Conventional GPS. Each of these fields indicates the support of the associated positioning method. bit 1 0 not supported 1 supported.

9.3.51 MES Timers and Constants in RRC-Connected mode

This IE specifies timer values and constant values used by the MES in RRC-Connected mode.

Table 9.3.51.1: *MES Timers And Constants in RRC-Connected Mode* information elements

< MES Timers and Constants in RRC-Connected mode IE > ::= < **MES Timers and Constants Length** : bit (4) > { 0 | 1 < **T305** : **GRA AND CELL UPDATE TIMER IE** > } { 0 | 1 < **T314** : bit (3) > } { 0 | 1 < **T315** : bit (3) > } < spare bits >** } ;

Table 9.3.51.2: *MES Timers And Constants in RRC-Connected Mode* information element details

MES Timers and Constants Length (4 bit field) This field is the binary representation of the length of the *MES Timers and Constants in RRC-Connected Mode* IE in bits excluding the 4 bits used for this length field.
T305 (3 bit field) This field specifies the starting value of timer T305. This IE defined in clause 11.5.2.111a of ETSI TS 101 376-4-8 [7] System Information Segment 3G bis message.
T315 (3 bit field) This field specifies the starting value of timer T315. The following table specifies the coding: bit 3 2 1 0 0 0 0s 0 0 1 10s 0 1 0 30s 0 1 1 60s 1 0 0 180s --*default value* 1 0 1 600s 1 1 0 1200s 1 1 1 1800s.

T314 (3 bit field) This field specifies the starting value of timer T314. The following table specifies the coding: bit 3 2 1 0 0 0 0s 0 0 1 10s 0 1 0 30s 0 1 1 60s 1 0 0 180s --*default value* 1 0 1 600s 1 1 0 1200s 1 1 1 1800s.

9.3.51a MES Additional Timers and Constants in RRC-Connected mode

This IE specifies additional timer values and constant values used by the MES in RRC-Connected mode.

Table 9.3.51a.1: *MES Additional Timers And Constants in RRC-Connected Mode* information elements

< MES Additional Timers and Constants in RRC-Connected mode IE > ::= < **MES Additional Timers and Constants Length** : bit (6) > { 0 | 1 < **T3168** : bit (3) > } – { 0 | 1 < **T3192** : bit (3) > } { 0 | 1 < **T3202** : bit (6) > } { 0 | 1 < **BS_CV_MAX** : bit (9) > } { 0 | 1 < **USF_DELAY** : bit (3) > } < spare bits >** } ;

Table 9.3.51a.2: *MES Additional Timers And Constants in RRC-Connected Mode* information element details

MES Additional Timers and Constants Length (6 bit field) This field is the binary representation of the length of the *MES Additional Timers and Constants in RRC-Connected Mode* IE in bits excluding the 6 bits used for this length field.
T3168 (3 bit field) This IE defined in clause 11.5.2.111a of ETSI TS 101 376-4-8 [7] System Information Segment 3Gbis message.
T3192 (3 bit field) This IE defined in clause 11.5.2.111a of ETSI TS 101 376-4-8 [7] System Information Segment 3Gbis message.
T3202 (6 bit field) This IE defined in clause 11.5.2.111a of ETSI TS 101 376-4-8 [7] System Information Segment 3Gbis message.
BS_CV_MAX (9 bit field) This IE defined in clause 11.5.2.111a of ETSI TS 101 376-4-8 [7] System Information Segment 3Gbis message.
USF_DELAY (3 bit field) This IE defined in clause 11.5.2.111a of ETSI TS 101 376-4-8 [7] System Information Segment 3Gbis message.

9.3.52 MultiRate Configuration

Not used in GMR-1 3G.

9.3.53 Multislot Allocation

Not used in GMR-1 3G.

9.3.54 NAS Message

The *NAS Message* IE contains a non-access stratum message to be transferred transparently through GERAN.

Table 9.3.54.1: *NAS Message* information elements

< NAS Message IE > ::= < **Length of NAS Message** : bit (12) > < **NAS Message :** octet (1+val(Length of NAS Message)) > ;

Table 9.3.54.2: *NAS Message* information element details

Length of NAS Message (12 bit field) This field is used to calculate the length of the *NAS Message* IE excluding the bits used for this length field. Range: 0 to 4095.
NAS Message (variable length octet string) The first octet contains octet 1 of the NAS message, the second octet contains octet 2 of the NAS message and so on. See ETSI TS 101 376-4-7 [4].

9.3.55 NAS Synchronization Info

The *NAS Synchronization Info* IE is a container for non-access stratum information to be transferred transparently through GERAN.

Table 9.3.55.1: *NAS Synchronization Info* information elements

< NAS Synchronization Info IE > ::= < **NAS Synchronization Info** : bit (4) > > ;

Table 9.3.55.2: *NAS Synchronization Info* information element details

NAS Synchronization Info (4 bit field) This field contains NAS information to be transferred transparently through GERAN. The bits are numbered b1-b4, where b1 is the least significant bit.

9.3.56 NAS System Information GSM-MAP

This IE contains system information that belongs to the non-access stratum for a GSM-MAP type of PLMN. This information is transparent to RRC. It may contain either information specific to one CN domain (CS or PS) or information common for both CN domains.

Table 9.3.56.1: *NAS System Information GSM-MAP* information elements

< NAS System Information GSM-MAP IE > ::= < **Length of NAS System Information GSM-MAP** : bit (3) > < **NAS System Information GSM-MAP** : octet (1+val(Length of NAS System Information GSM-MAP)) >;

Table 9.3.56.2: *NAS System Information GSM-MAP* information element details

Length of NAS System Information GSM-MAP (3 bit field) This field is used to calculate the length in octets of the *NAS System Information GSM-MAP* IE excluding the bits used for this length field. Range: 0…7.
NAS System Information GSM_MAP (octet string) The first octet contains octet 1 of the NAS System Information element, the second octet contains octet 2 of the NAS system information element and so on. ETSI TS 101 376-4-8 [7].

9.3.57 Paging Cause

The *Paging Cause* IE indicates the cause of the paging request.

Table 9.3.57.1: *Paging Cause* information elements

< Paging Cause IE > ::= < **Paging Cause** : bit (3) >;

Table 9.3.57.2: *Paging Cause* information element details

Paging Cause (3 bit field)	
bit	
3 2 1	
0 0 0	Terminating Conversational Call
0 0 1	Terminating Streaming Call
0 1 0	Terminating Interactive Call
0 1 1	Terminating Background Call
1 0 0	Terminating High Priority Signalling
1 0 1	Terminating Low Priority Signalling
1 1 0	Terminating - cause unknown
1 1 1	Reserved.

9.3.58 Paging Record Type Identifier

The *Paging Record Type Identifier* IE indicates the identifier used in the Core Network Paging.

Table 9.3.58.1: *Paging Record Type Identifier* information elements

< Paging Record Type Identifier IE > ::= < **Paging Record Type Identifier** : bit (3) >;

Table 9.3.58.2: *Paging Record Type Identifier* information element details

Paging Record Type Identifier (3 bit field)	
bit	
3 2 1	
0 0 0	IMSI (GSM-MAP)
0 0 1	TMSI/PTMSI (GSM/MAP)
0 1 0	IMSI (DS-41)
0 1 1	TMSI (DS-41)
1 x x	reserved.

9.3.59 PDCP Capability

Indicates which algorithms and which value range of their parameters are supported by the MES.

The *PDCP Capability* IE indicates the algorithms and the value range of parameters supported by the MES PDCP.

Table 9.3.59.1: *PDCP Capability* information elements

```
< PDCP Capability IE > ::=
    {
        < PDCP Capability length : bit (8)>
        < Support for lossless serving RNC relocation : bit (1) > -- Serving BSC relocation for A/Gb mode
        {   < Support for RFC 2507 [i.6]: 0 >
        |   < Support for RFC 2507 [i.6]: 1 >
            < Max HC context space : bit (4) }
        {   < Support for RFC 3095 [i.5]: 0 >
        |   < Support for RFC 3095 [i.5]: 1 >
                { 0 | 1 < Maximum number of ROHC context sessions : bit (4) > }
                { 0 | 1 < Reverse decompression depth : bit (16) > }
                { < Support for RFC 3095 [i.5] context relocation: 0 >
                | < Support for RFC 3095 [i.5] context relocation: 1 > } }
        {   < Support for PEP : 0 >
        |   < Support for PEP : 1 >
                < Support for PEP Compression : bit (1) >
                < Support for PEP Handover : bit (1) >}
        {   < Support for Data Compression : 0 >  -- Data compression not supported
        |   < Support for Data Compression : 1 >
                < Data Compression Parameters : <Data Compression Parameters IE>}

        < spare bit >**;    -- Extension information may be truncated between released versions of the protocol
                            -- The receiver shall assume the value zero for any truncated bit
    };
```

Table 9.3.59.2: *PDCP Capability* information element details

PDCP Capability Length (8 bit field) This field is the binary representation of the length of the *PDCP Capability* IE in bits excluding the 8 bits used for this length field. Range: 0 to 255.
Support for lossless Serving RNC relocation (serving BSC relocation for A/Gb mode) (1 bit field) bit 1 0 Lossless Serving RNC relocation not supported 1 Lossless Serving RNC relocation supported.
Support for RFC 2507 [i.6] (1 bit field) **Support for RFC 3095 [i.5]** (1 bit field) bit 1 0 not supported 1 supported.
Max HC context space (4 bit field) This field indicates the maximum header compression context space supported by the MES, when IETF RFC 2507 [i.6] is supported and is encoded as follows: bit 4 3 2 1 0 0 0 0 512 bytes 0 0 0 1 1024 bytes 0 0 1 0 2048 bytes 0 0 1 1 4096 bytes 0 1 0 0 8192 bytes 0 1 0 1 16384 bytes 0 1 1 0 32768 bytes 0 1 1 1 65536 bytes 1 0 0 0 131072 bytes All other values are reserved.

Maximum number of ROHC context sessions (4 bit field) This field indicates the maximum number of ROHC context sessions when IETF RFC 3095 [i.5] is supported and is encoded as shown below. If this field is not present, the MES shall use the default value of 16: bit 4 3 2 1 0 0 0 0 2 sessions 0 0 0 1 4 sessions 0 0 1 0 8 sessions 0 0 1 1 12 sessions 0 1 0 0 16 sessions 0 1 0 1 24 sessions 0 1 1 0 32 sessions 0 1 1 1 48 sessions 1 0 0 0 64 sessions 1 0 0 1 128 sessions 1 0 1 0 256 sessions 1 0 1 1 512 sessions 1 1 0 0 1024 sessions 1 1 0 1 16384 sessions 1 1 1 0 reserved 1 1 1 1 reserved.
Reverse decompression depth (16 bit field) This field describes the reverse compression depth as an integer from 0 - 65 535. If the IE is not present, the default value of 0 (reverse decompression is not supported) is used.
Support for PEP (1 bit field) bit 1 0 PEP not supported 1 PEP supported.
Support for PEP Compression (1 bit field) bit 1 0 PEP compression not supported 1 PEP compression supported.
Support for PEP Handover (1 bit field) bit 1 0 PEP handover not supported 1 PEP handover supported.
Support for IETF RFC 3095 [i.5] **context relocation** (1 bit field) bit 1 0 Support for IETF RFC 3095 [i.5] context relocation not supported 1 Support for IETF RFC 3095 [i.5] context relocation supported.
Support for Data Compression (1 bit field) bit 1 0 Data compression not supported 1 Data compression supported.
Data Compression Parameters This IE is defined in clause 9.3.59a.

9.3.59a Data Compression Parameters

The *Data Compression Parameters* IE contains information about the Data Compression Methods.

Table 9.3.59a.1: *Data Compression Parameters* information elements

```
< Data Compression Parameter IE > ::=
    {
        < Data Compression Parameters Length : bit (6)>
        {   < V.44 Data Compression : 0 >
        |   < V.44 Data Compression : 1 >
                {0 | 1 < V.44 Parameters: <V.44 Parameters Struct>}} – 0 indicates default parameters
         < spare bit >**;   -- Extension information may be truncated between released versions of the protocol
                            -- The receiver shall assume the value zero for any truncated bit
    };
```

```
< V.44 Parameters  struct > ::=
    < N2 : bit (11) >
    < N7 : bit (9) >
    < N8 : bit (4) >
    < N4 : bit (8) >
    < N5 : bit (4) >
    < C1 : bit (4) >
    < C2 : bit (3) >
    < C3 : bit (8) >
    < C4 : bit (16) >
    < C5 : bit (4) >;
```

Table 9.3.59a.2: *Data Compression Parameters* information element details

Data Compression Parameters Length (6 bit field) This field is the binary representation of the length of the Data Compression Parameters IE in octets excluding the octet used for this length field. Range: 0 to 63.
V.44 Data Compression (1 bit field) bit 1 0 V.44 Data Compression Not supported 1 V.44 Data Compression Supported
N2 (11 bit field) Total number of codewords (node-tree) in octets. Number of codewords shall be greater than the maximum length of the data packet
N7 (9 bit field) Maximum String Length
N8 (4 bit field) Length of history in units of N2
N4 (8 bit field) Number of characters in alphabet
N5 (4 bit field) Number of control code and first available codewords
C1 (4 bit field) Initial values
C2 (3 bit field) Initial current codewords size bits
C3 (8 bit field) Initial threshold for changing codewords size in bits, 2^{C2}
C4 (16 bit field) Initial "current history position"
C5 (4 bit field) Initial current ordinal size in bits

9.3.60 PDCP Info

The *PDCP Info* IE contains information about the PDCP protocol.

Table 9.3.60.1: *PDCP Info* information elements

```
< PDCP Info IE > ::=
    {
        < PDCP mode : bit (1) >
        {    < Lossless Serving RNC relocation support : 0 >
        |    < Lossless Serving RNC relocation support : 1 >
             < Max PDCP SN : bit (1) > }
        < PDCP PDU header : bit (1) >
         < Service Class : bit(4) >
         < PDU Type : bit(1) >
         { 0 | 1 < Interactive class priority : bit (2) > }
         {  < Support for PEP: 0>
         |
             <Support for PEP: 1>
                 < Support for PEP Handover : bit (1) > }
        { 0 | 1 < Header compression information List : bit(3) >
        < Header compression information struct : < Header compression information struct > > } } *(1+val(Header
compression information List))
        {    < Data compression  support : 0 >
        |    < Data compression  support : 1 >
             { 0 | 1 <Downlink Data Compression Parameters : <Data Compression Parameters IE >>} -- 0 indicates
used of V.44 data compression with default parameters
             { 0 | 1 <Uplink Data Compression Parameters : <Data Compression Parameters IE >> } -- 0 indicates used
of V.44 data compression with default parameters
    };

< Header compression information struct > ::=
    < Header Compression Information struct length : bit (14) >
    { 000                        -- Header compression according to IETF RFC 2507 [i.6]
        < F_MAX_PERIOD : bit (16) >
        < F_MAX_TIME : bit (8) >
        < MAX_HEADER : bit (16) >
        < TCP_SPACE : bit (8) >
        < NON_TCP_SPACE : bit (16) >
        < EXPECT_REORDERING : bit (1) > }
    | 001                        -- Header compression according to IETF RFC 3095 [i.5]

        < Profiles List : bit (4) >
        < Profile instance : bit (2) > * (1 + val (Profiles List))
        { 0 | 1  < UPLINK: bit (1) >
                < CID inclusion info : bit (1) >
                { 0 | 1 < Max_CID : bit (14) > }
                { 0 | 1 < MRRU : bit (16) >
                        < Packet Sizes Allowed List : bit (4) >
                        < PACKET_SIZES_ALLOWED: bit (11) > * (1 + val (Packet Sizes Allowed List)) }
        { 0 | 1 < DOWNLINK: bit (1) >
            < CID inclusion info : bit (1) >
            { 0 | 1 < Max_CID : bit (14) > }
        }
        { 0 | 1 < Reverse_Decompression_Depth : bit (16) > }}
    | 010}                       -- PEP
    !    < Message escape : { 01 bit(1) | 1 bit (2) } bit** = < no string > > ;
```

Table 9.3.60.2: *PDCP Info* information element details

PDCP mode (1 bit field) bit 1 0   non-transparent 1   transparent.
Lossless Serving RNC relocation support (1 bit field) Lossless Serving RNC relocation is supported when both the RLC is in Acknowledged mode meaning when the IE "RLC mode" is "Acknowledged" bit 1 0   Lossless Serving RNC relocation not supported 1   Lossless Serving RNC relocation supported.

Max PDCP SN (1 bit field) This field indicates the maximum PDCP Sequence Number supported, when the lossless Serving RNC relocation is supported. bit 1 0 255 1 65 535.
PDCP PDU header (1 bit field) bit 1 0 not present 1 present.
Service Class (4 bit field) 0001 Robust VOIP 0010 Conversational 0011 Streaming 0100 Interactive 0101 Background 0110 PTT spectrally-efficient voice – unicast 0111 PTT spectrally-efficient voice – multicast 1000 to 1111 - Spare.
PDU Type (1 bit field) 0 IPv4 1 IPv6.
Priority of Interactive Class (2 bit field) 00 - Signalling 01 - Highest priority of other interactive 02 - next highest 03 - lowest.
Header compression information List (3 bit field) This field is the binary representation of the number of header compression information. Range: 0 to maxPDCPAlgoType-1. NOTE: Link with the PDCP instances to be clarified in the procedure.
Header compression information struct The Header compression information struct is repeated up to maxPDCPalgoType times.
Header Compression Information struct length (14 bit field) This field is the binary representation of the length of the Header Compression Information struct excluding the bits used for this length field. Range: 0 to 4 095.
F_MAX_PERIOD (16 bit field) This field is a binary representation of the maximum number of compressed non-TCP headers that may be sent without sending a full header. Range 1 to 65 535.
F_MAX_TIME (8 bit field) This field is a binary representation of the maximum time in seconds that a compressed headers may not be sent after sending last full header. Range 1 to 255.
MAX_HEADER (16 bit field) This field is a binary representation of the largest header size in octets that may be compressed. Range 60 to 65 535.
TCP_SPACE (8 bit field) This field is a binary representation of the maximum CID value for TCP connections. Range 3 to 255.
NON_TCP_SPACE (16 bit field) This field is a binary representation of the maximum CID value for non-TCP connections. Range 3 to 65 535.
EXPECT_REORDERING (1 bit field) bit 1 0 reordering not expected, 1 reordering expected.
UPLINK (1 bit field) bit 1 0 does not indicate the necessary information elements for UL 1 indicates the necessary information elements for UL.

DOWNLINK (1 bit field)
bit
1
0 does not indicate the necessary information elements for DL
1 indicates the necessary information elements for DL.

CID inclusion info
This field configures which method shall be used to carry IETF RFC 3095 [i.5] CID values:
bit
1
0 PDCP Header
1 IETF RFC 3095 [i.5] packet format

Max_CID
This field describes the highest context ID number to be used by the MES compressor. If this field is not present then the default value of 15 is used.
This field is encoded as a binary number.
Range 0 to 16383. A value of 0 shall be counted as reserved.

Profiles List (4 bit field)
This field is a binary representation of the number of ROHC profiles supported by the GERAN decompressor.
Range 0 to maxROHC-Profiles-1.

Profile instance
This field is a binary representation of the supported profile types.
Range 1 to 3. Any other value received shall be treated as reserved.

MRRU
This field describes the Maximum Reconstructed Reception Unit. When RLC is configured in non-transparent mode, this field is set to the 0 and the segmentation function of the IETF RFC 3095 [i.5] shall not be used by the MES. If this IE is not present, the default value of 0 shall be used (segmentation function shall not be used by the MES).
The field is encoded as a binary number.
Range 0 to 65 535.

Packet Sizes Allowed List (4 bit field)
This field is the binary representation of the list of packet sizes that are allowed to be produced by IETF RFC 3095 [i.5].

PACKET_SIZES_ALLOWED (11 bit field)
This field is the binary representation of the packets sizes in octets as defined by MES compressor.
Range 2 to 1 500. Any other received values shall be treated as reserved.

Reverse decompression depth (16 bit field)
This field describes the reverse compression depth as an integer from 0 to 65 535. Also it determines whether reverse decompression should be used or not and the maximum number of packets that can be reverse decompressed by the MES decompressor. If the IE is not present, the default value of 0 (reverse decompression shall not be used) is used.
Range 0 to 65 535.

Support for PEP (1 bit field)
bit
1
0 PEP compression not supported
1 PEP compression supported.

Support for PEP Handover (1 bit field)
bit
1
0 PEP handover not supported
1 PEP handover supported.

Support for Data Compression (1 bit field)
bit
1
0 Data Compression not supported
1 Data Compression supported.

Downlink Data Compression Parameters
This IE is defined in clause 9.3.59a.

If Data Compression is supported and this IE is not included, then V.44 data compression with default compression parameters shall be used.

Uplink Data Compression Parameters
This IE is defined in clause 9.3.59a.

If Data Compression is supported and this IE is not included, then V.44 data compression with default compression parameters shall be used.

9.3.61 PDCP SN Info

The *PDCP SN Info* IE indicates the PDCP sequence number that the sender of the message is expecting to be received next.

Table 9.3.61.1: *PDCP SN Info* information elements

< PDCP SN Info IE > ::= < **PDCP SN Info :** bit (16) >;

Table 9.3.61.2: *PDCP SN Info* information element details

PDCP SN Info (16 bit field) The *PDCP SN Info* field is encoded as a binary number. Range 0 to 65 535.

9.3.62 Physical Channel Configuration

The *Physical Channel Configuration* IE describes the dedicated and the shared physical resources.

Table 9.3.62.1: *Physical Channel Configuration* information elements

< Physical Channel Configuration IE > ::= {0 | 1 < **Uplink Physical Channel** : < Physical Channel Description IE > >} {0 | 1 < **Downlink Physical Channel** : < Physical Channel Description IE > > }

Table 9.3.62.2: *Physical Channel Configuration* information element details

Physical Channel Description This IE is defined in clause 9.3.62a.

9.3.62a Physical Channel Description

The Physical Channel Description IE describes the physical resources for DCH/PDCH independent of the direction.

Table 9.3.62a.1: *Physical Channel Description* information elements

< Physical Channel Description IE > ::=
{
0 -- DCH Description :
{0 | 1< **Power Control Parameter** : bit(6)>} -- Used in uplink only
{0 | 1< **Power Control Synch Offset** : bit (2) >} -- Used in uplink only
< **DCH Channel MCS Info**: <DCH MCS IE>
< **Channel Info** : <Channel Info IE >>
{0 <**MAC Slot Allocation**: bit(8))> | 1 < **Slot Allocation** : Slot Allocation IE >}
{0 | 1< **Frequency Parameters** : <Directional Frequency Parameters IE >>) -- used with UE Software Version Indicator 0x1 or higher; 0 implies that the frequency parameters are the same as what is currently allocated to the MES. The field is mandatory if the already allocated frequency bandwidth is not 31,25 kHz.
< **Frequency Parameters** : <Directional Frequency Parameters IE >>-- used with UE Software Version Indicator 0x0
{ 0 | 1 -- Conditional, used for Handover
<**Handover struct** : <Handover struct>>}

| 1 -- PDCH Description :
{0 | 1 < **Power Control Parameter** : bit(6)} -- Used in uplink only
{0 | 1 < **PDCH Channel MCS Info**: < PDCH MCS IE>>} -- Used in uplink only
{0 | 1 < **Frequency Parameters** : < Directional Frequency Parameters IE >>}
{0 | 1 < **PDCH Uplink Organization**: <PDCH Uplink Organization IE>> -- Used in uplink only
{0 | 1 < **MAC Slot Allocation** : bit(8) }
{0 | 1 < **TFI** : bit(8) > }
{0 | 1 < **Uplink Status Flag**: bit (8) > } -- Used in uplink only; 0 indicates a fixed allocation every uplink frame as indicated by MAC Slot Allocation
{ 0 | 1-- Conditional, used for Handover
<**Handover struct** : <Handover struct>>}
{ 0 | 1 <PDCH Channel Info < PDCH Channel Info IE>> <**Frequency Offset**: bit(3)>} -- used with UE Software Version Indicator 0x1 or higher; used when it is a fixed uplink allocation
};

< Directional Frequency Parameters IE> ::=
{ < **Bandwidth:** bit (3) >
< **ARFCN** : bit (11) >
< **Reserved**: bit(1) > };

< Handover struct > ::=
< **Handover Reference :** < Handover Reference IE > >
{ 0 | 1 < **Timing Advance** : < Packet Link Synchronization Parameters IE > > }
{ 0 | 1 < **GMR-1 Spotbeam Description** : < GMR-1 Spotbeam Description IE >> } ;

Table 9.3.62a.2: *Physical Channel* Description information element details

Power Control Parameter (6 bit field) This field is defined in ETSI TS 101 376-4-12 [13]. The parameter specifies the initial value of the power control field (PAR value) to be applied by the MES for the channel assignment.
Power Control Synch Offset (2 bit field) This field is defined in ETSI TS 101 376-4-12 [13].
Channel Info This IE is defined in ETSI TS 101 376-4-12 [13].
MAC Slot Allocation (8 bit field) This field is defined in ETSI TS 101 376-4-12 [13].
Slot Allocation This IE is defined in ETSI TS 101 376-4-12 [13].
TFI (8 bit field) This IE is defined in ETSI TS 101 376-4-12 [13].
Uplink Status Flag (8 bit field) This IE is defined in ETSI TS 101 376-4-12 [13]. If this field is not present for an Uplink TBF the USF value will be the same as uplink TFI.
PDCH Channel MCS Info PDCH MCS IE is defined in ETSI TS 101 376-4-12 [13].
DCH Channel MCS Info DCH MCS IE is defined in ETSI TS 101 376-4-12 [13].

Frequency Parameters When used in uplink physical channel description, either Frequency Parameters field is present or PDCH Uplink Organization field, but not both.
Bandwidth (3 bit field) This field represents the bandwidth of the allocated channel in multiples of 31,25 kHz. See ETSI TS 101 376-5-5 [11].
ARFCN (11 bit field) This field is the binary representation of the absolute radio frequency channel number (ARFCN) for the PDCH as defined in ETSI TS 101 376-5-5 [11]. Range 0 to2047.
Handover Reference This IE is defined in clause 9.3.34.
Timing Advance Packet Link Synchronization Parameters IE is defined in ETSI TS 101 376-4-12 [13].
GMR-1 Spotbeam Description This IE is defined in clause 9.3.7a.
PDCH Uplink Organization This IE is defined in ETSI TS 101 376-4-12 [13]. PDCH Uplink Organization shall be present when *Physical Channel* Description is used in Radio Bearer Reconfiguration message and the downlink bandwidth is 312,5 kHz. The PDCH Uplink Organization field provides the return frequency set required by the UT when the downlink is 312,5 kHz.
PDCH Channel Info This IE is defined in ETSI TS 101 376-4-12 [13].
Frequency Offset (3 bit field) This field is the frequency offset in 31,25 kHz of the assigned channel from the lowest frequency boundary assigned on the uplink. If the frequency band assigned on the uplink is not contiguous per PDCH uplink organization. The frequency offset does not account for the frequency band discontinuities.

9.3.63 PLMN Identity

The *PLMN Identity* IE identifies a Public Land Mobile Network for a GSM-MAP type of PLMN. The PLMN identity digits are defined in ETSI TS 101 376-3-3 [2].

Table 9.3.63.1: *PLMN Identity* information elements

< PLMN Identity IE > ::= < **MCC_digit_1** : bit (4) > < **MCC_digit_2** : bit (4) > < **MCC_digit_3** : bit (4) > < **MNC_digit_1 :** bit (4) > < **MNC_digit_2 :** bit (4) > { 0 | 1 < **MNC_digit_3 :** bit (4) > } ;

Table 9.3.63.2: *PLMN Identity* information element details

MCC_digit_1 (4 bit field) **MCC_digit_2** (4 bit field) **MCC_digit_3** (4 bit field) These fields are the binary representation of the MCC digit number X, where X goes from 1 to 3. Range: 0 to 9.
MNC_digit_1 (4 bit field) **MNC_digit_2** (4 bit field) **MNC_digit_3** (4 bit field) These fields are the binary representation of the MNC digit number X, where X goes from 1 to 2 or 3. Range: 0 to 9. The presence of a third MNC digit depends on the value of the MCC.

9.3.64 Power Command

Not used in GMR-1 3G.

9.3.65 Power Command and Access Type

Not used in GMR-1 3G.

9.3.66 Void

9.3.67 Void

9.3.68 Void

9.3.69 Protocol Error Cause

The *Protocol Error Cause* IE indicates the cause of the incomprehension of a message or information.

Table 9.3.69.1: *Protocol Error Cause* information elements

< Protocol Error Cause IE > ::= < **Protocol Error Cause :** bit (3) >;

Table 9.3.69.2: *Protocol Error Cause* information element details

Protocol Error Cause (3 bit field) bit 3 2 1 0 0 0 CSN.1 violation or encoding error 0 0 1 Message type non-existent or not implemented 0 1 0 Message not compatible with receiver state 0 1 1 Information element value not comprehended 1 0 0 Message content part error 1 0 1 Message extension not comprehended All other values are reserved.

9.3.70 Protocol Error Indicator

The *Protocol Error Indicator* IE indicates whether a message was transmitted due to a protocol error or not.

Table 9.3.70.1: *Protocol Error Indicator* information elements

< Protocol Error Indicator IE > ::= < **Protocol Error Indicator** : bit (1) >;

Table 9.3.70.2: *Protocol Error Indicator* information element details

Protocol Error Indicator (1 bit field) bit 1 0 False - no protocol error occurred 1 True - protocol error occurred.

9.3.71 Protocol Error Information

The *Protocol Error Information* IE contains diagnostic information returned by the receiver of a message that was not completely understood.

Table 9.3.71.1: *Protocol Error Information* information elements

< Protocol Error Information IE > ::= { 0 < **Protocol Error Cause :** < Protocol Error Cause IE > > | 1 } ; -- *reserved*

Table 9.3.71.2: *Protocol Error Information* information element details

Protocol Error Cause This IE is defined in clause 9.3.69.

9.3.72 RAB Identity

The *RAB Identity* IE uniquely identifies a radio access bearer within a CN domain.

Table 9.3.72.1: *RAB Identity* information elements

< RAB Identity IE > ::= { 0 < **RAB_Identity_GSM-MAP** : bit (8) > | 1 < **RAB_Identity_ANSI-41** : bit (8) > } ;

Table 9.3.72.2: *RAB Identity* information element details

RAB_Identity_GSM-MAP (8 bit field) This field indicates the RAB identity with a GSM-MAP-type PLMN. See ETSI TS 101 376-4-8 [7].
RAB_Identity_ANSI-41 (8 bit field) This field indicates the RAB identity with an ANSI-41-type PLMN. See ETSI TS 101 376-4-8 [7].

9.3.73 RAB Info

The *RAB Info* IE contains information used to uniquely identify a radio access bearer.

Table 9.3.73.1: *RAB Info* information elements

< RAB Info IE > ::= < **RAB Identity** : < RAB Identity IE > > < **CN Domain Identity** : < CN Domain Identity IE> > { 0 | 1 < **NAS Synchronization Indicator** : < NAS Synchronization Info IE > > } { 0 | 1 < **Upper Layer Bearer Info** : <Upper Layer Bearer Info IE>> } < **Re-Establishment Timer** : < Re-Establishment Timer IE > > { 0 | 1 < **RAB Info to Relocate** : < RAB Info to Relocate IE > > };

Table 9.3.73.2: *RAB Info* information element details

RAB Identity This IE is defined in clause 9.3.72.
CN Domain Identity This IE is defined in clause 9.3.15.
NAS Synchronization Indicator The *NAS Synchronization Info* IE is defined in clause 9.3.55.
Upper Layer Bearer Info This IE is defined in clause 9.3.135.
Re-Establishment Timer This IE is defined in clause 9.3.88.
RAB Info to Relocate This IE is defined in clause 9.3.74a.

9.3.74 RAB Info Post

The *RAB Info Post* IE contains information used to uniquely identify a radio access bearer.

Table 9.3.74.1: *RAB Info Post* information elements

< RAB Info Post IE> ::= < **RAB Identity** : < RAB Identity IE > > < **CN Domain Identity** : < CN Domain Identity IE > > { 0 | 1 < **NAS Synchronization Indicator** : < NAS Synchronization Info : bit (4) > > };

Table 9.3.74.2: *RAB Info Post* information element details

RAB Identity This IE is defined in clause 9.3.72.
CN Domain Identity This field is defined in clause 9.3.15.
NAS Synchronization Indicator The *NAS Synchronization Info* field is defined in clause 9.3.55.

9.3.74a RAB Info to Relocate

The *RAB Info to Relocate* IE contains the state information radio access bearer(s) to be relocated to another SRNS.

Table 9.3.74a.1: *RAB Info to Relocate* information elements

< RAB Info to Relocate IE > ::= { 0 | 1 < **Multicast binding info** : <Multicast Binding Info struct>> } { 0 | 1 < **PTT binding info** : <PTT Binding Info struct>> };
< Multicast Binding Info struct> ::= { < **Multicast Group Id** : bit (32) > < **Tunnel Port** : bit (16) > < **IPv4 PDP Address** : bit (32) > { 0 | 1 < **SSN** : bit (4) > } – Applicable only for relocation 0 }; – Available for extension
< PTT Binding Info struct> ::= { { 0 | 1 < **PTT Session Key** : bit (32) > } { 0 | 1 < **PTT Session Mode** : bit (2) > } { 0 | 1 < **PTT Session State** : bit (2) > } – Applicable only for relocation 0 }; – Available for extension

Table 9.3.74a.2: *RAB Info to Relocate* information element details

Multicast Group Id (32 bit field) This field identifies the IPv4 multicast group to which the MES wishes to bind the RAB. It contains the Class D IPv4 address of the multicast group in network byte order.
Tunnel Port (16 bit field) This field identifies a unique UDP port to use for the tunnel port. It contains a UDP port number in network byte order.
IPv4 PDP Address (32 bit field) This field identifies the IPv4 PDP address of the MES or TE. It contains the IPv4 address in network byte order.
SSN (4 bit field) This field contains the tunnel session number (range: 0-15).
PTT Session Key (32 bit field) This field identifies the PTT session to which the MES wishes to bind the RAB. . It contains the 32-bit checksum of the PTT group identifier, if applicable.
PTT Session Mode (2 bit field) This field identifies the mode in which PTT session will be used. Bit 2 1 0 0 Pre-established, unicast 0 1 Pre-established, multicast-capable 1 0 On-demand, unicast 1 1 On-demand, multicast-capable
PTT Session State (2 bit field) This field identifies the resource allocation state of the PTT session. Bit 2 1 0 0 Pre-established 0 1 Active 1 0 Active, talker 1 1 Reserved

9.3.75 RAB Information for Setup

The *RAB Information for Setup* IE indicates the radio access bearer(s) to setup.

Table 9.3.75.1: *RAB Information for Setup* information elements

< RAB Information for Setup IE > ::= < **RAB Info** : < RAB info IE > > < **PDCP - RB Information to Setup List** : bit (3) > < **PDCP - RB Information to Setup** : < PDCP - RB Information to Setup IE > > *(1+val(PDCP - RB Information to Setup List)) };

Table 9.3.75.2: *RAB Information for Setup* information element details

RAB Info This IE is defined in clause 9.3.73.
PDCP - RB Information to Setup List (3 bit field) This field is the binary representation of the number of RB to setup in a RAB. Range: 0 to maxRBperRAB-1.
PDCP - RB Information to Setup This IE is defined in clause 9.3.84a. This IE can be repeated up to maxRBperRAB times within one RAB information for setup IE.

9.3.75a RAB Information for Handover

The *RAB Information for Handover* IE indicates the radio access bearer(s) to handover.

Table 9.3.75a.1: *RAB Information for Handover* information elements

< RAB Information for Handover IE > ::= < **RAB Info** : < RAB info IE > > {0|1< **PDCP - RB Information to Setup List** : bit (3) > < **PDCP - RB Information to Setup** : < PDCP - RB Information to Setup IE > > *(1+val(PDCP - RB Information to Setup List)) }};

Table 9.3.75a.2: *RAB Information for Setup* information element details

RAB Info This IE is defined in clause 9.3.73.
PDCP - RB Information to Setup List (3 bit field) This field is the binary representation of the number of RB to setup in a RAB. Range: 0 to maxRBperRAB-1.
PDCP - RB Information to Setup This IE is defined in clause 9.3.84a. This IE can be repeated up to maxRBperRAB times within one RAB information for setup IE.

9.3.76 RAB Information to Reconfigure

The *RAB Information to Reconfigure* IE indicates the radio access bearer(s) to reconfigure.

Table 9.3.76.1: *RAB Information to Reconfigure* information elements

< RAB Information to Reconfigure IE > ::= < **RAB Identity** : < RAB Identity IE > > < **CN Domain Identity** : < CN Domain Identity IE > > < **NAS Synchronization Indicator** : < NAS synchronization Info : bit (4) > > { 0 | 1 < **Upper Layer Bearer Info** : <Upper Layer Bearer Info IE>> };

Table 9.3.76.2: *RAB Information to Reconfigure* information element details

RAB Identity This IE is defined in clause 9.3.72.
CN Domain Identity This IE is defined in clause 9.3.15.
NAS Synchronization Indicator The *NAS Synchronization Info* IE is defined in clause 9.3.55.
Upper Layer Bearer Info This IE is defined in clause 9.3.135.

9.3.77 RB Activation Time Info

The *RB Activation Time Info* IE contains the time, in terms of RLC sequence numbers, when a certain configuration shall be activated, for a number of radio bearers.

Table 9.3.77.1: *RB Activation Time Info* information elements

< RB Activation Time Info IE > ::= { 0 | 1 < **Repeated Radio Bearer Activation Time list** : bit (5) **>** < **Repeated Radio Bearer Activation Time** : < Radio Bearer Activation Time struct > > } *(1+val(Repeated Radio Bearer Activation Time list)) } ;
< Repeated Radio Bearer Activation Time struct > ::= { < **RB Identity** : < RB Identity IE > > { 0 | 1 { 00 < **GMPRS RLC Sequence Number** : bit (10) > | 01 < **Reserved** > | 10 < **DCCH TBF mode RLC Sequence Number** : bit (7) > | 11 < **Reserved>** }} } ;

Table 9.3.77.2: *RB Activation Time Info* information element details

Repeated radio bearer activation time list (5 bit field) This field is the binary representation of the number of RBs. Range: 0 to maxRB-1.
Repeated radio bearer activation time struct The Repeated radio bearer activation time struct is repeated up to maxRB times.
DCCH TBF mode RLC Sequence Number (7 bit) This IE indicates the RLC sequence number till the receiving entity has to wait to apply the new configuration.
GMPRS RLC Sequence Number (10 bit field) This field indicates the RLC send state variable for normal TBF mode GMPRS MES with radio bearers mapped on RLC AM and UM. This field is encoded as a binary number. Range: 0 to 1 023.

9.3.78 RB COUNT-C Information

The *RB COUNT-C Information* IE indicates RB COUNT-C values for a radio bearer.

Table 9.3.78.1: *RB COUNT-C Information* information elements

< RB COUNT-C Information IE > ::= < **RB Identity** : < RB Identity IE > > < **COUNT-C-Uplink** : bit (32) > < **COUNT-C-Downlink** : bit (32) >;

Table 9.3.78.2: *RB COUNT-C Information* information element details

RB Identity This IE is defined in clause 9.3.80.
COUNT-C-Uplink (32 bit field) This field is the binary representation of the amount of data sent in Uplink. See ETSI TS 133 102 [23].
COUNT-C-Downlink (32 bit field) This field is the binary representation of the amount of data sent in Downlink. See ETSI TS 133 102 [23].

9.3.79 RB COUNT-C MSB Information

The *RB COUNT-C MSB Information* IE indicates the MSB of the COUNT-C values of the radio bearer.

Table 9.3.79.1: *RB COUNT-C MSB Information* information elements

< RB COUNT-C MSB Information IE > ::= < **RB Identity** : bit (5) > < **COUNT-C-MSB-Uplink** : bit (25) > < **COUNT-C-MSB-Downlink** : bit (25) >;

Table 9.3.79.2: *RB COUNT-C MSB Information* information element details

RB Identity This IE is defined in clause 9.3.80.
COUNT-C-MSB-Uplink (25 bit field) This field indicates 25 MSBs from the COUNT-C-uplink associated to this RB. See ETSI TS 133 102 [23].
COUNT-C-MSB-Downlink (25 bit field) This field indicates 25 MSBs from the COUNT-C-downlink associated to this RB. See ETSI TS 133 102 [23].

9.3.80 RB Identity

The *RB Identity* IE indicates the identification number for the radio bearer affected by a certain message.

Table 9.3.80.1: *RB Identity* information elements

< RB Identity IE > ::= < **RB Identity** : bit (5) >;

Table 9.3.80.2: *RB Identity* information element details

RB Identity (5 bit field) The *RB Identity* field is encoded as a binary number. Range: 0 to 31. Values 0-4 shall only be used for signalling radio bearers.

9.3.80a RRB Identity

The *RRB Identity* IE indicates the identification number for the reduced radio bearer affected by a certain message.

Table 9.3.80a.1: R*RB Identity* information elements

< RRB Identity IE > ::= < **RRB Identity** : bit (3) >;

Table 9.3.80a.2: *RRB Identity* information element details

RRB Identity (3 bit field) The *RRB Identity* field is encoded as a binary number. Range: 0 to 7.

9.3.81 RB Information to Be Affected

The *RB Information to Be Affected* IE indicates identity of the RB to be affected by the message.

Table 9.3.81.1: *RB Information to Be Affected* information elements

< RB Information to Be Affected IE > ::= < **RB Identity** : < RB Identity IE > >;

Table 9.3.81.2: *RB Information to Be Affected* information element details

RB Identity (5 bit field) This field is defined in clause 9.3.80.

9.3.82 RB Information to Reconfigure

The *RB Information to Reconfigure* IE indicates the radio bearer to reconfigure.

Table 9.3.82.1: *RB Information to Reconfigure* information elements

< RB Information to Reconfigure IE > ::= < **RB Information to Reconfigure length** : bit (8) > < **RB Identity** : < RB Identity IE > > { 0 | 1 < Uplink **RLC Info** : < RLC info IE> > } { 0 | 1 < Downlink **RLC Info** : < RLC info IE> > } { 0 | 1 < **RB Stop/Continue** : bit (1) > } { 0 | 1 < **RB Mapping Info :** < RB Mapping Info IE > > } -- *Release 6* extension < spare bits> **; -- reserved for future use

Table 9.3.82.2: *RB Information to Reconfigure* information element details

RB Information to Reconfigure length (8 bit field) This field is the binary representation of the length of the IE *RB Information to Reconfigure* in bits excluding the bits used for this length field. Range: 0 to 255.
RB Identity This IE is defined in clause 9.3.80.
RB Stop/Continue (1 bit field) bit 1 0 stop RB 1 continue RB.
RB Mapping Info This IE is defined in clause 9.3.117.

9.3.82a PDCP - RB Information to Reconfigure

The *PDCP - RB Information to Reconfigure* IE indicates the radio bearer to reconfigure.

Table 9.3.82a.1: *PDCP - RB Information to Reconfigure* information elements

< PDCP - RB Information to Reconfigure IE > ::= { 0 | 1 < **PDCP Info** : < PDCP Info IE > > } { 0 | 1 < **PDCP SN Info** : < PDCP SN Info > > } < **RB Information to Reconfigure List** : bit (3) > < **RB Information to Reconfigure** : < RB Information to Reconfigure IE > > *(1+val(RB Information to Reconfigure List)) };

Table 9.3.82a.2: *RB Information to Reconfigure* information element details

PDCP Info This IE is defined in clause 9.3.60.
PDCP SN Info This IE is defined in clause 9.3.61. The PDCP sequence number info from the network is present only in case of lossless serving RNC relocation.
RB Information to Reconfigure This field is defined in clause 9.3.82.

9.3.83 RB Information to Release

The *RB Information to Release* IE indicates identity of the RB to be released.

Table 9.3.83.1: *RB Information to Release* information elements

< RB Information to Release IE > ::=   < **RB Identity :** < RB Identity IE > >;

Table 9.3.83.2: *RB Information to Release* information element details

RB Identity This field is defined in clause 9.3.80.

9.3.84 RB Information to Setup

The *RB Information to Setup* IE contains information about the RB to setup.

Table 9.3.84.1: *RB Information to Setup* information elements

< RB Information to Setup IE > ::=
    < **RB Information to Setup length** : bit (8) >
    < **RB Identity** : < RB Identity IE > >
    {0 | 1 < Uplink **RLC Info :** < RLC Info IE > > }
    {0 | 1 < Downlink **RLC Info :** < RLC Info IE > > }
    {0 | 1 < **RB Mapping Info** : < RB Mapping Info IE > > } -- *Release 6* extension
    < spare bits> **; -- reserved for future use

Table 9.3.84.2: *RB Information to Setup* information element details

RB Information to Setup length (8 bit field) This field is the binary representation of the length of the IE *RB Information to Setup* in bits excluding the bits used for this length field. Range: 0 to 255.
RB Identity This IE is defined in clause 9.3.80.
RLC Info This IE is defined in clause 9.3.91.
RB Mapping Info This IE is defined in clause 9.3.117.

9.3.84a PDCP - RB Information to Setup

The PDCP - *RB Information to Setup* IE contains information about the RB to setup.

Table 9.3.84a.1: *PDCP - RB Information to Setup* information elements

< PDCP - RB Information to Setup IE > ::=   <**PDCP Info** : <PDCP Info IE >>   { < **RB Information to Setup list** : bit (3) >   < **RB Information to Setup** : < RB Information to Setup IE >> *(1+val(RB Information to Setup List)) };

Table 9.3.84a.2: *RB Information to Setup* information element details

PDCP Info This field is defined in clause 9.3.60.
RB Information to Setup This IE is defined in clause 9.3.84.

9.3.84b RB CipheringSynchronization

Table 9.3.84b.1: RB *Ciphering Synchronization information details*

```
< RB Ciphering Synchronization IE > ::=
   { < RB List : bit (2) >
  < RB identity : <RB Identity IE >>
   {00 |  -- Transparent Mode
   {< Activation Time >: < Activation Time IE>>
    <HFN at activation Time : bit(11)> --based on activation time and the start time of deciphering, the MES may deduce a different HFN when it starts.
   }
   01 |-Non-Transparent Mode PDCH channel
   {<Current BSN: bit(10)>
    <Current HFN: bit(21)> --The MES shall increments the HFN by 1 if it detects a BSN wrap around based on Current BSN field and the first received BSN
   }
   10 | --Non-Transparent Mode DCCH channel
   {<Current BSN: bit(7)>
    <Current HFN: bit(24)>}  --The MES shall increments the HFN by 1 if it detects a BSN wrap around based on Current BSN field and the first received BSN
   }
   11 --Reserved}
   }*(1+val(RB List))

   }
```

Table 9.3.84b.2: *RB Ciphering SYnchronization* information element details

RB List This field indicates the number of RBs in the list, where zero represents 1 RB and so on. Range: 0 to 3 (meaning 1 to 4 RBs in the list).
RB Identity This IE is defined in clause 9.3.80.
Activation Time This IE is defined in clause 9.3.1.
HFN at activation Time : (11 bit field) Value of the HFN at the specified activation time, which could be in the past. Based on the activation time and the start time of deciphering, the MES may deduce a different HFN when it starts.
Current BSN (10 or 7 bit field) Value of the BSN at the time the activation time. The field size depends on the type of channel.
Current HFN (21 or 24 bit field) Value of the HFN at the time the activation time. The field size depends on the type of channel. The MES shall increments the HFN by 1 if it detects a BSN wrap around based on Current BSN field and the first received BSN.

9.3.85 RB Timer Indicator

This *RB Timer Indicator* IE indicates to GERAN if the timers T314 and T315 have expired in the MES.

Table 9.3.85.1: *RB Timer Indicator* information elements

```
< RB Timer Indicator IE > ::=
    < T314 Expired : bit (1) >
    < T315 Expired : bit (1) > ;
```

Table 9.3.85.2: *RB Timer Indicator* information element details

T314 Expired (1 bit field) bit 1 0 False - the timer has not expired 1 True - the timer has expired or the stored value is zero.
T315 Expired (1 bit field) bit 1 0 False - the timer has not expired 1 True - the timer has expired or the stored value is zero.

9.3.86 RB with PDCP Information

The *RB with PDCP Information* IE identifies the RB and provides the PDCP sequence number info from the sender of the message for lossless Serving RNC relocation.

Table 9.3.86.1: *RB with PDCP Information* information elements

< RB with PDCP Information IE > ::= < **RB Identity** : < RB Identity IE > > < **PDCP SN Info** : < PDCP SN Info > >;

Table 9.3.86.2: *RB with PDCP Information* information element details

RB Identity This IE is defined in clause 9.3.80.
PDCP SN Info This IE is defined in clause 9.3.61. PDCP sequence number info from the sender of the message for lossless Serving RNC relocation.

9.3.87 Void

9.3.88 Re-Establishment timer

This *Re-Establishment Timer* IE indicates which timer to associate with RAB.

Table 9.3.88.1: *Re-Establishment Timer* information elements

< Re-Establishment timer IE > ::= < **Re-Establishment timer** : bit (1) >;

Table 9.3.88.2: *Re-Establishment Timer* information element details

Re-Establishment Timer (1 bit field) bit 1 0 use T314 1 use T315.

9.3.89 Rejection Cause

The *Rejection Cause* IE indicates the cause for rejection of RRC connection establishment request.

Table 9.3.89.1: *Rejection Cause* information elements

```
< Rejection Cause IE > ::=
    < Rejection Cause : bit (1) >;
```

Table 9.3.89.2: *Rejection Cause* information element details

Rejection Cause (1 bit field)
bit
1
0 congestion
1 unspecified.

9.3.90 Release Cause

The *Release Cause* IE indicates the cause for releasing the RRC connection.

Table 9.3.90.1: *Release Cause* information elements

```
< Release Cause IE > ::=
    < Release Cause : bit (3) >;
```

Table 9.3.90.2: *Release Cause* information element details

Release Cause (3 bit field)
bit
3 2 1
0 0 0 normal event
0 0 1 unspecified
0 1 0 pre-emptive release
0 1 1 congestion
1 0 0 re-establishment reject
1 0 1 directed signalling connection re-establishment
1 1 0 user inactivity
1 1 1 reserved.

9.3.91 RLC Info

The *RLC Info* IE contains information about the RLC protocol.

Table 9.3.91.1: *RLC Info* information elements

```
< RLC Info IE > ::=
    < RLC Info length : bit (5) >
    { 00                          -- RLC in Acknowledged mode
            { 0 | 1 < Resegment : bit (1) >}
            { 0 | 1 < Transmission RLC Discard : < Transmission RLC Discard IE > >}
            { 0 | 1 < Reserved : bit (5) > }
    | 01                          -- RLC in Unacknowledged mode
            {0 | 1 < Reserved : bit (5) > }
    | 10                       -- RLC in Transparent mode
    !   < Message escape : { 1 bit (1) } bit**= < no string > > } ;   -- reserved
```

Table 9.3.91.2: *RLC Info* information element details

RLC Info length (5 bit field) This field is the binary representation of the RLC Info IE excluding the 5 bits used to define this field. Range 0 to 31.
Resegment bit 1 0 Retransmitted RLC data blocks shall not be resegmented 1 Retransmitted RLC data blocks shall be resegmented according to commanded MCS.
Transmission RLC Discard This IE is defined in clause 9.3.95.

9.3.92 RLC HFN IE

This IE contains the RLC HFN used in ciphering in AM or UM RLC.

Table 9.3.92.1: *RLC HFN* information elements

```
< RLC HFN IE >::=
    < RLC HFN length : bit (5) >
   {   000    < RLC HFN : bit (21) >      -- Used in Used in case of GMPRS-1 RLC on PDTCH
    |  001    < RLC HFN : bit (26) >      -- Used in the case of GMPRS-1 RLC on DCCH
    |  010    < RLC HFN : bit (25) >      -- Reserved
    |  011    < RLC HFN : bit (27) >      -- Reserved
-- Release 6 RLC HFN --
    |  100    < RLC HFN : bit (21) >      -- Reserved
    |  101    < RLC HFN : bit (27) >      -- Reserved
    |  110    < RLC HFN : bit (27) >      -- Reserved
    !  < Message escape : {111 } bit**= < no string > > } ;
```

Table 9.3.92.2: *RLC HFN* information element details

RLC HFN Length This field is the binary representation of the length in bits of the RLC HFN field in this IE. Range: 1+val(RLC HFN length).
RLC HFN (20..27 bit field) This field defines the RLC HFN used in the ciphering procedure at RLC/MAC. See ETSI TS 101 376-4-14 [14].

9.3.93 RPLMN Information

Not used in GMR-1 3G.

9.3.94 RRC Cause

The *RRC Cause* IE is to provide the reason for failure of the physical channel setup, reconfiguration, release or the reason for completion of handover.

Table 9.3.94.1: *RRC Cause* information elements

```
< RRC Cause IE > ::=
   < RRC Cause : bit (8) >;
```

Table 9.3.94.2: *RRC Cause* information element details

RRC Cause (8 field)
Bits
8 7 6 5 4 3 2 1
0 0 0 0 0 0 0 0 Normal event
0 0 0 0 0 0 0 1 Abnormal release, unspecified
0 0 0 0 0 0 1 0 Abnormal release, channel unacceptable
0 0 0 0 0 0 1 1 Abnormal release, timer expired
0 0 0 0 0 1 0 0 Abnormal release, no activity on the radio path
0 0 0 0 0 1 1 0 UTRAN configuration unknown
0 0 0 0 1 0 0 0 Handover impossible, timing advance out of range
0 0 0 0 1 0 0 1 Channel mode unacceptable
0 0 0 0 1 0 1 0 Frequency not implemented
0 0 0 0 1 1 0 0 Lower layer failure
0 1 0 0 0 0 0 1 Call already cleared
0 1 0 1 1 1 1 1 Semantically incorrect message
0 1 1 0 0 0 0 0 Invalid mandatory information
0 1 1 0 0 0 0 1 Message type non-existent or not implemented
0 1 1 0 0 0 1 0 Message type not compatible with protocol state
0 1 1 0 0 1 0 0 Conditional IE error
0 1 1 0 0 1 0 1 No cell allocation available
0 1 1 0 1 1 1 1 Protocol error unspecified
All other cause values shall be treated as 0000 0000, "normal event".

9.3.95 RRC Packet Downlink Assignment

The *RRC Packet Downlink Assignment* IE is sent by the network to the MES to indicate the assigned downlink resources. The *RRC Packet Downlink Assignment* IE contains the entire Packet Downlink Assignment message as is defined in ETSI TS 101 376-4-12 [13].

Table 9.3.95.1: *RRC Packet Downlink Assignment* information elements

< RRC Packet Downlink Assignment IE > ::= -- See Packet Downlink Assignment Message in ETSI TS 101 376-4-12 [13]

9.3.95a RRC Packet Downlink Assignment 2

Not used in GMR-1 3G.

9.3.96 RRC Packet Uplink Assignment

The *RRC Packet Uplink Assignment* IE is sent by the network to the MES to indicate the assigned uplink resources. The *RRC Packet Uplink Assignment* IE contains the entire Packet Uplink Assignment message as defined in ETSI TS 101 376-4-12 [13].

Table 9.3.96.1: *RRC Packet Uplink Assignment* information elements

< RRC Packet Uplink Assignment IE > ::= See Packet Uplink Assignment message in ETSI TS 101 376-4-12 [13]

9.3.96a RRC Packet Uplink Assignment 2

Not used in GMR-1 3G.

9.3.97 RRC State Indicator

The *RRC State Indicator* IE is indicates to a MES the RRC state to be entered.

Table 9.3.97.1: *RRC State Indicator* information elements

< RRC State Indicator IE > ::= < **RRC State Indicator** : bit (2) >;

Table 9.3.97.2: *RRC State Indicator* information element details

RRC State Indicator (2 bit field) bit 2 1 0 0 RRC-Cell _Dedicated state 0 1 RRC-Cell_Shared state 1 0 RRC-GRA_PCH state 1 1 Reserved.

9.3.98 RRC Transaction Identifier

The *RRC Transaction Identifier* IE identifies the RRC procedure transaction for the message this IE was included within.

Table 9.3.98.1: *RRC Transaction Identifier* information elements

< RRC Transaction Identifier IE > ::= < **RRC Transaction Identifier** : bit (2) >;

Table 9.3.98.2: *RRC Transaction Identifier* information element details

RRC Transaction Identifier This field is the binary representation of the RRC Transaction Identifier. Range: 0 to 3.

9.3.98a Reference

The *Reference* IE contains information to match a response from the network when multiple requests were transmitted before a receiving answer from the network.

Table 9.3.98a.1: *Reference* information elements

< Reference IE > ::= < **Reference** : bit (16) >;

Table 9.3.98a.2: *Request Reference* information element details

Reference This field contains the 16 bit binary number.

9.3.99 PDCH Description

Not used in GMR-1 3G.

9.3.100 Security Capability

The *Security Capability* IE indicates the security capabilities of the MES.

Table 9.3.100.1: *Security Capability* information elements

< Security Capability IE > ::= < **Security Capability Length** : bit (7)> < **Iu mode Ciphering algorithm capability** : < Iu mode Ciphering algorithm capability struct > > < **Iu mode Integrity protection algorithm capability** : < Iu mode Integrity protection algorithm capability struct > >; < spare bit >**; -- *Extension information may be truncated between released versions of the protocol* -- *The receiver shall assume the value zero for any truncated bit* < Iu mode Ciphering algorithm capability struct > ::= < **UEA0 support** : bit (1) > < **UEA1 support** : bit (1) > < **AES-256 support** : bit (1) > < spare bit > *13; < Iu mode Integrity protection algorithm capability struct > ::= < **UIA1 support** : bit (1) > < spare bit > *15;

Table 9.3.100.2: *Security Capability* information element details

Security Capability Length (7 bit field) This field is the binary representation of the length of the Security Capability IE in bits excluding the bits used for this length field. Range: 0 to 127.
Iu mode Ciphering algorithm capability struct This structure indicates the ciphering algorithms supported by the MES. **UEA0 support** (1 bit field) **UEA1 support** (1 bit field) **AES-256 support** (1 bit field) These fields indicate the support of the UEA encryption algorithm UEAx, where X has a range from 0 to 1 and the support of AES-256. At least one Ciphering algorithm shall be supported. bit 0 Ciphering algorithm is not supported 1 Ciphering algorithm is supported.
Iu mode Integrity protection algorithm capability struct This structure indicates the Integrity protection algorithms supported by the MES.
UIA1 support (1 bit field) These field indicates the support of the UIA integrity protection algorithm UIAx, where X has a range from 1 to 1. At least one integrity protection algorithm shall be supported. bit 0 Integrity protection algorithm is not supported 1 Integrity protection algorithm is supported.

9.3.101 Signalling RB Information To Setup

The *Signalling RB Information To Setup* IE indicates information for setting up SRBs.

Table 9.3.101.1: *Signalling RB Information To Setup* information elements

< Signalling RB Information To Setup IE > ::= < **Signalling RB Information to Setup length** : bit (8) > < **SRB Identity** : bit (2) > { 0 | 1 < **RB Mapping Info :** < RB Mapping Info IE > > } -- *Release 6 extension* < spare bits> **; -- reserved for future use

Table 9.3.101.2: *Signalling RB Information To Setup* information element details

SRB Identity (2 bit field) bit 2 1 0 0 SRB1 0 1 SRB2 1 0 SRB3 1 1 SRB4.
Signalling RB Information To Setup length (8 bit field) This field is the binary representation of the length of the IE *Signalling RB Information To Setup* in bits excluding the bits used for this length field. Range: 0 to 255.
RB Mapping Info This IE is defined in clause 9.3.117.

9.3.102 START

The *START* IE contains the START value used to initialize the 20 most significant bits of all hyper frame numbers (MAC HFN, RLC UM HFN, RLC AM HFN, RRC HFN) for a CN domain. This field is defined in ETSI TS 133 102 [23].

Table 9.3.102.1: *START* information elements

< START IE > ::= < **START :** bit(20) > ;

Table 9.3.102.2: *START* information element details

START (20 bit field) The START bits are numbered b0-b19, where b0 is the least significant bit.

9.3.103 Starting Time

The *Starting Time* IE provides the start TDMA frame number, FN modulo 42432.

Table 9.3.103.1: *Starting Time* information elements

< Starting Time IE > ::= < **Starting Time Value :** octet(2) > ;

Table 9.3.103.2: *Starting Time* information element details

Starting Time Value This field is encoded as defined in ETSI TS 101 376-4-8 [7].

9.3.104 Synchronization Indication

The *Synchronization Indication* IE is to indicate which type of handover is to be performed.

Table 9.3.104.1: *Synchronization Indication* information elements

< Synchronization Indication IE > ::= < **Synchronization Indication Value**: bit (4) > ;

Table 9.3.104.2: *Synchronization Indication* information element details

Synchronization Indication Value This field is encoded as defined in ETSI TS 101 376-4-8 [7].

9.3.105 Time Difference

Not used in GMR-1 3G.

9.3.106 Timing Advance

See ETSI TS 101 376-4-12 [13].

9.3.107 Transmission RLC Discard

The *Transmission RLC Discard* IE indicates SDU Discard mode.

Table 9.3.107.1: *Transmission RLC Discard* information elements

< Transmission RLC Discard IE > ::= < **Transmission RLC Discard** : bit (1) >;

Table 9.3.107.2: *Transmission RLC Discard* information element details

Transmission RLC Discard (1 bit field) This field indicates whether the discharge of RLC buffer on the transmitter side can occur. For UM RLC or TM RLC, RLC discard shall not be used for that radio bearer. bit 1 0 no discharge of the transmission RLC buffer 1 discharge of the transmission RLC buffer based on timer.

9.3.108 UE UTRAN Radio Access Capability

This IE indicates the UTRAN radio access capability of the MES.

Table 9.3.108.1: *UE UTRAN Radio Access Capability* information elements

< UE UTRAN Radio Access Capability IE > ::= { < **UE UTRAN Radio Access Capability length** : bit(14) > < **UE UTRAN Radio Access Capability** : bit (1+val(UE UTRAN Radio Access Capability length)) > } ;

Table 9.3.108.2: *UE UTRAN Radio Access Capability* information element details

UE UTRAN Radio Access Capability length This field indicates the length of the UE Radio Access capability field in bits.
UE UTRAN Radio Access Capability This field is encoded as the UE Radio Access capability IE in ETSI TS 125 331 [21].

9.3.108a UE UTRAN Predefined Configuration Status Information

This IE is valid only for UTRAN capable mobiles. The IE indicates UTRAN predefined configuration status information/UECapability/UTRANClassmark information. The IE includes the INTER RAT HANDOVER INFO (defined in ETSI TS 125 331 [21]) which may give UTRAN related information to the network (target system) for intersystem handover. The INTER-RAT HANDOVER INFO message contains following information:

- the pre-defined configuration status information; and/or
- security information to be used after handover to UTRAN, see ETSI TS 131 102 [22]; and/or
- the UTRAN Capabilities of the MES.

None, one, two or three of these three information may be present. The security information present in the message should be ignored.

Table 9.3.108a.1: *UE UTRAN Predefined Configuration Status Information* information elements

< UE UTRAN Predefined configuration status information IE > ::= { < **UE UTRAN Predefined Configuration Status Information length** : bit(14) > < **UE UTRAN Predefined Configuration Status Information** : bit (1+val(UE UTRAN Predefined configuration status information length)) > } ;

Table 9.3.108a.2: *UE UTRAN Predefined Configuration Status Information* information element details

UE UTRAN Predefined Configuration Status Information length This field indicates the length of the UE UTRAN Predefined Configuration Status Information field in bits.
UE UTRAN Predefined Configuration Status Information This value part of this field is the INTER RAT HANDOVER INFO message as defined in ETSI TS 125 331 [21].

9.3.109 UE UTRAN Radio Access Capability Extension

This IE indicates the UTRAN radio access capability extension of the MES.

Table 9.3.109.1: *UE UTRAN Radio Access Capability Extension* information elements

< UE UTRAN Radio access capability extension IE > ::= { < **UE UTRAN Radio Access Capability Extension length** : bit(10) > < **UE UTRAN Radio Access Capability Extension** : bit (1+val(UE UTRAN Radio Access Capability Extension length)) > };

Table 9.3.109.2: *UE UTRAN Radio Access Capability Extension* information element details

UE UTRAN Radio Access Capability length This field indicates the length of the UE UTRAN Radio access capability extension field in bits.
UE UTRAN Radio Access Capability Extension This IE is defined in ETSI TS 125 331 [21] as Radio access capability extension.

9.3.110 UE CDMA2000 Radio Access Capability

This Information Element contains the UE CDMA2000 radio access capability that is structured and coded according to the specification used for the corresponding system type.

Table 9.3.110.1: *UE CDMA2000 Radio Access Capability* information elements

< UE CDMA2000 Radio Access Capability IE > ::= < **CDMA2000 Information length** : bit(12) > < **CDMA2000 Information** : bit(1+val(CDMA2000 Information length)) > ;

Table 9.3.110.2: *UE CDMA2000 Radio Access Capability* information element details

CDMA2000 Information length (12 bit field) This field indicates the length of the CDMA2000 Information field in bits.
CDMA2000 Information This field is encoded as the *CDMA2000 Radio Access Capability* IE defined in TIA/EIA/IS-2000.5 [i.2] or later, TIA/EIA/IS-833 [i.1] or later, TIA/EIA/IS-834 [i.7] or later.

9.3.110a UE Software Version Indicator

The *UE Software Version Indicator* IE indicates the compatibility level of the software running in the MES.

Table 9.3.110a.1: *UE Software Version Indicator* information elements

< UE Software Version Indicator IE > ::= < **UE Software Version Indicator** : bit (8) >;

Table 9.3.110a.2: *UE Software Version Indicator* information element details

UE Software Version Indicator (8 bit field) This IE indicates the compatibility level of the software running in the MES. The use of this IE by the network is implementation dependent. Bit 8 7 6 5 4 3 2 1 0 0 0 0 0 0 0 0 -- Reserved 0 0 0 0 0 0 0 1 -- corresponds to version approved by ETSI December, 2012 0 0 0 0 0 0 1 0 -- corresponds to version approved by ETSI December 2016 All other values are reserved.

9.3.111 UTRAN Freq List

This variable length IE is coded as defined in ETSI TS 101 376-4-8 [7].

9.3.112 Wait Time

The *Wait Time* IE defines the time period the MES has to wait before repeating the rejected procedure.

Table 9.3.112.1: *Wait Time* information elements

< Wait Time IE > ::= < **Wait Time** : bit (4) >;

Table 9.3.112.2: *Wait Time Capability* information element details

Wait Time (4 bit field) bit 4 3 2 1 0 0 0 0 -- *repetition is not allowed* 0 0 0 1 1 s 0 0 1 0 2 s : : 1 1 1 0 14 s 1 1 1 1 15 s.

9.3.113 Iu mode Channel Request Description

The *Iu mode Channel Request Description* IE is used by the MES to request uplink resources.

Table 9.3.113.1: *Iu mode Channel Request Description* information elements

```
< Iu mode Channel Request Description IE > ::=
    < LENGTH_IN_OCTETS : bit(8) >                          -- Remaining length
    < PACKET_ESTABLISHMENT_CAUSE : bit(2) >
    < Iu mode RRC Channel Request Description : Iu mode Channel Request Description IE >-- Defined in
ETSI TS 101 376-4-12 [13]
{ 0 | 1 < HFN_LSB : bit(1) > }
    < spare bit >**;
```

Table 9.3.113.2: *Iu mode Channel Request Description* information element details

PACKET_ESTABLISHMENT_CAUSE (2 bit field) This field indicates the reason for requesting the access. Bit 2 1 0 0 User Data 0 1 Page Response 1 0 Cell Update 1 1 Mobility Management procedure.
Iu mode Channel Request Description This IE is defined in ETSI TS 101 376-4-12 [13].
HFN_LSB (1 bit field) This field contains the least significant bit of the HFN of the radio bearer for which the TBF is established, in the direction of the TBF.

9.3.114 Wait Indication

The *Wait Indication* IE element is used by the network to indicate the time the MES shall wait before attempting another channel request after the GERAN Iu mode DTM REJECT message is received.

Table 9.3.114.1: *Wait Indication* information elements

```
< Wait Indication IE > ::=
    < Wait Indication : bit (8) >;
```

Table 9.3.114.2: *Wait Indication* information element details

Wait Indication Value (8 bit field) This field is coded as the binary representation of the T3142 timeout value in seconds. This IE is defined in ETSI TS 101 376-4-8 [7].

9.3.115 Void

9.3.116 PDCP Context Relocation Info

The *PDCP Context Relocation Info IE* indicates that the header compression context relocation is to be performed during SBSS relocation for the given radio bearer.

Table 9.3.116.1: *PDCP Context Relocation Info* elements

```
< PDCP Context Relocation Info IE > ::=
        < PDCP Context Relocation Info length: bit (2) >
        {    < Downlink RFC 3095 [i.5] Context Relocation Indication: 0 >
        |    < Downlink RFC 3095 [i.5]Context Relocation Indication: 1 > }
        {    < Uplink RFC 3095 [i.5] Context Relocation Indication: 0 >
        |    < Uplink RFC 3095 [i.5] Context Relocation Indication: 1 >}
;
```

Table 9.3.116.2: *PDCP Context Relocation Info* information elements details

Downlink RFC 3095 [i.5] Context Relocation Indication (1 bit field) bit 1 0 RFC 3095 [i.5] context relocation is not performed in downlink 1 RFC 3095 [i.5] context relocation is performed in downlink.
Uplink RFC 3095 [i.5] Context Relocation Indication (1 bit field) bit 1 0 RFC 3095 [i.5] context relocation is not performed in uplink 1 RFC 3095 [i.5] context relocation is performed in uplink.

9.3.117 RB mapping info

Not used in GMR-1 3G.

9.3.118 Interleaving

Not used in GMR-1 3G.

9.3.119 Mode

Not used in GMR-1 3G.

9.3.120 Modulation

Not used in GMR-1 3G.

9.3.121 Added or Reconfigured DL TrCH information

Not used in GMR-1 3G.

9.3.122 Added or Reconfigured UL TrCH information

Not used in GMR-1 3G.

9.3.123 Deleted DL TrCH information

Not used in GMR-1 3G.

9.3.124 Deleted UL TrCH information

Not used in GMR-1 3G.

9.3.125 DL TrCH Information Common For All Transport Channels

Not used in GMR-1 3G.

9.3.126 Semi-static Transport Format Information

Not used in GMR-1 3G.

9.3.127 TFCS Explicit Configuration

Not used in GMR-1 3G.

9.3.128 Void

9.3.129 TFCS Removal Information

Not used in GMR-1 3G.

9.3.130 Transport Channel Identity

Not used in GMR-1 3G.

9.3.131 TFC

Not used in GMR-1 3G.

9.3.132 Transport Format Combination Set

Not used in GMR-1 3G.

9.3.133 Transport Format Set

Not used in GMR-1 3G.

9.3.134 UL TrCH Information Common For All Transport Channels

Not used in GMR-1 3G.

9.3.135 Upper Layer Bearer Info

The *Upper Layer Bearer Info* IE element is used to specify upper layer bearer information.

Table 9.3.135.1: *Upper Layer Bearer Info* information elements

< Upper Layer Bearer Info IE > ::= < **Upper Layer Bearer Info** : bit (4) >;

Table 9.3.135.2: *Upper Layer Bearer Info* information element details

Upper Layer Bearer Info (4 bit field) This field is used to indicate or specify upper layer bearer information 0000 - Vocoder rate 2,45 kbps 0001 - Vocoder rate 4 kbps All other values are reserved for future use.

9.3.136 RLC Sequence Number

The *RLC Sequence Number* IE element contains RLC/MAC Sequence Number.

Table 9.3.136.1: *RLC Sequence Number* information elements

< RLC Sequence Number IE > ::= < **Sequence Number** : bit (10) >;

9.3.137 Carrier Reconfiguration Type

Table 9.3.137.1: *Carrier Reconfiguration Type* information elements

< Carrier Reconfiguration Type IE > ::= < **Carrier Reconfiguration Type** : bit (2) >;

Table 9.3.137.2: *Carrier Reconfiguration Type* information element details

Carrier Reconfiguration Type (2 bit field) This field indicates the type of carrier reconfiguration being carried out by the network. bit 2 1 0 0 Uplink Only -- change in only uplink physical channel type required for all radio bearers 0 1 Downlink Only -- change in only downlink physical channel type required for all radio bearers 1 0 Uplink and downlink -- change in both uplink and downlink physical channel type required for all radio bearers 1 1 Reserved

9.3a Information element definitions

```
InformationElements DEFINITIONS AUTOMATIC TAGS ::=

-- ***************************************************
--
--     CORE NETWORK INFORMATION ELEMENTS (9.3)
--
-- ***************************************************

BEGIN

IMPORTS
    maxCNdomains,
    maxRBallRABs,
    maxRB

FROM Constant-definitions;


-- NOTE : for ActivationTime, value 'now' always appear as default, and is encoded
-- by absence of the field

ActivationTime ::=                  BIT STRING (SIZE (22))

CN-DomainIdentity ::=               ENUMERATED {
                                        cs-domain,
                                        ps-domain }

CN-InformationInfo ::=              SEQUENCE {
    plmn-Identity                       PLMN-Identity                       OPTIONAL,
    cn-DomainGSM-MAP-NAS-SysInfo        NAS-SystemInformationGSM-MAP        OPTIONAL,
    cn-DomainRelInfo            CN-DomainRelInfo            OPTIONAL
}

CN-DomainRelInfo ::=                SEQUENCE {
    cn-DomainIdentity                   CN-DomainIdentity,
    cn-DomainGSM-MAP-NAS-SysInfo                                NAS-SystemInformationGSM-MAP
    }
```

```
CellUpdateCause ::=                 ENUMERATED {
                                        cellReselection,
                                        periodicalCellUpdate,
                                        uplinkDataTransmission,
                                        geran-pagingResponse,
                                        radiolinkFailure,
                                        rlc-unrecoverableError,
                                        invalidRLC-MACcontrolmessage,
                                        spare1 }

CipheringModeInfo ::=               SEQUENCE {
    -- NOTE: The ciphering algorithm is included in the CipheringModeCommand.
    cipheringModeCommand                CipheringModeCommand,
    cipheringActivationTimeforDBPSCH                ActivationTime                      OPTIONAL,
    rb-DL-CiphActivationTimeInfo        RB-ActivationTimeInfoList           OPTIONAL
}

CipheringModeCommand ::=            CHOICE {
    startRestart                        CipheringAlgorithm,
    spare                           NULL
}

CipheringAlgorithm ::=              BIT STRING {
-- For each bit value "0" means false/ not supported
                                            spare15(0),
                                            spare14(1),
                                            spare13(2),
                                            spare12(3),
                                            spare11(4),
                                            spare10(5),
                                            spare9(6),
                                            spare8(7),
                                            spare7(8),
                                            spare6(9),
                                            spare5(10),
                                            spare4(11),
                                            spare3(12),
                                            spare2(13),
                                            uea1(14),
                                            uea0(15)
                                            }   (SIZE (16))


DL-CounterSynchronisationInfo ::=   SEQUENCE {
    rb-WithPDCP-InfoList                    RB-WithPDCP-InfoList            OPTIONAL,
    rb-PDCPContextRelocationList            RB-PDCPContextRelocationList    OPTIONAL
}

Digit ::=                           INTEGER (0..9)

FailureCauseWithProtErrTrId ::=     SEQUENCE {
        rrc-TransactionIdentifier       RRC-TransactionIdentifier,
        failureCause                    FailureCauseWithProtErr
}

FailureCauseWithProtErr ::=         CHOICE {
    configurationUnsupported            NULL,
    physicalChannelFailure              NULL,
    incompatibleSimultaneousReconfiguration
                                        NULL,
    protocolError                       ProtocolErrorInformation,
    cellUpdateOccurred                  NULL,
    invalidConfiguration                NULL,
    configurationIncomplete             NULL,
    spare7                              NULL,
    spare6                              NULL,
    spare5                              NULL,
    spare4                              NULL,
    spare3                              NULL,
    spare2                              NULL,
    spare1                              NULL
}

GRA-Identity ::=                    BIT STRING (SIZE (16))

GRA-UpdateCause ::=                 ENUMERATED {
```

```
                                        changeOfGRA,
                                        periodicGRAUpdate,
                                        spare2,
                                        spare1 }

GERAN-DRX-CycleLengthCoefficient ::=    INTEGER (3..9)

G-RNTI ::=                          SEQUENCE {
    sbsc-Identity                       SBSC-Identity,
    s-RNTI                              S-RNTI
}

IntegrityCheckInfo ::=              SEQUENCE {
-- RRC-MessageSequenceNumberList includes RRC-MessageSequenceNumber.
    messageAuthenticationCode           MessageAuthenticationCode,
    rrc-MessageSequenceNumberList           RRC-MessageSequenceNumberList
}

IntegrityProtActivationInfo ::=     SEQUENCE {
-- RRC-MessageSequenceNumberList includes RRC-MessageSequenceNumber
    rrc-MessageSequenceNumberList       RRC-MessageSequenceNumberList
}

IntegrityProtectionAlgorithm ::=                            ENUMERATED {
                                        -- For each NULL means false/ not supported
        uia1        BIT STRING (SIZE (16)),
        spare1      NULL,
        spare2      NULL,
        spare3      NULL,
        spare4      NULL,
        spare5      NULL,
        spare6      NULL,
        spare7      NULL,
        spare8      NULL,
        spare9      NULL,
        spare10     NULL,
        spare11     NULL,
        spare12     NULL,
        spare13     NULL,
        spare14     NULL,
        spare15     NULL
        }

IntegrityProtectionModeCommand ::=  CHOICE {
    startIntegrityProtection            SEQUENCE {
        integrityProtInitNumber             IntegrityProtInitNumber
    },
    modify                              SEQUENCE {
        dl-IntegrityProtActivationInfo      IntegrityProtActivationInfo
    }
}

IntegrityProtInitNumber ::=         BIT STRING (SIZE (32))

IntegrityProtectionModeInfo ::=     SEQUENCE {
    -- NOTE: DL integrity protection activation info and Integrity
    -- protection intialisation number have been nested inside
    -- IntegrityProtectionModeCommand.
    integrityProtectionModeCommand      IntegrityProtectionModeCommand,
    integrityProtectionAlgorithm        IntegrityProtectionAlgorithm        OPTIONAL
}

MessageAuthenticationCode ::=       BIT STRING (SIZE (32))

MCC ::=                             SEQUENCE (SIZE (3)) OF
                                        Digit

MNC ::=                             SEQUENCE (SIZE (2..3)) OF
                                        Digit

NAS-SystemInformationGSM-MAP ::=    OCTET STRING (SIZE (1..8))

PLMN-Identity ::=                   SEQUENCE {
    mcc                                 MCC,
    mnc                                 MNC
}

PDCP-SN-Info ::=                    INTEGER (0..65 535)
```

```
RB-PDCPContextRelocation ::=            SEQUENCE {
    dl-RFC3095-Context-Relocation           BOOLEAN,
    ul-RFC3095-Context-Relocation           BOOLEAN
}

RB-PDCPContextRelocationList ::=            SEQUENCE (SIZE (1..maxRBallRABs)) OF
                                            RB-PDCPContextRelocation

ProtocolErrorCause ::=              ENUMERATED {
                                        csn1-ViolationOrEncodingError,
                                        messageTypeNonexistent,
                                        messageNotCompatibleWithReceiverState,
                                        ie-ValueNotComprehended,
                                        informationElementMissing,
                                        messageContentPartError,
                                        messageExtensionNotComprehended,
                                        spare2, spare1 }

ProtocolErrorIndicator ::=
                                    CHOICE {
    noError                             NULL,
    errorOccurred                       SEQUENCE {
        rrc-TransactionIdentifier           RRC-TransactionIdentifier,
        protocolErrorInformation            ProtocolErrorInformation
    }
}

ProtocolErrorInformation ::=        SEQUENCE {
    diagnosticsType                     CHOICE {
        type1                               SEQUENCE {
            protocolErrorCause                  ProtocolErrorCause
        },
        spare                               NULL
    }
}

Rb-timer-indicator ::=              SEQUENCE {
    t314-expired                        BOOLEAN,
    t315-expired                        BOOLEAN }

RB-ActivationTimeInfoList ::=       SEQUENCE (SIZE (1..maxRB)) OF
                                        RB-ActivationTimeInfo

RB-ActivationTimeInfo ::=           SEQUENCE {
    rb-Identity                         RB-Identity,
    rlc-SequenceNumber                  RLC-SequenceNumber }


RLC-SequenceNumber :: =                 CHOICE {
    rlc-GPRS-SequenceNumber                 BIT STRING (SIZE (7)),
    rlc-EGPRS-SequenceNumber                BIT STRING (SIZE (11)),
    rlc-DCCH-TBFMode-SequenceNumber         BIT STRING (SIZE (4)),
    rlc-TCH-TBF-SequenceNumber          BIT STRING (SIZE (8))
}

RB-Identity ::=                     INTEGER (1..32)

RB-WithPDCP-Info ::=                SEQUENCE {
    rb-Identity                         RB-Identity,
    pdcp-SN-Info                        PDCP-SN-Info
}

RB-WithPDCP-InfoList ::=            SEQUENCE (SIZE (1..maxRBallRABs)) OF
                                        RB-WithPDCP-Info

RRC-MessageSequenceNumber ::=       INTEGER (0..15)


RRC-MessageSequenceNumberList ::=   SEQUENCE (SIZE (4..5)) OF
                                        RRC-MessageSequenceNumber


RRC-TransactionIdentifier ::=       INTEGER (0..3)

RRC-StateIndicator ::=              ENUMERATED {
                                        rrc-Cell-Dedicated, rrc-Cell-Shared, rrc-GRA-PCH}
```

```
SBSC-Identity ::=                   BIT STRING (SIZE (12))

S-RNTI ::=                          BIT STRING (SIZE (20))


START-Value ::=                     BIT STRING (SIZE (20))

STARTList ::=                       SEQUENCE (SIZE (1..maxCNdomains)) OF
                                        STARTSingle

STARTSingle ::=                     SEQUENCE {
    cn-DomainIdentity                   CN-DomainIdentity,
    start-Value                         START-Value
}

END
```

9.4 Multiplicity values and type constraint values

Table 9.4.1 includes constants that are either used as multi bounds (name starting with "max") or as high or low value in a type specification (name starting with "lo" or "hi"). Constants are specified only for values appearing more than once in the RRC specification. In case a constant is related to one or more other constants, an expression is included in the "value" column instead of the actual value.

Table 9.4.1: Multiplicity values and type constraint values

Constant	Explanation	Value
CN information		
maxCNdomains	Maximum number of CN domains	4
MES information		
maxTransactions	Maximum number of parallel RRC transactions in downlink	25
maxPDCPalgoType	Maximum number of PDCP algorithm types	8
maxSystemCapability	Maximum number of system specific capabilities that can be requested in one message.	16
maxTBF	Maximum number of TBFs	8
GERAN mobility information		
maxRAT	Maximum number of Radio Access Technologies	maxOtherRAT + 1
maxOtherRAT	Maximum number of other Radio Access Technologies	15
maxGRA	Maximum number of GRAs in a cell	8
maxInterSysMessages	Maximum number of Inter System Messages	4
maxRABsetup	Maximum number of RABs to be established	16
RB information		
maxRB	Maximum number of RBs	32
maxRBallRABs	Maximum number of non signalling RBs	27
maxRBperRAB	Maximum number of RBs per RAB	8
maxSRBsetup	Maximum number of signalling RBs to be established	8
maxRFC3095-CID	Maximum number of available CID values per radio bearer	16 384
Transport Channel Information		
maxTrCH	Maximum number of transport channels	8
maxTF	Maximum number of different transport formats that can be included in the Transport format set for one transport channel	32
maxTFC	Maximum number of Transport Format Combinations	32
maxTBSize	Maximum number of Transport Block Size	1 370
maxRLCSize	Maximum number of RLC Size	1 370
N	Maximum number of Timeslot Number in DL	8
M	Maximum number of Timeslot Number in UL	8
Other information		
maxNumGSMFreqRanges	Maximum number of GSM Frequency Ranges to store	32
maxNumFDDFreqs	Maximum number of FDD centre frequencies to store	8
maxNumTDDFreqs	Maximum number of TDD centre frequencies to store	8
maxNumCDMA200Freqs	Maximum number of CDMA2000 centre frequencies to store	8

9.4a Constant definitions

```
Constant-definitions DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

maxCNdomains                INTEGER ::= 4
maxRBallRABs                INTEGER ::= 27
maxRB                       INTEGER ::= 32


END
```

10 Protocol timers, counters, other parameters and default configurations

10.1 Timers for MES

Table 10.1.1: Timers for MES

Timer	Start	Stop	At expiry
T300	Started when the transmission of RRC CONNECTION REQUEST is indicated as successfully delivered by RLC.	Reception of RRC CONNECTION SETUP.	Retransmit RRC CONNECTION REQUEST if V300 =< N300, else go to Idle mode. Its value is 7 seconds.
T302	Started when the transmission of CELL UPDATE/GRA UPDATE is indicated as successfully delivered by RLC.	Reception of CELL UPDATE CONFIRM/URA UPDATE CONFIRM.	Retransmit CELL UPDATE/GRA UPDATE if V302 =< N302, else, go to Idle mode. Its value is 7 seconds.
T304	Started when the transmission of MES CAPABILITY INFORMATION is indicated as successfully delivered by RLC.	Reception of MES CAPABILITY INFORMATION CONFIRM.	Retransmit MES CAPABILITY INFORMATION if V304 =< N304, else initiate a cell update procedure. Its value is 7 seconds.
T305	Entering GRA_PCH Reception of GRA UPDATE CONFIRM.	Entering another state.	Transmit GRA UPDATE. See clause 7.8.
T306	Started when the transmission of CHANNEL CHANGE PREPARATION COMPLETE message is confirmed by RLC.	When delivery of CHANNEL CHANGE PREPARATION COMPLETE is confirmed by RLC.	Locally release the RRC Connection and inform upper layers. Its value is 7 seconds.
T314	When the criteria for radio link failure are fulfilled. The timer is started only if radio bearer(s) that are associated with T314 exist.	When the Cell Update procedure has been completed.	See clause 7.8.
T315	When the criteria for radio link failure are fulfilled. The timer is started only if radio bearer(s) that are associated with T315 exist.	When the Cell Update procedure has been completed.	See clause 7.8.

Timer	Start	Stop	At expiry
T3119	In RRC Cell_Dedicated or RRC Cell_Shared states, when autonomous position update is enabled. For the use of T3119 in idle mode, see ETSI TS 101 376-4-8 [7].	In RRC Cell_Dedicated or RRC Cell_Shared states, when autonomous position update is disabled; When entering RRC-GRA_PCH state or RRC Idle mode. For the use of T3119 in idle mode, see ETSI TS 101 376-4-8 [7].	See clause 7.13.2a.
T3124	At the start point of the timeslot in which the HANDOVER ACCESS message is sent the first time.	When PHYSICAL INFORMATION message has been received.	Its value is set to 675 ms if the channel type of the channel allocated in the RADIO BEARER RECONFIGURATION COMPLETE message is a DCH/S; otherwise its value is set to 320 ms.
T3148	Started after the GERAN Iu mode DTM REQUEST message transmission is indicated as successfully delivered by RLC.	When the RADIO BEARER RECONFIGURATION message or GERAN Iu mode DTM REJECT message is received.	Its value is 4 seconds. At expiry the MES shall reinitiate DTM Request procedure.
$T_{RRC-M-REP}$	When measurements are started on receipt of MEASUREMENT ORDER message.	On completion of measurement procedure.	Abandon measurement procedure.

10.1a Timers on the network side

Table 10.1a.1: Timers on the network side

Timer	Start	Stop	Action at expiry	Typical Value
T3143	After having sent the PHYSICAL INFORMATION message	Reception of the RADIO BEARER RECONFIGURATION COMPLETE message	Indicate to the RLC sublayer to send once more PHYSICAL INFORMATION message	Its value is network dependent
$T_{RRC-M-ORD}$	After sending MEASUREMENT ORDER	On receiving MEASUREMENT REPORT with matching Reference Number	Retransmit MEASUREMENT ORDER	Its value is network dependent

10.2 Counters for MES

Table 10.2.1: Counters for MES

Counter	Reset	Incremented	When reaching max value
V300	When initiating the procedure RRC connection establishment	Upon expiry of T300	When V300 > N300, the MES enters on RRC-Idle mode
V302	When initiating the procedure Cell update or GRA update	Upon expiry of T302	When V302 > N302 the MES enters in RRC-Idle mode
V304	When sending the first MES CAPABILITY INFORMATION message	Upon expiry of T304	When V304 > N304 the MES initiates the Cell update procedure

10.3 MES constants and parameters

Table 10.3.1: MES constants and parameters

Constant	Usage
N302	Maximum number of retransmissions of the CELL UPDATE/URA UPDATE message. Its value is 3.
N304	Maximum number of retransmissions of the MES CAPABILITY INFORMATION message. Its value is 2.

10.3a Network constants and parameters

Table 10.3a.1: Network constants and parameters

Constant	Usage
N3143	Maximum number of retransmissions of the PHYSICAL INFORMATION message.

10.4 MES variables

10.4.0 General

Table 10.4.0.1: MES variables

Name of the Variable	Usage
CELL_UPDATE_STARTED	This variable indicates whether a cell update or GRA update procedure is in progress.
CIPHERING_STATUS	This variable contains information about the current status of ciphering in the MES.
ESTABLISHED_SIGNALLING_CONNECTIONS	This variable is used to store information about established signalling connections.
ESTABLISHMENT_CAUSE	This variable is used to store the cause for establishment of a signalling connection received by upper layers, to be used at RRC connection establishment.
ESTABLISHED_RABS	This variable is used to store information about the established radio access bearers and signalling radio bearers in the MES.
FAILURE_CAUSE	This variable contains the cause for failure of a MES initiated procedure, to be reported in a retransmitted message.
FAILURE_INDICATOR	This variable indicates whether the procedure has failed for a MES initiated procedure.
GRA_IDENTITY	This variable stores the assigned GRA identity for this MES when in RRC-GRA_PCH state.
G_RNTI	This variable stores the assigned G-RNTI for this MES.
INITIAL_MES_IDENTITY	In this variable the identity used by the MES when establishing an RRC connection is stored.
INCOMPATIBLE_SECURITY_RECONFIGURATION	This variable indicates whether an incompatible simultaneous reconfiguration of a security function has been received.
INTEGRITY_PROTECTION_ACTIVATION_INFO	This variable contains information to be sent to GERAN about when a new integrity protection configuration shall be activated in the uplink for signalling radio bearers in case of modification of integrity protection.
INTEGRITY_PROTECTION_INFO	This variable contains information about the current status of the integrity protection in the MES.

Name of the Variable	Usage
LATEST_CONFIGURED_CN_DOMAIN	This variable stores the CN-domain that was most recently configured to be used for ciphering and integrity protection.
MES_CAPABILITY_REQUESTED	This variable stores information about the MES capabilities that have been requested by GERAN but that have not yet been transferred to GERAN.
INVALID_CONFIGURATION	This variable indicates whether a received message contained an invalid configuration, by means of invalid values or invalid combinations of information elements.
MES_CAPABILITY_TRANSFERRED	This variable stores information about which UE capabilities that have been transferred to GERAN.
ORDERED_RECONFIGURATION	This variable stores information about an ongoing Reconfiguration procedure.
PDCP_SN_INFO	This variable contains PDCP receive sequence numbers for one or several radio bearers to be included in a response message to GERAN.
PROTOCOL_ERROR_INDICATOR	This variable indicates whether there exist a protocol error that is to be reported to GERAN.
PROTOCOL_ERROR_INFORMATION	This variable contains diagnostics to be reported to GERAN for a message that was not completely understood.
PROTOCOL_ERROR_REJECT	This variable indicates whether there has occurred a severe protocol error causing the ongoing procedure to fail.
RB_TIMER_INDICATOR	This variable contains information to be sent to GERAN if any of the timers T314 or T315 has expired when the MES sends a cell update with cause RL failure.
RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO	This variable contains information to be sent to GERAN about when a new ciphering configuration shall be activated in the uplink for radio bearers using RLC-AM or RLC-UM.
SECURITY_MODIFICATION	This variable contains information on which CN domain is affected by the ongoing security reconfiguration.
START_THRESHOLD	This variable contains information about the maximum allowed value of the START for a CN domain.
START_VALUE_TO_TRANSMIT	This variable contains the value of START for new radio bearer(s) to be transmitted in a response message.
TRANSACTIONS	This variable stores the identifications of the ongoing RRC procedure transactions.
TIMERS_AND_CONSTANTS	This variable contains the values for all timers and constants used in RRC-Connected mode.
UNSUPPORTED_CONFIGURATION	This variable indicates whether a received message contained a configuration that is not supported by the MES.

10.4.1 CELL_UPDATE_STARTED

This variable indicates whether a cell update or GRA update procedure is in progress.

Table 10.4.1.1: CELL_UPDATE_STARTED Variable

```
< CELL_UPDATE_STARTED VAR > ::=
    < Cell Update Started : bit (1) > ;
```

Table 10.4.1.2: CELL_UPDATE_STARTED Variable details

Cell Update Started (1 bit field) bit 1 0 False - when leaving or entering the RRC Connected Mode 1 True - a Cell or GRA Update procedure is in progress.

10.4.2 CIPHERING_STATUS

This variable contains information about the current status of ciphering in the MES. When performing handover or cell reselection to UTRAN the value of this variable is transferred to the corresponding UTRAN variable. When performing handover or cell reselection from UTRAN the value of this variable is transferred from the corresponding UTRAN variable.

Table 10.4.2.1: CIPHERING_STATUS Variable

< CIPHERING_STATUS VAR > ::= < **CN Domain Related Information List** : bit (2) > { < **CN Domain Identity** : < CN Domain Identity IE > > < **Status** : bit (1) > < **Reconfiguration** : bit (1) > } * (1+val(CN Domain Related Information List)) ;

Table 10.4.2.2: CIPHERING_STATUS Variable details

CN Domain Related Information List (2 bit field) This field is used to repeat information for each CN Domain. Range: 0 to maxCNdomains-1, where 0 enables one CN domain to be described.
CN Domain Identity The *CN Domain Identity* IE is defined in clause 9.3.15.
Status (1 bit field) bit 1 0 Not Started - when leaving the RRC-Connected mode 1 Started - when entering the RRC-Connected mode.
Reconfiguration (1 bit field) bit 1 0 False - when leaving or entering the RRC Connected Mode 1 True - an RRC procedure performing reconfiguration of ciphering is ongoing.

10.4.3 ESTABLISHED_SIGNALLING_CONNECTIONS

This variable is used to store information about established signalling connections. This variable is cleared when entering the RRC Connected Mode when not otherwise stated in the procedure or when leaving the RRC Connected Mode. When performing handover or cell reselection to UTRAN the value of this variable is transferred to the corresponding UTRAN variable. When performing handover or cell reselection from UTRAN the value of this variable is transferred from the corresponding UTRAN variable.

Table 10.4.3.1: ESTABLISHED_SIGNALLING_CONNECTIONS Variable

< ESTABLISHED_SIGNALLING_CONNECTIONS VAR > ::= { 0 | 1 < **Signalling Connection List** : bit (2) > < **CN Domain Identity** : < CN Domain Identity IE > > * (1+ val(Signalling Connection List)) } ;

Table 10.4.3.2: ESTABLISHED_SIGNALLING_CONNECTIONS Variable details

Signalling Connection List (2 bit field) This field is used to repeat the CN domain identity of CN domains with established signalling connection. Range: 0 to maxCNdomains-1, where 0 enables one CN domain with established signalling connection to be described.
CN Domain Identity The *CN Domain Identity* IE is defined in clause 9.3.15.

10.4.4 ESTABLISHMENT_CAUSE

This variable is used to store the cause for establishment of a signalling connection received by upper layers, to be used at RRC connection establishment. This variable is cleared when entering or leaving the RRC Connected Mode.

Table 10.4.4.1: ESTABLISHMENT_CAUSE Variable

```
< ESTABLISHMENT_CAUSE VAR > ::=
    { 0 | 1  < Establishment Cause : < Establishment Cause IE > > } ;
```

Table 10.4.4.2: ESTABLISHMENT_CAUSE Variable details

Establishment Cause This IE is defined in clause 9.3.21.

10.4.5 ESTABLISHED_RABS

This variable is used to store information about the established radio access bearers and signalling radio bearers in the MES. This variable is cleared when entering or leaving the RRC Connected Mode. When performing handover or cell reselection to UTRAN the value of this variable is transferred to the corresponding UTRAN variable. When performing handover or cell reselection from UTRAN the value of this variable is transferred from the corresponding UTRAN variable.

Table 10.4.5.1: ESTABLISHED_RABS Variable

```
< ESTABLISHED_RABS VAR > ::=
    {
        { 0  -- Not present when entering or leaving the RRC-Connected mode when not otherwise stated in the procedure
        | 1  < RAB Information List :bit (4) >
                {    < RAB Info : < RAB Info IE > >
                     < RB Information List : bit (3) >
                     {    < RB Identity : < RB Identity IE > >
                          < RB Started : bit (1) > } * (1+val(RB Information List))
            } * (1+val (RAB Information List))
        }
        { 0  -- Not present when leaving RRC-Connected mode
        | 1  < Signalling RB Information List : bit (3) >
                < Signalling RB Started : bit (1) >* (1+val(Signalling RB Information List)) }
    } ;
```

Table 10.4.5.2: ESTABLISHED_RABS Variable details

RAB Information List (4 bit field) This field is used to repeat information for each RAB established. Range: 0 to maxRABsetup-1, where 0 enables one established RAB to be described.
RAB Info The *RAB Info* IE is defined in clause 9.3.73.
RB Information List (3 bit field) This field is used to repeat information for each RB of the RAB. Range: 0 to maxRBperRAB-1, where 0 enables one RB to be described.
RB Identity This IE is defined in clause 9.3.80.
RB Started (1 bit field) bit 1 0 Stopped 1 Started - default value.
Signalling RB Information List (3 bit field) This field is used to repeat information for each SRB. Range: 0 to maxSRBsetup-1, where 0 enables one SRB to be described.
Signalling RB Started (1 bit field) Field repeated in the order of Signalling RB1 and upwards. bit 1 0 Stopped 1 Started - default value.

10.4.6 FAILURE_CAUSE

This variable contains the cause for failure of a MES initiated procedure, to be reported in a retransmitted message. This variable is cleared when entering or leaving the RRC Connected Mode.

Table 10.4.6.1: FAILURE_CAUSE Variable

< FAILURE_CAUSE VAR > ::= { 0 | 1 < **Failure Cause** : < Failure Cause IE > > } ;

Table 10.4.6.2: FAILURE_CAUSE Variable details

Failure Cause The *Failure Cause* IE is defined in clause 9.3.24.

10.4.7 FAILURE_INDICATOR

This variable indicates whether the procedure has failed for a MES initiated procedure.

Table 10.4.7.1: FAILURE_INDICATOR Variable

< FAILURE_INDICATOR VAR > ::= < **Failure Indicator** : bit(1) > ;

Table 10.4.7.2: FAILURE_INDICATOR Variable details

Failure Indicator (1 bit field) bit 1 0 False - when entering or leaving the RRC-Connected mode. 1 True - Procedure has failed.

10.4.8 GRA_IDENTITY

This variable stores the assigned GRA identity for this MES when in RRC-GRA_PCH state. This variable is cleared when entering or leaving the RRC Connected Mode.

Table 10.4.8.1: GRA_IDENTITY Variable

< GRA_IDENTITY VAR > ::= { 0 | 1 < **GRA Identity** : < GRA Identity IE > > } ;

Table 10.4.8.2: GRA_IDENTITY Variable details

GRA Identity This IE is defined in clause 9.3.30.

10.4.9 G_RNTI

This variable stores the assigned G-RNTI for this MES. This variable is cleared when leaving the RRC-Connected mode.

Table 10.4.9.1: G_RNTI Variable

< G_RNTI VAR > ::= { 0 | 1 < **G-RNTI** : < G-RNTI IE > > } ;

Table 10.4.9.2: G_RNTI Variable details

G-RNTI This IE is defined in clause 9.3.32. Not present when leaving the RRC-Connected mode.

10.4.10 INITIAL_MES_IDENTITY

In this variable the identity used by the MES when establishing an RRC connection is stored.

Table 10.4.10.1: INITIAL_MES_IDENTITY Variable

< INITIAL_MES_IDENTITY VAR > ::= { 0 | 1 < **Initial MES Identity** : < Initial MES Identity IE > > } ;

Table 10.4.10.2: INITIAL_MES_IDENTITY Variable details

Initial MES Identity This IE is defined in clause 9.3.35. Not present when leaving the RRC-Connected mode.

10.4.11 INCOMPATIBLE_SECURITY_RECONFIGURATION

This variable indicates whether an incompatible simultaneous reconfiguration of a security function has been received.

Table 10.4.11.1: INCOMPATIBLE_SECURITY_RECONFIGURATION Variable

< INCOMPATIBLE_SECURITY_RECONFIGURATION VAR > ::= < **Incompatible Security Reconfiguration** : bit(1) > ;

Table 10.4.11.2: INCOMPATIBLE_SECURITY_RECONFIGURATION Variable details

Incompatible Security Reconfiguration (1 bit field) bit 1 0 False - when entering or leaving the RRC-Connected mode. 1 True - when an incompatible simultaneous security reconfiguration has been detected.

10.4.12 INTEGRITY_PROTECTION_ACTIVATION_INFO

This variable contains information to be sent to GERAN about when a new integrity protection configuration shall be activated in the uplink for signalling radio bearers in case of modification of integrity protection. This variable is cleared when entering or leaving the RRC-Connected mode. When performing handover to UTRAN the value of this variable is transferred to the corresponding UTRAN variable. When performing handover from UTRAN the value of this variable is transferred from the corresponding UTRAN variable.

Table 10.4.12.1: INTEGRITY_PROTECTION_ACTIVATION_INFO Variable

```
< INTEGRITY_PROTECTION_ACTIVATION_INFO VAR > ::=
    { 0 | 1  < Uplink Integrity Protection Activation Info : < Integrity Protection Activation Info IE > > } ;
```

Table 10.4.12.2: INTEGRITY_PROTECTION_ACTIVATION_INFO Variable details

Integrity Protection Activation Info This IE is defined in clause 9.3.37.

10.4.13 INTEGRITY_PROTECTION_INFO

This variable contains information about the current status of the integrity protection in the MES. When performing handover or cell reselection to UTRAN the value of this variable is transferred to the corresponding UTRAN variable. When performing handover or cell reselection from UTRAN the value of this variable is transferred from the corresponding UTRAN variable.

Table 10.4.13.1: INTEGRITY_PROTECTION_INFO Variable

```
< INTEGRITY_PROTECTION_INFO VAR > ::=
    {
        < Historical Status : bit (1) >
        < Status : bit (1) >
        < Reconfiguration : bit (1) >
        { 0  -- Cleared when entering or leaving the RRC-Connected mode
        | 1  < Signalling RB Specific Integrity Protection Information List : bit (3) >
            {    -- Signalling SRB1 and upwards
                < Uplink RRC HFN : bit (28) >
                < Downlink RRC HFN : bit (28) >
                < Uplink RRC Message Sequence Number : bit (4) >
                { 0 | 1 < Downlink RRC Message Sequence Number : bit (4) > }
            } * (1+val(Signalling RB Specific Integrity Protection Information List))
        }
    } ;
```

Table 10.4.13.2: INTEGRITY_PROTECTION_INFO Variable details

Historical Status (1 bit field) bit 1 0 Never been active - set when entering the RRC-Connected mode 1 Has been active.
Status (1 bit field) bit 1 0 Not Started - when leaving the RRC-Connected mode 1 Started - when entering the RRC-Connected mode.
Reconfiguration (1 bit field) bit 1 0 False - when leaving or entering the RRC Connected Mode 1 True - an RRC procedure performing reconfiguration of ciphering is ongoing.
Signalling RB Specific Integrity Protection Information List (3 bit field) This field is used to repeat information for each SRB with specific integrity protection information. Range: 0 to maxSRBsetup-1, where 0 enables one SRB with specific integrity protection information to be described.
Uplink RRC HFN (28 bit field) **Downlink RRC HFN** (28 bit field) The field indicates the RRC HFN.
Uplink RRC Message Sequence Number (4 bit field) **Downlink RRC Message Sequence Number** (4 bit field) This field is the binary representation of the sequence number of the RRC message. Range 0 to 15.

10.4.14 INVALID_CONFIGURATION

This variable indicates whether a received message contained an invalid configuration, by means of invalid values or invalid combinations of information elements.

Table 10.4.14.1: INVALID_CONFIGURATION Variable

< INVALID_CONFIGURATION VAR > ::= < **Invalid Configuration** : bit(1) > ;

Table 10.4.14.2: INVALID_CONFIGURATION Variable details

Invalid Configuration (1 bit field) bit 1 0 False - when entering or leaving the RRC-Connected mode. 1 True - an invalid configuration has been detected.

10.4.14a LATEST_CONFIGURED_CN_DOMAIN

This variable stores the CN-domain that was most recently configured to be used for ciphering and integrity protection. When performing handover or cell reselection to UTRAN the value of this variable is transferred to the corresponding UTRAN variable. When performing handover or cell reselection from UTRAN the value of this variable is transferred from the corresponding UTRAN variable.

Table 10.4.14a.1: LATEST_CONFIGURED_CN_DOMAIN Variable

< LATEST_CONFIGURED_CN_DOMAIN VAR > ::= { 0 | 1 < **Latest configured CN domain** : < CN Domain Identity IE > > } ;

Table 10.4.14a.2: LATEST_CONFIGURED_CN_DOMAIN Variable details

Latest configured CN domain The *CN Domain Identity* IE is defined in clause 9.3.15. The variable is cleared when entering GERAN RRC connected mode when not stated otherwise in the procedure or when leaving GERAN RRC connected mode.

10.4.15 MES_CAPABILITY_REQUESTED

This variable stores information about the MES/UE capabilities that have been requested by GERAN but that have not yet been transferred to GERAN. This variable is cleared when entering or leaving the RRC-Connected mode.

Table 10.4.15.1: MES_CAPABILITY_REQUESTED Variable

< MES_CAPABILITY_REQUESTED VAR > ::=
    < **MES GERAN Iu mode Radio Access Capability** : < MES GERAN Iu mode Radio Access Capability IE > >
    { 0 | 1 < **MES GERAN A/Gb mode Radio Access Capability** : < MES GERAN A/Gb mode Radio Access Capability IE > >}
    { 0 | 1 < **UE UTRAN Radio Access Capability**: < UE UTRAN Radio Access Capability IE > >}
    { 0 | 1 < **UE UTRAN Radio Access Capability Extension**: < UE UTRAN Radio Access Capability Extension IE > >}
    { 0 | 1 < **UE CDMA2000 Radio Access Capability** : < UE CDMA2000 Radio Access Capability IE > >} ;

Table 10.4.15.2: MES_CAPABILITY_REQUESTED Variable details

MES GERAN Iu mode Radio Access Capability This IE is defined in clause 9.3.45.
MES GERAN A/Gb mode Radio Access Capability This IE is defined in clause 9.3.44.
UE UTRAN Radio Access Capability This IE is defined in clause 9.3.108.
UE UTRAN Radio Access Capability Extension This IE is defined in clause 9.3.109.
UE CDMA2000 Radio Access Capability This IE is defined in clause 9.3.110.

10.4.16 MES_CAPABILITY_TRANSFERRED

This variable stores information about which UE/MES capabilities that have been transferred to GERAN. This variable is cleared when entering or leaving the RRC-Connected mode when not stated otherwise in the procedure. When performing handover or cell reselection to UTRAN the value of this variable is transferred to the corresponding UTRAN variable. When performing handover or cell reselection from UTRAN the value of this variable is transferred from the corresponding UTRAN variable.

Table 10.4.16.1: MES_CAPABILITY_TRANSFERRED Variable

< MES_CAPABILITY_TRANSFERRED VAR > ::=
    < **MES GERAN Iu mode Radio Access Capability** : < MES GERAN Iu mode Radio Access Capability IE > >
    { 0 | 1 < **MES GERAN A/Gb mode Radio Access Capability** : < MES GERAN A/Gb mode Radio Access Capability IE > >}
    { 0 | 1 < **UE UTRAN Radio Access Capability**: < UE UTRAN Radio Access Capability IE > >}
    { 0 | 1 < **UE UTRAN Radio Access Capability Extension**: < UE UTRAN Radio Access Capability Extension IE > >}
    { 0 | 1 < **UE CDMA2000 Radio Access Capability** : < UE CDMA2000 Radio Access Capability IE > >} ;

Table 10.4.16.2: MES_CAPABILITY_TRANSFERRED Variable details

MES GERAN Iu mode Radio Access Capability This IE is defined in clause 9.3.45.
MES GERAN A/Gb mode Radio Access Capability This IE is defined in clause 9.3.44.
UE UTRAN Radio Access Capability This IE is defined in clause 9.3.108.
UE UTRAN Radio Access Capability Extension This IE is defined in clause 9.3.109.
UE CDMA2000 Radio Access Capability This IE is defined in clause 9.3.110.

10.4.17 ORDERED_RECONFIGURATION

This variable stores information about an ongoing Reconfiguration procedure.

Table 10.4.17.1: ORDERED_RECONFIGURATION Variable

< ORDERED_RECONFIGURATION VAR > ::= < **Ordered reconfiguration** : bit (1) > ;

Table 10.4.17.2: ORDERED_RECONFIGURATION Variable details

Ordered reconfiguration (1 bit field) bit 1 0 False - when entering or leaving the RRC-Connected mode. 1 True - reconfiguration procedure is ongoing.

10.4.18 PDCP_SN_INFO

This variable contains PDCP receive sequence numbers for one or several radio bearers to be included in a response message to GERAN. This variable is cleared when entering or leaving the RRC-Connected mode.

Table 10.4.18.1: PDCP_SN_INFO Variable

< PDCP_SN_INFO VAR > ::= { 0 | 1 < **RB with PDCP Information List** : bit (5) > < **RB with PDCP Information** : < RB with PDCP Information IE > > * (1 + val(RB with PDCP Information List)) };

Table 10.4.18.2: PDCP_SN_INFO Variable details

RB with PDCP Information List (5 bit field) This field used to repeat information for each RB with PDCP Information. Range: 0 to maxRBallRABs-1, where 0 enables one RB with PDCP Information to be described. Other values are reserved.
RB with PDCP Information This IE is defined in clause 9.3.86.

10.4.19 PROTOCOL_ERROR_INDICATOR

This variable indicates whether there exist a protocol error that is to be reported to GERAN. This variable is cleared when entering or leaving the RRC-Connected mode.

Table 10.4.19.1: PROTOCOL_ERROR_INDICATOR Variable

< PROTOCOL_ERROR_INDICATOR VAR > ::= < **Protocol Error Indicator** : < Protocol Error Indicator IE > > ;

Table 10.4.19.2: PROTOCOL_ERROR_INDICATOR Variable details

Protocol Error Indicator This IE is defined in clause 9.3.70.

10.4.20 PROTOCOL_ERROR_INFORMATION

This variable contains diagnostics to be reported to GERAN for a message that was not completely understood. This variable is cleared when entering or leaving the RRC-Connected mode.

Table 10.4.20.1: PROTOCOL_ERROR_INFORMATION Variable

< PROTOCOL_ERROR_INFORMATION VAR > ::= { 0 | 1 < **Protocol Error Information**: < Protocol Error Information IE > > } ;

Table 10.4.20.2: PROTOCOL_ERROR_INFORMATION Variable details

Protocol Error Information This IE is defined in clause 9.3.71.

10.4.21 PROTOCOL_ERROR_REJECT

This variable indicates whether there has occurred a severe protocol error causing the ongoing procedure to fail.

Table 10.4.21.1: PROTOCOL_ERROR_REJECT Variable

< PROTOCOL_ERROR_REJECT VAR > ::= < **Protocol Error Reject** : bit (1) > ;

Table 10.4.21.2: PROTOCOL_ERROR_REJECT Variable details

Protocol Error Reject (1 bit field) bit 1 0 False - when entering or leaving the RRC-Connected mode. 1 True - a severe protocol error has occurred.

10.4.22 RB_TIMER_INDICATOR

This variable contains information to be sent to GERAN if any of the timers T314 or T315 has expired when the MES sends a cell update with cause RL failure. This variable is cleared when entering or leaving the RRC-Connected mode.

Table 10.4.22.1: RB_TIMER_INDICATOR Variable

< RB_TIMER_INDICATOR VAR > ::= { 0 | 1 < **RB Timer Indicator** : < RB Timer Indicator IE > > } ;

Table 10.4.22.2: RB_TIMER_INDICATOR Variable details

RB Timer Indicator This IE is defined in clause 9.3.85.

10.4.23 RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO

This variable contains information to be sent to GERAN about when a new ciphering configuration shall be activated in the uplink for radio bearers using RLC-AM or RLC-UM. This variable is cleared when entering or leaving the RRC-Connected mode.

Table 10.4.23.1: RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO Variable

< RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO VAR > ::= { 0 | 1 < **RB Uplink Ciphering Activation Time Info** : < RB Uplink Ciphering Activation Time Info IE > > } ;

Table 10.4.23.2: RB_UPLINK_CIPHERING_ACTIVATION_TIME_INFO Variable details

RB Uplink Ciphering Activation Time Info This IE is defined in clause 9.3.77.

10.4.24 START_THRESHOLD

This variable contains information about the maximum allowed value of the START for a CN domain. This variable is cleared when entering or leaving the RRC-Connected mode. When performing handover or cell reselection to UTRAN the value of this variable is transferred to the corresponding UTRAN variable. When performing handover or cell reselection from UTRAN the value of this variable is transferred from the corresponding UTRAN variable.

Table 10.4.24.1: START_THRESHOLD Variable

< START_THRESHOLD VAR > ::= { 0 | 1 < **Threshold** : bit (20) > } ;

Table 10.4.24.2: START_THRESHOLD Variable details

Threshold (20 bit field) This field is the binary representation of maximum allowed value of the START for a CN domain. Range: 0 to 1048575.

10.4.25 START_VALUE_TO_TRANSMIT

This variable contains the value of START for new radio bearer(s) to be transmitted in a response message. This variable is cleared when entering or leaving the RRC-Connected mode. When performing handover or cell reselection to UTRAN the value of this variable is transferred to the corresponding UTRAN variable. When performing handover or cell reselection from UTRAN the value of this variable is transferred from the corresponding UTRAN variable.

Table 10.4.25.1: START_VALUE_TO_TRANSMIT Variable

< START_VALUE_TO_TRANSMIT VAR > ::= { 0 | 1 < **START** : < START IE > > } ;

Table 10.4.25.2: START_VALUE_TO_TRANSMIT Variable details

START This IE is defined in clause 9.3.102.

10.4.26 TRANSACTIONS

This variable stores the identifications of the ongoing RRC procedure transactions. This variable is cleared when leaving the RRC Connected mode.

Table 10.4.26.1: TRANSACTIONS Variable

```
< TRANSACTIONS VAR > ::=
  { 0 | 1  < Accepted Transactions List : bit (5) >
          {   < Message Type : < Message Type IE > >
              < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
          } * (1+val(Accepted Transactions List))
  }
  { 0 | 1  < Rejected Transactions List : bit (5) >
          {   < Message Type : < Message Type IE > >
              < RRC Transaction Identifier : < RRC Transaction Identifier IE > >
          } * (1+val(Rejected Transactions List))
  } ;
```

Table 10.4.26.2: TRANSACTIONS Variable details

Accepted Transactions List (5 bit field) **Rejected Transactions List** (5 bit field) These fields are used to repeat information for each accepted or rejected transactions respectively. Range: 0 to maxTransactions-1, where 0 enables one transaction to be described.
Message Type This IE is defined in clause 9.2.1.
RRC Transaction Identifier This IE is defined in clause 9.3.98.

10.4.27 TIMERS_AND_CONSTANTS

This variable contains the values for all timers and constants used in RRC-Connected mode.

Table 10.4.27.1: TIMERS_AND_CONSTANTS Variable

```
< TIMERS_AND_CONSTANTS VAR > ::=
  < MES Timers and Constants In Connected Mode : < MES Timers and Constants In Connected Mode IE > >
  < MES Additional Timers and Constants In Connected Mode : < MES Additional Timers and Constants In
Connected Mode IE > >

;
```

Table 10.4.27.2: TIMERS_AND_CONSTANTS Variable details

MES Timers and Constants In Connected Mode This IE is defined in clause 9.3.51. All parameters are set to the default value when leaving the GERAN Iu to another RAT.
MES Additional Timers and Constants In Connected Mode This IE is defined in clause 9.3.51a. All parameters are set to the default values when leaving the GERAN Iu to another RAT.

10.4.28 UNSUPPORTED_CONFIGURATION

This variable indicates whether a received message contained a configuration that is not supported by the MES.

Table 10.4.28.1: UNSUPPORTED_CONFIGURATION Variable

```
< UNSUPPORTED_CONFIGURATION VAR > ::=
    < Unsupported Configuration : bit (1) > ;
```

Table 10.4.28.2: UNSUPPORTED_CONFIGURATION Variable details

Unsupported Configuration bit 1 0 False - when entering or leaving the RRC-Connected mode. 1 True - an unsupported configuration has been detected.

10.4.29 SECURITY_MODIFICATION

This variable contains information on which CN domain is affected by the ongoing security reconfiguration. When performing handover to UTRAN the value of this variable is transferred to the corresponding UTRAN variable. When performing handover from UTRAN the value of this variable is transferred from the corresponding UTRAN variable.

Table 10.4.29.1: SECURITY_MODIFICATION Variable

```
< SECURITY_MODIFICATION VAR > ::=
    { 0 | 1  < Status for each CN domain : bit (2) >
            {    < CN Domain Identity: < CN Domain Identity IE > >
                 < Status : bit (1) >
            } * (1+val(Status for each CN domain))
    } ;
```

Table 10.4.29.2: SECURITY_MODIFICATION Variable details

Status for each CN domain (2 bit field) This field is used to repeat the status for each CN domain. Range: 0 to maxCNdomains-1, where 0 enables one status of CN domain to be described.
CN Domain Identity This IE is defined in clause 9.3.15.
Status (1 bit field) bit 1 0 Not affected 1 Affected.

11 Specific functions

11.1 Provision and reception of RRC information between network nodes

11.1.1 General

In certain cases, e.g. when performing handover to GERAN or when performing SBSS relocation, RRC information may need to be transferred between GERAN nodes, between GERAN and another RAT, between nodes within another RAT or between the MES and another RAT.

The RRC information exchanged between network nodes or between the MES and another RAT is typically transferred by means of RRC information containers. An RRC information container is a self-contained and extensible RRC information unit that may be used to transfer a number of different RRC messages, one at a time. As stated before, RRC information containers may be used to transfer RRC messages across interfaces other than the Um interface. The RRC messages that may be included in RRC information containers have similar characteristics as the RRC messages that are transferred across the Um interface.

The RRC messages that are sent to/from the MES, e.g. RADIO BEARER RECONFIGURATION, INTER SYSTEM TO UTRAN HANDOVER COMMAND HANDOVER FROM GERAN Iu MODE COMMAND are covered by clauses 7 and 9 of the present document. The following clauses concern RRC messages exchanged between network nodes.

In future versions of this specification, it is possible to extend the RRC messages transferred across interfaces other than Um. For these RRC messages the same extension mechanism applies as defined for RRC messages transferred across the Um interface, as is specified in clause 9, i.e. both critical and non-critical extensions may be added.

The transfer syntax for RRC information containers and RRC messages transferred between network nodes is derived from the description used in the target node. The resulting bit or octet string is, carried in a container, transferred between the network nodes.

When using a separate RRC information container for each endpoint, the receiving RRC protocol entity is able to interpret the received container; this means that the receiver need not take into account information about the (network interface) message used in transferring the container.

11.1.2 General error handling for RRC messages exchanged between network nodes

The error handling for RRC messages that are exchanged between network nodes applies the same principles as defined for other RRC messages.

Although the same principles apply for network nodes receiving unknown, unforeseen and erroneous RRC messages received in RRC information containers, the notification of the error should be done in a different manner, as specified in the following:

The network node receiving an invalid RRC message from another network node should:

1> if the received RRC message was unknown, unforeseen or erroneous:

  2> prepare an RRC FAILURE INFO message, including the IE "*Failure Cause*" set to "Protocol error" and the IE "Protocol error information" including an IE "*Protocol Error Cause*" which should be set as follows:

    3> to "CSN.1 violation or encoding error" upon receiving an RRC message for which the encoded message does not result in any valid c syntax value;

    3> to "Message type non-existent or not implemented" upon receiving an unknown RRC message type;

    3> to "Message extension not comprehended" upon receiving an RRC message including an undefined critical message extension;

    3> to "Information element value not comprehended" upon receiving an RRC message including an mandatory IE for which no default value is defined and for which either the value is set to spare or for which the encoded IE does not result in a valid transfer syntax. The same applies for conditional IEs, for which the conditions for presence are met, the IE is present but has a value set to spare or for which the encoded IE does not result in a valid transfer syntax;

    3> to "Information element missing" upon receiving an RRC information container with an absent conditional IE for which the conditions for presence are met.

1> if there was another failure to perform the operation requested by the received RRC message:

  2> prepare an RRC FAILURE INFO message, including the IE "*Failure Cause*" set to a value that reflects the failure cause;

1> send the RRC FAILURE INFO message to the network node from which the invalid RRC protocol information was received.

NOTE 1: The appropriate (failure) messages used across the network interfaces may not support the inclusion of a RRC information container. In this case, the information contained in the RRC FAILURE INFO message may need to be transferred otherwise e.g. by mapping to a cause value (e.g. a cause value in the RR-HANDOVER FAILURE message when there is a error associated with the RRC-RADIO BEAERER RECONFIGURATION message).

NOTE 2: In case the RRC procedure used to perform SBSS relocation fails e.g. due to non comprehension, the source BSS may notify the target BSS by including the diagnostics information (IEs "Protocol error" and "Protocol error information") in the "RRC message "SBSS Relocation" Info sent in the RRC information container" used for a subsequent relocation request.

11.1.3 RRC Information to target GERAN Iu mode BSS

The RRC information container "RRC Information to target GERAN Iu mode BSS" may either be sent from source GERAN Iu mode BSS or from another RAT. In case of Handover to GERAN, this information originates from another RAT, while in case of SBSS relocation the RRC information originates from the source BSS. In case of handover to GERAN, the RRC information transferred may provide GERAN specific information, as defined in the INTER RAT HANDOVER INFO WITH INTER RAT CAPABILITIES message, that the target BSS needs when preparing the handover command message. In case of SBSS relocation, the RRC information transferred specifies the configuration of RRC and the lower layers it controls, e.g. including the radio bearer and RLC configuration. It is used by the target BSS to initialize RRC and the lower layer protocols to facilitate SBSS relocation in a manner transparent to the MES.

Table 11.1.3.1: RRC INFORMATION TO TARGET GERAN IU MODE BSS information elements

< RRC INFORMATION TO TARGET GERAN IU MODE BSS message content > ::= { 0 -- *critical extension escape available* { { 00 <**Handover to GERAN**: < INTER RAT or MODE HANDOVER INFO WITH MES CAPABILITIES Message > > | 01 < **SBSS Relocation** : < SBSS RELOCATION INFO > > | 10 < **RFC3095 Context Info** : < RFC3095 CONTEXT INFO > ! < Message escape : { 11 } bit** = < no string > > } -- *reserved for future extension* ! < Content part error : bit (*) = < no string > > } ! < Message escape critical extension : 1 bit (*) = < no string > >} ;

Table 11.1.3.2: RRC INFORMATION TO TARGET GERAN IU MODE BSS information element details

INTER RAT or MODE HANDOVER INFO WITH MES CAPABILITIES This message is defined in clause 11.1.5.
SBSS RELOCATION INFO This message is defined in clause 11.1.5.
RFC3095 CONTEXT INFO This message is defined in clause 11.1.5.3.

11.1.4 RRC information, target BSS to source BSS

There are 2 possible cases for BSS relocation:

1 The MES is already under control of target BSS; and

2 The SBSS Relocation with Handover (MES still under control of SBSS), but MES is moving to a location controlled by the target BSS (based on measurement information).

In case 1 the relocation is transparent to the MES and there is no "reverse" direction container. The SBSS just assigns the "serving" function to the target BSS, which then becomes the Serving BSS.

In case 2 the relocation is initiated by SBSS, which also provides the RRC INFORMATION TO TARGET GERAN IU MODE BSS Container to the target BSS. Based upon this information, the target BSS prepares the RADIO BEARER RECONFIGURATION Message.

The source BSS then transmits the Handover Message to the MES, which then performs the handover.

In the successful case, the MES transmits a RADIO BEARER RECONFIGURATION COMPLETE message, using the new configuration, to the target BSS.

In case of failure, the MES transmits an RADIO BEARER RECONFIGURATION FAILURE, using the old configuration, to the source BSS and the RRC context remains unchanged (has to be confirmed and checked with the SBSS relocation procedure).

Table 11.1.4.1: RRC Information Target BSS To Source BSS information elements

```
< RRC Information Target BSS To Source BSS message content > ::=
   { 0 -- critical extension escape available
         {    00
                  < RADIO BEARER RECONFIGURATION : < RADIO BEARER RECONFIGURATION message > >
                  < Synchronization Information Transfer Time : < Activation Time IE > > --  used with UE Software
Version Indicator 0x1 or higher
         |    01  < RRC FAILURE INFO : < RRC FAILURE INFO message > >
         ! < Message escape : {10 | 11} bit (*) = <no string> > } -- reserved for future extension
      !    < Content part error : bit (*) = < no string > > }
   !    < Message escape critical extension : 1 bit (*) = < no string > >} ;
```

Table 11.1.4.2: RRC Information Target BSS To Source BSS information element details

RADIO BEARER RECONFIGURATION This message is defined in clause 9.3.28.
RRC FAILURE INFO This message is defined in clause 9.3.44.
Synchronization Information Transfer Time This IE indicates the frame number at which the source BSS shall transfer the synchronization information to target BSS. The *Activation Time* IE is defined in clause 9.3.1.

11.1.5 RRC messages exchanged between network nodes

11.1.5.0 RADIO BEARER RECONFIGURATION

This RRC message is sent between network nodes to transfer the actual RADIO BEARER RECONFIGURATION message including the details of the radio configuration to be used upon handover to GERAN as compiled by the target BSS.

Direction: target BSS → source RAT

The message is exactly the same as the RADIO BEARER RECONFIGURATION defined in clause 9.2.29.

11.1.5.1 INTER RAT or MODE HANDOVER INFO WITH MES CAPABILITIES

This RRC message is sent between network nodes when preparing for an inter RAT handover to GERAN.

Direction: source RAT → target BSS

Table 11.1.5.1.1: INTER RAT or MODE HANDOVER INFO WITH MES CAPABILITIES elements

```
< INTER RAT or MODE HANDOVER INFO WITH MES CAPABILITIES message content > ::=
        {
        -- MES Information Elements
            { 0 | 1  < MES GERAN Iu mode Radio Access Capability : < MES GERAN Iu mode radio access capability IE > > }
            { 0 | 1  < MES GERAN A/Gb mode Radio Access Capability : < MES GERAN A/Gb mode radio access capability IE > > }
            { 0 | 1  < UE UTRAN Radio Access Capability : < UE UTRAN radio access capability IE > > }
            { 0 | 1  < UE UTRAN Radio Access Capability Extension : < UE UTRAN radio access capability extension IE >> }
            { 0 | 1  < UE CDMA2000 Radio Access Capability : < UE CDMA2000 radio access capability IE > > }
            { 0 | 1  < Failure Cause and Error Information : < Failure Cause and Error Information IE > > }
            { 0 | 1  < Multirate configuration : < Multirate configuration IE > > }
    !   < Content part error : bit (*) = < no string > > } ;
```

Table 11.1.5.1.2: INTER RAT or MODE HANDOVER INFO WITH MES CAPABILITIES element details

MES GERAN Iu mode Radio Access Capability This IE is defined in clause 9.3.45.
MES GERAN A/Gb mode Radio Access Capability This IE is defined in clause 9.3.44.
UE UTRAN Radio Access Capability This IE is defined in clause 9.3.108.
UE UTRAN Radio Access Capability Extension This IE is defined in clause 9.3.109.
UE CDMA2000 Radio Access Capability This IE is defined in clause 9.3.110.
MultiRate configuration IE This IE is defined in clause 9.3.52. If the present speech codec is a multi-rate speech codec, the old BSS may inform the new BSS of the current multi-rate codec configuration by including the MultiRate configuration information element in the RRC INFORMATION TO TARGET GERAN IU MODE BSS message.

11.1.5.2 SBSS RELOCATION INFO

This RRC message is sent between network nodes when preparing for an SBSS relocation or a handover from UTRAN to GERAN *Iu mode*.

Direction: source RAT or BSS → target BSS

Table 11.1.5.2.1: SBSS RELOCATION INFO information elements

```
< SBSS Relocation Information message content > ::=
        {
        -- MES Information Elements
        < RRC State Indicator : < RRC State Indicator IE > >
        < State of RRC procedure : bit (4) >
        -- Ciphering related information
        {    00  < GERAN A/Gb Security Info : < GERAN A/Gb Security Info IE > >
        |    01  < GERAN Iu Security Info : < GERAN Iu Security Info IE > >
        |    10  {< GERAN Iu Security Info : < GERAN Iu Security Info IE > > -- This is used if AES-256 Ciphering is being used
                  < Active  AES-256 Ciphering Key: bit(256)>
                   <Active Key Age: bit(16)>
                  {0 |1<Pending AES-256 Ciphering Key: bit(256)>}
                  <NONCE: bit(64)>} -- This field shall be set to all zeros if NONCE was not provided during Key Exchange procedure.
                  }
        |    11  < Extension : < Extension IE > >}
        < G-RNTI : < G-RNTI IE > >
        < START : < START IE > >
        { 0 | 1  < MES GERAN Iu mode Radio Access Capability : < MES GERAN Iu mode Radio Access Capability IE > > }
```

{ 0 | 1 < **MES GERAN A/Gb mode Radio Access Capability** : < MES GERAN A/Gb mode Radio Access Capability IE > > }
{ 0 | 1 < **UE UTRAN Radio Access Capability** : < UE UTRAN Radio Access Capability IE > > }
{ 0 | 1 < **UE UTRAN Radio Access Capability Extension** : < UE UTRAN Radio Access Capability Extension IE >> }
{ 0 | 1 < **UE CDMA2000 Radio Access Capability** : < UE CDMA2000 Radio Access Capability IE > > }

< **GRA Id** : < GRA Id > >
< **CN Common GSM-MAP NAS System Info** : < NAS System Information GSM-MAP IE > >
< **Length of CN Domain Related Information** : bit (2) >
{ < **CN Domain Identity** : < CN Domain Identity IE > >
< **CN Domain Specific GSM-MAP NAS System Info** : < NAS System Information GSM-MAP IE > >
{ 0 | 1 < **Signalling RB Information to Setup List :** bit (3) >
< **Signalling RB Information to Setup** : < Signalling RB Information to Setup IE > > *(1+val(Signalling RB Information to Setup List))
{ 0 | 1 < **RAB Information for Setup List** : bit (4) >
< **RAB Information for Setup** : < RAB Information for Setup IE > > *(1+val(RAB Information for Setup List)) }
{ 0 | 1 < **RB Information to Reconfigure List** : bit (5) >
< **RB Information to Reconfigure** : < RB Information to Reconfigure IE > > }*(1+val(RB Information to Reconfigure List))
{ 0 | 1 < **RAB Information for Handover List** : bit (4) >
< **RAB Information for Handover** : < RAB Information for Handover IE > > *(1+val(RAB Information for Handover List)) }
{ 0 | 1 < **Multirate configuration** : < Multirate Configuration IE > > }
{ 0 | 1 < **TDMAFN** : < bit(22) > }
{ 0 | 1 < **Failure Cause and Error Information** : < Failure Cause and Error Information IE > > }
{0 | 1 < **MES GPS Position** > }
{0 | 1 < **Source Traffic Cell Identity** : <GMR-1 Cell Identity IE> > }
{0 | 1 < **DL Traffic ARFCN** : bit(11) > }
{ null | 0 bit** = < no string >
| 1--*Release* 6 additions, non-critical extension
{
{ 0 | 1 < **UL TrCH Information Common For All Transport Channels** : < UL TrCH Information Common For All Transport Channels IE> > }
{ 0 | 1 < **Added or Reconfigured UL TrCH Information List** : bit (3) >
{ < **Added or Reconfigured UL TrCH Information** : < Added or Reconfigured UL TrCH Information IE > > } }*(1 + val(Added or Reconfigured UL TrCH information list))
{ 0 | 1 < **DL TrCH Information Common For All Transport Channels** : < DL TrCH Information Common For All Transport Channels IE> > }
{ 0 | 1 < **Added or Reconfigured DL TrCH Information List** : bit (3) >
{ < **Added or Reconfigured DL TrCH Information** : < Added or Reconfigured DL TrCH Information IE > > } }*(1 + val(Added or Reconfigured DL TrCH information list))
} };
! < Content part error : bit (*) = < no string > > } ;

Table 11.1.5.2.2: SBSS RELOCATION INFO information element details

RRC State Indicator
This IE is defined in clause 9.3.97.

State of RRC procedure (4 bit field)
This IE describes the state of the RRC procedure started in the source cell (i.e. RB reconfiguration) as follows:

bit 4 3 2 1	
0 0 0 0	Await no RRC message
0 0 0 1	Complete
0 0 1 0	Await RB Setup Complete
0 0 1 1	Await RB Reconfiguration Complete
0 1 0 0	Await RB Release Complete
0 1 0 1	Send Cell Update Confirm
0 1 1 0	Send URA Update Confirm

All other values are reserved.

GERAN A/Gb Security Info
This IE is defined in clause 11.2.

GERAN Iu or UTRAN Security Info
This IE is defined in clause 11.2.

Active AES-256 Ciphering Key This field is the AES-256 key being used
Active Key Age This fiels indicates the age the key being provided in units of minutes.
Pending AES-256 Ciphering Key This field is present if key exchange has already been done and awaiting security mode procedure to activate it.
MES GERAN Iu mode Radio Access Capability This IE is defined in clause 9.3.45.
MES GERAN A/Gb mode Radio Access Capability This IE is defined in clause 9.3.44.
UE UTRAN Radio Access Capability This IE is defined in clause 9.3.108.
UE UTRAN Radio Access Capability Extension This IE is defined in clause 9.3.109.
UE CDMA2000 Radio Access Capability This IE is defined in clause 9.3.110.
Ciphering status for each CN domain (2 bit field) This field is the binary representation of the number of CN domains. Range: 0 to maxCNdomains-1.
Ciphering Status (1 bit field) This field indicates the status of ciphering for the CN domain bit 1 1 Ciphering started 0 Ciphering not started.
START This IE is defined in clause 9.3.102.
TDMAFN (22 bit field) This field is the binary representation of the TDMA Frame Number. The description of the TDMA Frame Number is in ETSI TS 101 376-5-2 [8].
CN Domain Identity This IE is defined in clause 9.3.15.
G-RNTI IE This IE is defined in clause 9.3.32.
GRA Identity This IE indicates the GRA ID as defined in clause 9.3.30.
CN Common GSM-MAP NAS System Info The *NAS System Information GSM-MAP* IE is defined in clause 9.3.56.
Length of CN Domain Related Information (2 bit field) This field is used to calculate the number of CN domains included in this IE. Range: 0 to MaxCNdomains-1.
CN Domain Specific GSM-MAP NAS System Info The *NAS System Information GSM-MAP* IE is defined in clause 9.3.55.
Signalling RB Information to Setup List (3 bit field) This field is the binary representation of the number of SRB to setup. Range: 0 to maxSRBsetup-1.
Signalling RB Information to Setup This IE is present for each SRB to establish. This IE is defined in clause 9.3.101.
RAB Information for Setup List (4 bit field) This field is the binary representation of the number of RAB to setup. Range: 0 to maxRABsetup-1.
RAB Information for Setup This IE is present for each signalling RAB to establish. This IE is defined in clause 9.3.75.
RB Information to Reconfigure List (5 bit field) This field is the binary representation of the number of RB to reconfigure. Range: 0 to maxRB-1.
RB Information to Reconfigure This IE is defined in clause 9.3.82.
RAB Information for Handover List (4 bit field) This field is the binary representation of the number of RAB to setup. Range: 0 to maxRABsetup-1.
RAB Information for Handover This IE is present for each signalling RAB to establish. This IE is defined in clause 9.3.75a.
MultiRate Configuration IE This IE is defined in clause 9.3.52. If the present speech codec is a multi-rate speech codec, the old BSS may inform the new BSS of the current multi-rate codec configuration by including the MultiRate configuration information Field Element in the RRC INFORMATION TO TARGET GERAN IU MODE BSS message.
Failure Cause and Error Information The *Failure Cause and Error Information* IE is defined in clause 9.3.25.
UL TrCH Information Common For All Transport Channels The IE *UL TrCH Information Common For All Transport Channels* is defined in clause 9.3.134.

Added or Reconfigured UL TrCH information List (3 bit field) This field is used to repeat information on each TrCH to be added or reconfigured in UL. Range: 0 to maxTrCH-1, where 0 enables one TrCH to be described.
Added or Reconfigured UL TrCH Information The IE *Added or Reconfigured UL TrCH information* IE is defined in clause 9.3.122.
DL TrCH Information Common For All Transport Channels The IE *DL TrCH Information Common For All Transport Channels* is defined in clause 9.3.125.
Added or Reconfigured DL TrCH information List (3 bit field) This field is used to repeat information on each TrCH to be added or reconfigured in DL. Range: 0 to maxTrCH-1, where 0 enables one TrCH to be described.
Added or Reconfigured DL TrCH Information The IE *Added or Reconfigured DL TrCH information* is defined in clause 9.3.121.
MES GPS Position This IE contains the value part of GPS Position IE defined in ETSI TS 101 376-4-8 [7].
Source Traffic Cell Identity This IE contains the Cell Identity of the traffic cell in which the MES is operating. The GMR-1 Cell Identity IE is defined in clause 9.3.30a.
DL Traffic ARFCN (11 bit field) This IE contains the ARFCN of the downlink traffic carrier on which the MES is operating. ARFCN is defined in ETSI TS 101 376-5-5 [11].

11.1.5.3 IETF RFC 3095 CONTEXT INFO

This RRC message is sent between network nodes in SBSS/SRNS or SBSS/SBSS relocation. It is used to transfer the compressor and decompressor context information of the IETF RFC 3095 [i.5] protocol.

Direction: source BSS → target BSS/RNC

Table 11.1.5.3.1: IETF RFC 3095 [i.5] CONTEXT INFO information elements

```
< RFC 3095 Context Info IE > ::=
    < RB with RFC 3095 Context List : bit(5) >
    {   < RB Identity : < RB Identity IE > >
        < RFC 3095 Context List : bit(14) >
        {
            { 0 | 1  -- Downlink RFC 3095 context
                < Downlink RFC 3095 Context Identity: bit(14) >
                < DL_MODE: bit(2) >
                < REF_IR: octet(3000) >
                { 0 | 1  < REF_TIME: bit(32) > }
                { 0 | 1  < SYN_OFFSET_ID : bit(16) > }
                { 0 | 1  < SYN_SLOPE_TS : bit(32) > }
                { < DYN_CHANGED : 0 >
                | < DYN_CHANGED : 1 > }
            }
            { 0 | 1  -- Uplink RFC 3095 context
                < Uplink RFC 3095 Context Identity: bit(14) >
                < UL_MODE: bit(2) >
                < REF_IR: octet(3000) >
                { 0 | 1  < REF_TIME: bit(32) > }
                { 0 | 1  < SYN_OFFSET_ID : bit(16) > }
                { 0 | 1  < SYN_SLOPE_TS : bit(32) > }
                { 0 | 1  < REF_SN_1 : bit(15) > }
            }
        }*(1 + val(RFC 3095 Context List))
    }*(1 + val(RB with RFC 3095 Context List));
```

Table 11.1.5.3.2: IETF RFC 3095 [i.5] CONTEXT INFO information elements details

RB with RFC 3095 [i.5] **Context List** (5 bit field) This field is the binary representation of the number of Radio Bearers with IETF RFC 3095 [i.5] context information. Range: 0 to maxRBallRABs - 1.
RB Identity This IE is defined in clause 9.3.80.
IETF RFC 3095 [i.5] **Context List** (14 bit field) This field is the binary representation of the number of the IETF RFC 3095 [i.5] contexts for this Radio Bearer. Range: 0 to maxRFC3095-CID - 1.
Downlink IETF RFC 3095 [i.5] **Context Identity** (14 bit field) **Uplink IETF RFC 3095** [i.5] **Context Identity** (14 bit field) This field represents the identity of the IETF RFC 3095 [i.5] in respectively Downlink and Uplink.
REF_IR (3000 octet string field**)** This field corresponds to the RTP IR header (see clause 5.7.7 of IETF RFC 3095 [i.5] for detailed format) corresponding to the oldest header in the compressor sliding window.
RF_TIME (32 bit field) This field corresponds to the arrival time (at the compressor) of REF_IR in milliseconds. See clauses 4.5.4 and 6.5.1 of IETF RFC 3095 [i.5].
SYN_SLOPE_TS (32 bit field) This field corresponds to the last synchronized slope of TS. See clauses 5.5.1.2 and 5.7 of IETF RFC 3095 [i.5]. In SO state, TS(n) = TS(m) + (n-m) * SYN_SLOPE_TS, where n and m is the RTP SN of current packet and the reference packet. Note that the unit of SYN_SLOPE_TS depends on whether TS is scaled before compression or not.
DYN_CHANGED (1 bit field) This field corresponds to the information whether dynamic fields other than RTP SN, RTP TS and IP-ID have changed in the headers that are stored in the sliding window. Set to TRUE if changed and FALSE if not changed. bit 1 0 DYN_CHANGED not supported 1 DYN_CHANGED supported.
SYN_OFFSET_ID (16 bit field) This field corresponds to the RTP Sequence Number of the predecessor of the latest RTP packet. This could be used to perform local repair of context by decompressor in U or O mode (see "ref - 1" in clause 5.3.2.2.5 in IETF RFC 3095 [i.5] for further explanation).
DL_MODE (2 bit field) **UL_MODE** (2 bit field) This field represents the IETF RFC 3095 [i.5] mode in respectively Downlink and Uplink before the SBSS relocation. The optimal mode to operate in depends on the characteristics of the environment of the compression protocol, such as feedback abilities, error probabilities and distributions, effects of header size variation, etc. bit 1 0 0 0 U-mode -- Unidirectional mode 0 1 O-mode -- Bidirectional Optimistic mode 1 0 R-mode -- Bidirectional Reliable mode 1 1 reserved.

11.1.5.3a ZBHC CONTEXT INFO

This RRC message is sent between network nodes in SBSS/SRNS or SBSS/SBSS relocation. It is used to transfer the compressor and decompressor context information of the Zero-Byte Header Compression (ZBHC) protocol.

Direction: source BSS → target BSS/RNC

Table 11.1.5.3a.1: ZBHC CONTEXT INFO information elements

```
< ZBHC Context Info IE > ::=
    < RB with ZBHC Context List : bit(5) >
    {    < RB Identity : < RB Identity IE > >
         { 0 | 1  < Uplink ZBHC Context: ZBHC Context IE > }
    }*(1 + val(RB with ZBHC Context List));


< ZBHC Context IE > ::=
    {    0  –  IPv4 related context
              < DSCP : bit(6) >
              < ECN : bit(2) >
              < Source IPv4 Address : bit(32) >
              < Destination IPv4 Address : bit(32) >
              < IPv4 Identifier : bit(16) >
       | 1  – IPv6 related context
              < Traffic Class : bit(8) >
              < Flow Label : bit(20) >
              < Source IPv6 Address : bit(128) >
              < Destination IPv6 Address : bit(128) >
    }
    < Source UDP Port : bit(16) >
    < Destination UDP Port : bit(16) >
    < RTP Version : bit(2) >
    < RTP Payload Type : bit(7) >
    <RTP SSRC : bit(32) >
    < RTP Sequence: bit(16) >
    < RTP Timestamp: bit(32) >
    < Last Frame Number: bit(22) >;
```

Table 11.1.5.3a.2: ZBHC CONTEXT INFO information elements details

RB with ZBHC Context List (5 bit field) This field is the binary representation of the number of Radio Bearers with Zero-Byte Header Compression context information. Range: 0 to maxRBallRABs - 1.
RB Identity This IE is defined in clause 9.3.80.
Uplink ZBHC Context This field represents the Zero-Byte Header Compression context for the RB in the uplink direction.
DSCP (6 bit field**)** This field contains the DiffServ Code Point value in the IPv4 header.
ECN (2 bit field**)** This field contains the Explicit Congestion Notification bits in the IPv4 header.
Source IPv4 Address (32 bit field**)** This field contains the Source Address in the IPv4 header.
Destination IPv4 Address (32 bit field**)** This field contains the Destination Address in the IPv4 header.
IPv4 Identifier (16 bit field**)** This field contains the Identifier value in the IPv4 header.
Traffic Class (8 bit field**)** This field contains the Traffic Class bits in the IPv6 header.
Flow Label (20 bit field**)** This field contains the Flow Label bits in the IPv6 header.
Source IPv6 Address (128 bit field**)** This field contains the Source Address in the IPv6 header.
Destination IPv6 Address (128 bit field**)** This field contains the Destination Address in the IPv6 header.

Source UDP Port (16 bit field**)** This field contains the Source Port in the UDP header.
Destination UDP Port (16 bit field**)** This field contains the Destination Port in the UDP header.
RTP Version (2 bit field**)** This field contains the Version value in the RTP header.
Payload Type (7 bit field**)** This field contains the Payload Type in the RTP header.
RTP SSRC (16 bit field**)** This field contains the Synchronization Source identifier in the RTP header.
RTP Sequence (16 bit field**)** This field contains the Sequence Number in the RTP header.
RTP Timestamp (32 bit field**)** This field contains the Timestamp in the RTP header.
Last Frame Number (22 bit field**)** This field contains the last frame number received in the uplink.

11.1.5.4 SRNS CONTEXT INFO

This RRC message is sent between network nodes during SRNS relocation. It contains PDCP context information and additional state to be transferred to the target SRNS in the RRC Container within the Forward SRNS Context message defined in ETSI TS 125 413 [28].

Direction: source RNC → target RNC

Table 11.1.5.4.1: SRNS CONTEXT INFO information elements

< SRNS Context Info IE > ::= { 0 | 1 < **RFC 3095 Context Info** : <RFC 3095 Context Info IE> > } { 0 | 1 < **ZBHC Context Info** : <ZBHC Context Info IE> > } { <**DCH Synchronization Info List** : bit(3)>} -- DCH Synchronization Info used to assist receiver acquisition at target SRNS {< LHCP **Timing Offset**: bit(6) > {< RHCP **Timing Offset**: bit(6) > < LHCP **Frequency Offset**: bit(9) > < RHCP **Frequency Offset**: bit(9) > < **RB Identity** : < RB Identity IE >> }* val(DCH Synchronization List);

Table 11.1.5.4.2: SRNS CONTEXT INFO information elements details

IETF RFC 3095 [i.5] Context Info IE This IE is defined in clause 11.1.5.3.
ZBHC Context Info IE This IE is defined in clause 11.1.5.3a.
DCH Synchronization Info List (3 bit field) This field is used to repeat information on each DCH Synchronization. Range: 0 to 4.
LHCP Timing Offset: (6 bit field) This field contains the latest LHCP timing offset measured by the DCH receiver at the source SRNS. Units: Ts/40 resolution unit, where Ts is a symbol period for a reference symbol rate of 23,4 Ksps. Range: -20 to +20 units for a range of -1/2 to +1/2 reference symbol duration. This field is encoded in 2's complement binary form. Values outside this range are reserved.
RHCP Timing Offset: (6 bit field) This field contains the latest RHCP timing offset measured by the DCH receiver at the source SRNS. Units: Ts/40 resolution unit, where Ts is a symbol period for a reference symbol rate of 23,4 Ksps. Range: -20 to +20 units for a range of -1/2 to +1/2 reference symbol duration. This field is encoded in 2's complement binary form. Values outside this range are reserved.
LHCP Frequency Offset: (9 bit field) This field contains the latest LHCP frequency offset measured by the DCH receiver at the source SRNS.This frequency offset is normalized to a carrier frequency of 1 600 000 000 Hz by the source RNC. The target RNC shall apply the value after scaling it to the target uplink ARFCN. Units: 1 Hz. Range: -200 to +200 Hz, This field is encoded in 2's complement binary form. Values outside this range are reserved.

RHCP Frequency Offset: (9 bit field) This field contains the latest RHCP frequency offset measured by the DCH receiver at the source SRNS.This frequency offset is normalized to a carrier frequency of 1 600 000 000 Hz by the source RNC. The target RNC shall apply the value after scaling it to the target uplink ARFCN. Units: 1 Hz. Range: -200 to +200 Hz, This field is encoded in 2's complement binary form. Values outside this range are reserved.
RB Identity This IE is defined in clause 9.3.80. This field is set to one of the RBs that were assigned on the DCH slot.

11.2 Provision and reception of RRC security information between network nodes

11.2.1 General

In certain cases, e.g. when performing handover or when performing SBSS relocation, RRC security related information shall be transferred between other RATs and GERAN or between GERAN nodes within GERAN.

The lengths of the RLC counters of non-transparent radio bearers are different between GPRS (24 bits) and EGPRS (20 bits). The BSC shall set the HFN values according the source cell (GPRS or EGPRS) and independent from the target cell (UTRAN, GPRS or EGPRS).

In the following, the RRC security information to be transferred is separated into the three scenarios:

- GERAN *A/Gb mode* to GERAN *Iu mode*.
- GERAN *Iu mode* to GERAN *Iu mode* or UTRAN to GERAN *Iu mode*.

11.2.2 RRC Security Information, from GERAN-A/Gb to GERAN-Iu

The START value is used to initialize the most significant bits of all the HFN counters (MAC HFN, RLC AM HFN, RLC UM HFN, RRC HFN).

Direction: source: GERAN *A/Gb mode* BSC → target GERAN *Iu mode* BSC

Table 11.2.2.1: *GERAN A/Gb Security Info* information elements

```
< GERAN A/Gb Security Info IE >::=
  {
    < Start-CS : < START IE > >
    < Start-PS : < START IE > >
  ! < Content part error : bit (*) = < no string > > } ;
```

Table 11.2.2.2: *GERAN A/Gb Security Info* information element details

Start-CS The *START* IE is used to initialize the most significant bits of all the HFN counters (MAC HFN, RLC AM HFN, RLC UM HFN, RRC HFN) for the CS domain. The *START* IE is defined in clause 9.3.102.
Start-PS The *START* IE is used to initialize the most significant bits of all the HFN counters (MAC HFN, RLC AM HFN, RLC UM HFN, RRC HFN) for the PS domain. The *START* IE is defined in clause 9.3.102.

11.2.3 RRC Security Information, from GERAN Iu mode/UTRAN to GERAN Iu mode

This IE contains security information required for continued communication between the MES and GERAN after a handover or SRNS/SBSS relocation.

Direction: source: BSC/RNC → target BSC

Table 11.2.3.1: *GERAN Iu or UTRAN Security Info* information elements

```
< GERAN Iu or UTRAN Security Info IE >::=
    {
        < Ciphering status for each CN domain : bit (2) >
            {   < CN domain identity : < CN domain identity > >
                < Ciphering Status : bit (1) > }*(1+val(Ciphering status for each CN domain))
        < Latest configured CN Domain : bit (2) >
        < Ciphering info for transparent RB : bit (2) >
            {   < CN domain identity : < CN domain identity > >
                < MAC-HFN : bit (11) > } *(1+val(Ciphering info for transparent RB))
        < Ciphering info for non-transparent RB : bit (5) >
            {   < RB Id : < RB Identity IE > >
                < DL HFN : < RLC HFN IE > >
                < UL HFN : < RLC HFN IE > > }*(1+val(Ciphering info for non-transparent RB))
        {   < Integrity Protection status : 1 >
                {   < SRB-Id : bit (2) >
                    < UL RRC HFN : bit (28) >
                    < DL RRC HFN : bit (28) >
                    < Uplink RRC Message Sequence number : bit (4) > }*4
                    < Downlink RRC Message Sequence number : bit (4) > }*4
        |   < Integrity Protection status : 0 > }
    !   < Content part error : bit (*) = < no string > > } ;
```

Table 11.2.3.2: *GERAN Iu or UTRAN Security Info* information element details

Ciphering status for each CN domain (2 bit field) This field is the binary representation of the number of repeated groups of fields and IEs. Range: 0 to maxCNdomains-1.
CN Domain Identity This IE is defined in clause 9.3.115.
Ciphering status (1 bit field) This field indicates the ciphering status of the indicated CN Domain. Bit 1 0 Ciphering not started 1 Ciphering started.
Last Configured CN Domain (2 bit field) This field indicates the last configured CN Domain. This field is encoded as the CN Domain Identity in clause 9.3.15.
Ciphering info for transparent RB (2 bit field) This field is the binary representation of the number of instances of ciphering info which is provided for transparent mode RLC RBs. Range: 0 to maxCNDomains-1.
MAC-HFN (11 bit field) This field contains the MAC-HFN. The MAC-HFN is defined as the 11 MSB of the COUNT-C value.
Ciphering info for non-transparent RB (5 bit field) This field is the binary representation of the number of non-transparent mode RLC RBs for which ciphering info is provided. Range: 0 to maxRB-1.
DL HFN/UL HFN The *RLC HFN* IE is defined in clause 9.3.92.
Integrity Protection status (1 bit field) This field indicates the status of integrity protection in the current cell. The field is encoded: Bit 1 0 Integrity Protection not started 1 Integrity Protection started.
SRB-Id (2 bit field) This field defines the SRB Id for which the following integrity protection information applies: bit 2 1 0 0 SRB1 0 1 SRB2 1 0 SRB3 1 1 SRB4.
UL/DL RRC HFN (28 bit field) This field contains the RRC HFN in the indicated direction. For each SRB, in case the activation times for the next Integrity Protection configuration to be applied on this SRB have already been reached, this IE corresponds to the last value used. Else this value corresponds to the value the source would have initialized the HFN to at the activation time. Increment of HFN due to RRC SN roll over is taken care of by target based on the value sent by the source.

Uplink RRC Message Sequence Number (4 bit field) This field is the binary representation of the RRC Sequence number for the indicated SRB. For each SRB, this IE corresponds to the last value received or in case the activation time was not reached for a configuration the value equals (activation time -1). Range 0 to 15.
Downlink RRC Message Sequence Number (4 bit field) This field is the binary representation of the RRC Sequence number for the indicated SRB. For each SRB, this IE corresponds to the last value used or in case the activation time was not reached for a configuration, to the value (activation time -1). In particular, for SRB2, this IE should not take into account the RRC message that will trigger the relocation Range 0 to 15.

11.2.4 RRC Security Information, from GERAN Iu to UTRAN

NOTE: This information should be specified in ETSI TS 125 331 [21] since UTRAN is the target RAT.

11.3 HFN mapping rules for radio bearer using non-transparent mode RLC

The length of RLC counters in UTRAN (RLC-AM 20bits, RLC-UM 25bits) and GERAN-Iu are different. In GERAN-Iu there are additional differences between GPRS (RLC-AM and RLC-UM 24bits) and EGPRS (RLC-AM and RLC-UM 20bits).

The network nodes shall use the following HFN mapping rules when sending or receiving HFN values within the RRC information containers:

1> the source network node shall set the HFN value as used in the source cell;

1> if the target network node receives an HFN value with the same length as used in the target cell;

 2> increment this HFN by 1; and

 2> use this value as HFN in the target cell;

1> if the target network node receives an HFN which is longer than the one used in the target cell;

 2> take the MSBs as needed for the target cell;

 2> increment this value by 1; and

 2> use this value as HFN in the target cell;

1> if the target network node receives an HFN which is shorter than the one used in the target cell;

 2> increment this HFN by 1;

 2> add a number of least significant zero bits as needed; and

 2> use this value as HFN in the target cell.

11.4 Calculated Transport Format Combination

Not supported in GMR-1 3G.

11.5 Signalling TFC

Not supported in GMR-1 3G.

Annex A (informative): Bibliography

ETSI TS 101 376-3-7: "GEO-Mobile Radio Interface Specifications; Part 3: Network specifications; Sub-part 7: Discontinuous Reception (DRX); GMR-1 03.013".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

ETSI TS 101 376-4-2: "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 2: GMR-1 Satellite Network Access Reference Configuration GMR-1 04.002".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

ETSI TS 101 376-4-4: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 4: Radio interface protocol specifications; Sub-part 4: Layer 1 General Requirements; GMR-1 3G 44.004".

ETSI TS 101 376-4-5: "GEO-Mobile Radio Interface Specifications; Part 4: Radio interface protocol specifications; Sub-part 5: Data Link Layer General Aspects; GMR-1 04.005".

NOTE: This is a reference to a GMR-1 Release 1 specification. See the introduction for more details.

ETSI TS 101 376-2-1: "GEO-Mobile Radio Interface Specifications; Part 2: Service specifications; Sub-part 1: Service Accessibility; GMR-1 02.011".

ETSI TS 101 376-5-3: "GEO-Mobile Radio Interface Specifications (Release 3); Third Generation Satellite Packet Radio Service; Part 5: Radio interface physical layer specifications; Sub-part 3: Channel Coding; GMR-1 3G 45.003".

ETSI TS 101 344: "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description; Stage 2; 3GPP TS 23.060 ".

IANA ROHC "profile identifier definition".

NOTE: Available at http://www.iana.org/assignments/rohc-pro-ids.

ETSI TS 125 133: "Universal Mobile Telecommunications System (UMTS); Requirements for support of radio resource management (FDD) (3GPP TS 25.133 Release 7)".

ETSI TS 125 123: "Universal Mobile Telecommunications System (UMTS); Requirements for support of radio resource management (TDD) (3GPP TS 25.123 Release 7)".

TIA/EIA/IS-98: "Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations".

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